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The tone system of Acatlán Mixtec and some exceptions to the OCP

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1. Introduction[1]

Linguistic theory is a theory about grammars. It provides the basic principles on which grammars are built, and predicts which processes will or will not be found in any particular grammar. Sometimes, however, the results of a particular analysis contradict what the general principles of linguistic theory predict. It is within that tension that most of the work in Linguistics is done. In this paper I will present an analysis of the tone system of Acatlán Mixtec, a Mesoamerican language, which seems to contradict some of the predictions made by the Obligatory Contour Principle, a condition that rules out sequences of like tones (Leben 1978, McCarthy 1986). According to the analysis I am going to present here, sequences of low tones exist both morpheme-internally and as a product of the concatenation of morphemes in Acatlán Mixtec. Since these results are in conflict with the predictions made by the OCP, I will be forced to weaken the OCP to a certain extent. Objections against the OCP have been raised in several occasions, particularly in Odden (1986), who suggests that the OCP is only a manifestation of a general preference for grammars that avoid sequences of like elements at the melodic level. This interpretation has been disputed by McCarthy (1986), who claims that even Odden's facts require a principle that constrains the power of autosegmental phonology. I will conclude that the OCP has to be given a broader interpretation, as a condition that rules out the use of the power of autosegmental phonology to introduce abstract phonetic distinctions without overt phonetic contrasts.

The paper is structured as follows: In the first section, I discuss a process of Upstepping that affects high tones. I argue for a hypothesis that regards upstepping as an automatic process, predictable from the phonological environment, by which a high tone is upstepped when it is preceded by another high tone. This result is important because it shows that high tones in Acatlán Mixtec obey the OCP. In the second section I show that mid tones also obey the OCP. A rule of Rising-to-high in Acatlán Mixtec provides evidence that sequences of mid toned syllables correspond to a single mid tone linked to all the syllables in the sequence. In the third section I discuss the behavior of low tones, which seem to disobey the OCP. I show that sequences of low toned syllables that arise in the course of the derivation, as well as morpheme internal sequences of low toned syllables, should be regarded as linked to a separate low tone each. This yields a sequence of low tones on the tonal tier, in violation of the OCP. In the last section I review the major papers in which the OCP is discussed in its various forms, to evaluate the status of the OCP with respect to my analysis of Acatlán Mixtec.

[1] Special thanks to Matthew Chen, and also to Beverly Goodman, Barbara Levergood, David Perlmutter, Karin Pizer, Sandy Schane, and the audiences at UCSD and WECOL 92, Tucson. The usual disclaimer applies.

2. High tones and Upstepping

2.1. The tone system

Acatlán Mixtec is a tone language of the Otomanguean family, spoken in the state of Puebla, Mexico. It was originally described by Eunice Pike and Kent Wistrand (1974). In a tone language, pitch contrasts and segmental phonemes take part in building up morphemes, to follow a characterization suggested by Welmers (1973). Tone languages are widespread in Africa and Asia, and many more can be found in Central America. Some typological variation can be found among tone languages. Welmers distinguished between discrete-level tone languages and terraced-level tone languages. In terraced-level tone languages there is a progressive shift in the pitch level of the utterance. The change happens in a series of terraces or groups, so that the pitch at which a tone is realized varies regularly from terrace to terrace, but the relative differences in pitch that the tonal system encodes are preserved within the limits of the tone group. Terraced-level tone languages are found mainly in Africa. The paradigmatic case of a language of this kind is represented, for instance, by Tiv (Arnott, 1964). In Tiv, a high tone automatically drops its pitch level after a low tone, and some times it does so after another high tone also. In a phrase like *á dzà gá*, the second high tone is going to be uttered in a lower pitch than the first high tone. This automatic drop is called downdrift, and it is sometimes contrasted with downstep, or non-automatic drop of a high tone after another high tone. In *à vé jé* "he came indeed", for instance, the emphatic morpheme *je* is realized at a pitch somewhere between high and low[2]. Both downstep and downdrift have the property of being iterative. A downdrifted high will set a new ceiling for the tones that follow, so that a high tone that comes after it will be realized at the same pitch. The interaction of these two properties of downdrift creates a characteristic terracing effect, in which the overall pitch level of the utterance shifts downwards.

Acatlán Mixtec also belongs to the group of terraced-level tone languages, but it is different from Tiv and most African languages in that the direction of register shift is upwards, instead of downwards. Like other dialects of Mixtec, Acatlán Mixtec has three tones that normally contrast, but in addition there is an upstepped tone that is realized at a higher pitch than any previous tone, and resets the pitch level for the tones that follow one step higher. In (1.a), for instance, the morpheme *ni* "2nd Sg Pol" has a pitch of 3, which corresponds to that of a high tone, when preceded by a mid tone. Same thing when it comes after a low tone, as in (1.b). But when it comes after a high tone, as in (1.c), it is realized with a pitch of 4, that is, an upstepped tone.

(1.a)	t i i - n i t o ? o	(1.b) ? i t u - n i
	M M H ↑H L	M L H
	2 2 3 4 2	2 1 3
	grab you.sg.pol stranger	*cornfield you.sg.pol*
	grab the stranger.	*your cornfield*

[2] In Pulleyblank (1986) cases like this, which involve non-automatic drop, are explained by means of a floating low tone that precedes the downstepped high. The process that causes downdrift is thus generalized to account for downstep.

(1.c) š i n i - n i
L H ↑H
1 3 4
sees you.sg.pol
you see

Another example is provided by *to?o* "stranger". In (1.a), when *to?o* follows a word that ends in a high tone, it shows up with the pattern upstepped-low. But when it is preceded by a non-high tone, as in (2), the tone pattern of the word is high-low:

(2) ? i i t o ? o
MM H L
2 2 3 1
one stranger

The upstepping process is iterative, just as the process of downstep or downdrift in Tiv, and there is no obvious upper limit to it[3]. Thus, in the following example, when two upstepped tones come one after another the pitch level of the last one reaches a level of 5:

(3) d a č a ?m a - s i ᵐb e l u
M M L H ↑H ↑H
2 2 1 3 4 5
causative-will.be.crushed-animal.pron. hat
the animal will crush the hat

The alternation of high tones and upstepped tones in morphemes like *ni* "2 sg pol" or *to?o* "stranger" can be accounted for by a rule that changes a high tone into an upstepped tone when preceded by another high tone:

(4) H → ↑H / H _

I will refer to the hypothesis that upstepped tones arise only as a result of an automatic process that affects a high tone when it follows another high tone as the Upstepping Hypothesis. Aditional evidence for the Upstepping hypothesis comes from the fact that an upstepped tone never occurs before low or mid (and I assume that it never occurs after pause either). According to the Upstepping Hypothesis, the derivation of the example (1.c) would be as in (5):

[3] A remaining question is what the domain of upstepping is. From the bulk of data presented in Pike and Wistrand (1974) one can conclude that the domain is the sentence. However, there are some scattered examples in which the pitch level of the utterance goes back to the initial level before the end of the sentence. For instance, in *kočituwani mee* "you don't kiss the baby so much", which has the tone melody H↑H↑H↑H↑H↑HL, the pitch sequence is 3456781. The last low tone is uttered at the lowest possible pitch level in absolute terms.

(5) š i n i - n i → š i n i - n i
L H H L H ↑H

2.2 The representation of sequences of high-toned syllables

According to the Upstepping Hypothesis, upstepped tones are derived from high tones. Every high tone, then, should turn into an upstepped tone when preceded by another high or an upstepped tone. However, there are some potential counterexamples to this claim, which require an explanation. Sequences of high toned syllables can be found all over the place in Acatlán Mixtec. The word *di?i* "mother", for instance, has the melody high-high in the next sentence:

(6) m a n i - t e n u u d i ? i - t e
L L H ↑HL H H ↑H
1 1 3 4 2 4 4 5
loved-3.masc.fam by mother-3.masc.fam
he is loved by his mother

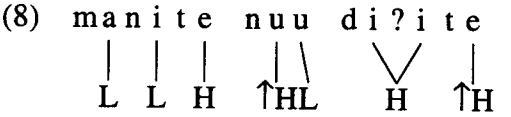
This example represents a challenge to the Upstepping Hypothesis, since there seem to be some high tones that are immune to the rule. Why does not the second syllable of *di?i* "mother" show up with an upstep tone instead of showing up with a high tone? The Upstepping Hypothesis predicts that this should be the case. Some additional data, however, will show that the behavior of morphemes like *di?i* is not exceptional with respect to the Upstepping Hypothesis.

A crucial property of morphemes that, like *di?i*, show up with a sequence of high toned syllables is that their second syllable always bears the same tone as the first one. In some cases *di?i* shows up with the melody mid-mid, as in (7).

(7) d i ? i ⁿ z i k u
M M L M
2 2 1 2
mother will.sew
the mother who will sew

So, even though *di?i* undergoes various sandhi processes, which I will spell out later, the surface tone assigned to the second syllable never differs from the one assigned to the first one. A reasonable way of accounting for this pattern is to assume that *di?i* has a single tone that is linked to its two syllables. In a sequence of high toned syllables in Acatlán Mixtec the rule of Upstepping does not apply because there is only one tone linked to the whole sequence of syllables, and not a sequence of high tones, which is what the input to the rule specifies. Thus, if any high-high sequence in Acatlán Mixtec can be shown to involve the sharing of a single tonal unit among various syllables, as in *di?i* "mother", the potential problem created by sequences of high toned syllables for the Upstepping Hypothesis will be dismissed. I will refer to the hypothesis that sequences of high toned syllables correspond to a single tone with multiple linkings as the *Level Tone Hypothesis.*

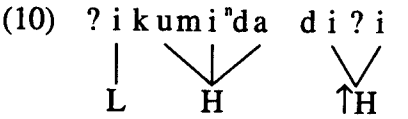
My analysis of the tone pattern of words like *di?i* relies on a now commonly accepted distinction between tones as independent units on the tone tier and tone bearing units, which in Acatlán Mixtec are the syllables. One of the main achievements of autosegmental theories of Phonology was to show that there are mismatches between these two levels. A word like *di?i* "mother" in sentence (6) has two high toned syllables, but only one high tone on the tone tier. The representation of sentence (6) is as in (8):



The Level Tone Hypothesis also accounts for a third tone melody that *di?i* can show up with. The melodies mid-mid and high-high in *di?i* "mother" alternate with the melody upstepped-high, as in the next example:

(9) ? i k u m i - ⁿd a d i ? i
M H H H ↑H H
2 3 3 3 4 4
have-we.incl mother
we have a mother

When *di?i* "mother" is preceded by a high tone, as in (9), the high tone in the tone tier is going to be upstepped, as in the following derivation. Notice the sequence of high toned syllables in the sentence, that corresponds to a multiply-linked high tone in the underlying representation.



On the surface, it looks like the upstepping process has affected only the first high-toned syllable of the word *di?i*, yielding an upstepped tone followed by an high tone. But according to my analysis, what one has in this case is a single upstepped tone that extends over two syllables. On the surface, this is going to look like two syllables with the same pitch level, but this is not to be interpreted as an upstep tone followed by a high tone.

2.3. Is Acatlán Mixtec a terraced-level tone language?

An immediate consequence of an analysis that includes the Level Tone Hypothesis and the Upstepping Hypothesis is that upstepped tones can be completely dispensed with from the inventory of tones in Acatlán Mixtec. Only three tones need to be postulated as distinctive. An upstepped tone is always derived by means of a rule like (5). The question of whether the tone that brings about the shift in register is an additional toneme of the system or an allotone of another tone, arises naturally when one deals with terraced-level tone systems. In discussing what distinguishes a system with a true downstepped tone from a system that simply adds an extra tone, Hyman (1979) has argued that the status of the downstepped (or the upstepped) tone is not the decisive factor that characterizes terraced-level tone systems. He has summarized the reasons that have been given in the literature in favor of a downstep (or upstep) analysis of a

given tonal system. In reference to downstep, he listed three defining characteristics: a) a downstepped high tone contrasts with a high tone only after another high tone. b) After a downstepped high tone, the following high is realized at the same pitch level. c) In a system with a true downstep tone, the number of possible non-low tone levels is potentially infinite. The same applies, with some changes, regarding Acatlán Mixtec. However, Hyman has found some languages that one still would like to analyze as terraced- level tone languages, but present exceptions to (a) and (b). Hyman concludes that the defining characteristic of a true terracing system is the existence of a potentially infinite range of pitch levels.

Anderson (1978) has pointed out that it would be possible to take a downstepped tone like the one found in languages similar to Tiv to be a mid tone, and then have a rule that will reset the highest pitch level to make it identical to that of a preceding mid or high (i.e. non-low) tone. An alternative analysis to the one I am proposing may take Upstepped tones to be basic, i.e. present in the underlying form of some morphemes, and may analyze those cases in which a syllable that has an upstepped tone shows up with a high tone as a neutralization process, that changes upstepped tones into high tones after a low or a mid tone. This analysis is more costly, for it requires four tones instead of three, but it does not require that sequences of high toned syllables be given any special treatment. There is a gap, however, that this analysis leaves unexplained. Acatlán Mixtec is missing a syllable or a morpheme that will show up with a high tone invariably after any other tone, no matter whether the preceding tone is mid, low or high. There is no case of a syllable that bears a high tone after a mid tone, for instance, and also after a high tone. With the Upstepping Hypothesis the gap is explained naturally, because every high tone that is preceded by another high tone will turn into an upstepped tone.

Considered in general terms, the shape taken by the Upstepping rule in my analysis corresponds to that of a dissimilation rule. Its input is a sequence of like segments, and its output is a representation in which the two segments are no longer identical. It has been claimed that rules of these kind are motivated by the OCP (Yip, 1988). The OCP imposes many sorts of restrictions on a phonological system. For instance, it disallows sequences of like segments in the course of the derivation. This means that no rule will create such a sequence, or that if sequences like that arise in the course of the derivation there will be a rule that will solve the situation, either by fusing the two elements or by dissimilating or deleting one of them. How does the Upstepping rule solve a potential OCP violation? The phonological nature of register shift has been subject to debate since the first terraced-level tone languages were described. I will follow Clements (1981) and Pulleyblank (1986) in their use of "feet" or tone groups[4] to indicate the domain for register shift. Tone groups are not just a device to encode some phonetic process, but rather a part of the phonological representation of tones. The hypothesis that shifts in register are not a mere phonetic process is in general accepted by those authors that think that the distinctive units that underlie pitch differences are a product of tone and register[5]. Thus, when the second of two adjacent high tones is assigned to a new tone group, its phonological representation is being changed, and becomes different from that of a preceding high tone that is in another tone group.

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[4] The need for some entity of higher level than the tone is motivated by the impossibility of assigning pitch levels in terraced-level tone languages in a purely local way, as Clements (1979) and Hyman (1979) have pointed out. Within each tone group, pitch differences reflect tone differences, but that difference is not carried over from tone group to tone group. In a language with upstep, like Acatlán Mixtec, the pitch assigned to a tone will go up a step from one tone group to the next. The relative hierarchy of each tone group is encoded by means of a branching binary tree.

[5] According to Inkelas (1989), for instance, a downstepped high (like the one found in Tiv) should be analyzed as a high tone that shares a register feature "low" with a preceding low tone. A more abstract treatment of register,

There is also another side to the OCP, which in Acatlán Mixtec turns out to have interesting consequences. The OCP will mark as ill-formed any sequence of like elements in the lexical entries of the different morphemes. In the case of high tones in Acatlán Mixtec, this means that no morpheme will be listed in the lexicon with a melody high-high. Since a sequence of high tones is the input to the upstepping process, the surface manifestation of this constraint is that no morpheme will be found with the pattern H↑H. According to Pike and Wistrand, no morpheme has this pattern, with the exception of a small class of verbs. An example of a verb like this is given in (11):

(11) k o - y u ? i - n i
H ↑H ↑H ↑H
3 4 5 6
neg-fear-2Sg.pol
you do not fear

The verb *yu?i* "fear" has the melody high-upstepped. Other verbs like *date* "is being shorn" or *čitu* "kisses" have the same melody. If the Upstepping Hypothesis is correct, then these verbs should be listed with an original sequence of high tones in their respective lexical entries, as follows:

(12)

d a t e	č i t u	y u ? i
| |	| |	| |
H H	H H	H H
is being shorn	*kisses*	*fear*

The representations in (12), if they correspond to the lexical entries of the verbs in question, would stand as a serious infraction to the OCP. However, a closer look at the verbal system of Acatlán Mixtec reveals that the sequences of high tones are not part of the lexical entries of the verbs. Those sequences are derived after the verbs undergo morphological changes as a result of verbal inflection. It happens that, in Mixtec, the verbal category of Tense is realized as a floating tonal melody, that is added to the verbal stem. In Pike and Wistrand's work, no complete analysis of the verbal paradigm is given. However, the following example can be offered to illustrate the point. The differences in tense and voice (or aspect) in the verb *kaa* "to perforate" are encoded in the tonal melodies that characterize each tense:

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such as the one proposed by Pulleyblank (1986), has the advantage of not being linked to a particular analysis of the phonological environment that conditions downstep. If register shift processes are motivated by the OCP, then it is not really necessary to have a register feature that will be held responsible for the naturalness of the process, and it may be the case that many of the analyses that motivated an interpretation of downstep like the one found in Inkelas (1989) can be reinterpreted as a manifestation of the OCP. This is the direction taken in Clark's (1990) recent analysis of Igbo, a language which is typologically similar to Tiv.

(13)	kạ̀ạ̀	LL	*will be perforated*
	kạ́ạ̀	HL	*is perforated*
	kạ̄ạ̄	MM	*will perforate*
	kạ̀ạ́	LH	*perforates*

Given these facts, I conclude that the sequence high-upstepped in verbs of Acatlán Mixtec is the result of a morphological process that juxtaposes the melody of the stem to the floating melody of the inflection. In this way, the prediction I made when I assumed that the OCP was responsible for the upstepping process is fulfilled. There are no lexical entries with the sequence high-high, that would surface as high-upstepped.

3. Mid tones and sequences of high toned syllables.

3.1. Rising-to-high

I have claimed that sequences of high toned syllables in Acatlán Mixtec should be represented as a single high tone linked to the whole sequence of syllables. This claim is based on the behavior of morphemes like *di?i* "mother", in which the second syllable always bears the same tone as the first one through the various sandhi states of the morpheme. *di?i* may have the melodies mid-mid, high-high or upstepped-high, as a result of some tone sandhi processes in Acatlán Mixtec. In every case, the overall shape of the word is a level tone. To account for this fact I suggested that *di?i* has to be analyzed as having a single tone on the tonal tier that is linked to both syllables, as in (8) above. I refer to this hypothesis as the Level Tone Hypothesis. In this section I will show that some of the tone sandhi processes in Acatlán Mixtec give evidence that supports the Level Tone hypothesis. I will refine this hypothesis by showing that the high tone that is linked to a sequence of syllables is a mid tone initially, which rises to high after a certain class of morphemes. All the sequences of high toned syllables, I will claim, arise in Acatlán Mixtec as a result of this process of rising-to-high. Proving this point is essential to keeping the Upstepping Hypothesis intact, because if sequences of high toned syllables in Acatlán Mixtec cannot be analyzed according to the Level Tone Hypothesis then upstepping would no longer be entirely predictable.

There is a class of morphemes in Acatlán Mixtec that cause a following low tone or mid tone to change to high. If a high tone follows one of these morphemes no change occurs. This amounts to saying that after a morpheme of this class all tones neutralize to high. The class of morphemes that trigger this rule of rising-to-high is arbitrary (i.e. lexically marked). Words like *kʷà?à* "many" or *dī?ī* "mother" belong to this class. Following Pike and Wistrand's classification, I will refer to this class as "class C", and I will mark the morphemes that belong to this class with a subscript capital C. When a class C morpheme is followed by a syllable that bears a basic low or mid tone, this syllable will change its tone to a high tone, as the following examples show:

(14.a)	kʷa?a ku?i	(14.b) kʷa?a de?e
	L L L L	L L L M
	L L H L	L L H M
	many sisters	*many children*

(14.c) d i ? i ⁿz i k u
M M L M
M M H M
the mother who will sew

In (14.a), when *kù?ì* "sister" follows *kʷà?à* "many", the tone of the first syllable changes from low to high. Similarly, in (14.b) the low tone in the first syllable of *dè?ē* "children" changes to high after *kù?ì* "sister". In (14.c), the low tone in the first syllable of ⁿzìkū "will sew" changes to high when preceded by *dī?ī* "mother". This last example shows that the process of rising to high is not tied to any phonological feature of the class C morpheme. *kʷà?à* ends in a low tone, and *dī?ī* ends in a mid tone. Both morphemes, however, affect a following low in the same way.

Class C morphemes also change a mid tone into a high tone, as the next examples show. The word *ɲū?ù* "fire" has a melody mid-low, which shows up in (15.a). When *ɲū?ù* "fire" is preceded by the class C word *màdì* "negative specifier" in (15.b), the mid tone in the first syllable changes to H:

(15.a) ɲu?u ni?i
M L L M
fire flaring
a flaring fire

(15.b) madi ɲu?u tii
L L M L MM
L L H L MM
neg.spec. fire small
not a small fire

But when a sequence of two or more mid tones follow a class C morpheme, the whole sequence of mid tones rise to high, as the following examples show:

(16.a) n a - k i n i d e ? e
M M M L M
M H H ↑H M
when-will.shot son
when the son will shot

(16.b) m a n i - t e n u u d i ? i - t e
L L M LL M M M
L L H ↑HL H H ↑H
loved-3.masc.fam by mother-3.masc.fam
he is loved by his mother

Leaving the details of the derivation aside, these examples show that when a morpheme like kīnī "shoot", which has the melody mid-mid, follows a class C morpheme like nā "when", the resulting melody is not high-mid, as one would expect, but high-high. The same phenomenon occurs with *di?i* "mother" in (16.b).

So, after a Class C morpheme, bisyllabic morphemes undergo the following changes:

Basic melody Sandhi form

LL	HL
LM	HM
ML	HL
MM	HH

It is only in morphemes with the melody mid-mid that the second syllable undergoes a change in tone. To explain this fact, I suggest that bisyllabic morphemes with the melody mid-mid should be analyzed as having a single mid tone that is linked to the two syllables in the word. The second syllable in morphemes of this kind changes its tone to high because it is linked to the same tone as the first syllable. By having a single mid tone with multiple linkings in morphemes with the melody mid-mid, the changes that any morpheme undergoes after a class C morpheme can be expressed in a general and uniform way. A rule of Rising-to-high will only have to indicate that a tone will rise to high after a class C morpheme, regardless of how many syllables it is linked to. The rule of Rising-to-high can be stated under this form:

(17) $T \rightarrow H / C\_\_$

Given this analysis, the examples (14.b) and (16.a) will have the derivations in (18) and (19), respectively:

(18) k^{w}a ? a d e ? e → k^{w}a ? a d e ? e
L L L M L L H M

(19) na-kini de?e → na-kini de?e
M M L M M H H M

→ na-kini de?e
M H ↑HM

In (18), the low tone associated to the first syllable of *de?e* "child" changes to high after the class C morpheme *k^{w}a?a* "many". In (19), the mid tone associated to the two syllables of *kini* "will shot" changes to high after the class C morpheme *na* "when", yielding a sequence of high toned syllables. Since *kini* "will shot" is itself a class C morpheme, the tone that follows it will also change to high. The double application of the rule of rising-to-high creates a sequence of high tones, which gives the input for the rule of Upstepping to apply. Thus, the first syllable of *de?e* ends up with an upstepped tone.

An alternative analysis to the one I am proposing would be to assign a mid tone to each of the syllables in morphemes like *dī?ī* "mother" or *kīnī* "will shoot", and then formulate a rule that will change a mid tone to high after a class C regardless of how many mid tones intervene. Such a rule will look like this:

(20) $M \rightarrow H / C\,M\_\_$

If this rule is let to apply iteratively from right to left, it would give the following derivation for example (16.a) (some tones are left unmarked to make the example more clear):

(21) n a - k i n i d e ? e
M M M
M M H
M H H
when will.shot son
when the son will shot

Rule (20) changes the rightmost mid tone on *kīnī* first, skipping over the mid tone that is associated to the first syllable. After this, the rule will apply again to the first mid tone of *kīnī*,yielding a sequence of high tones.

What is wrong with an account like this? On the one hand, it makes use of a global rule, like (20). Global rules introduce a great deal of arbitrariness in the analysis. If one can specify in a rule like (20) that an arbitrary number of mid tones has to be skipped over, why not mentioning also low tones, or high tones? Why is it that the tones that can be skipped over are identical to the tone that undergoes the change? This fact is left unexplained. On the other hand, the process of rising-to-high after a class C morpheme cannot be interpreted in a unified way under this account, because rule (20), which is written as to give the right output for mid tones, cannot apply to low tones. Since a low tone does not rise to high when another tone intervenes between it and a class C morpheme, a rule like (20) has to make explicit mention of mid tones. In example (16.a), for instance, the low tone on the first syllable of *de?e* also changes to high (and later on to an upstepped tone), but since rule (20) only applies to mid tones, another rule is needed to account for this change.

If one wants to argue for an analysis in which sequences of mid toned syllables are linked to a separate mid tone each, the rule of rising-to-high will have to be stated as a disjunction. It is true, anyway, that the two rules one would need for describing the process of rising-to-high, one for mid tones, another for low tones, can be collapsed into a single rule, using braces, parenthesis, or any other notational device[6]. But this is not a satisfactory solution. Disjunctive rules are bad not just because of the complexity in the formulation of the rule in itself, but because a disjuntion is an indication that a generalization is being missed. Since practically all the cases have to be listed, the explanatory power of the analysis evaporates. Only a rule like (17), which applies to any tone, can account for the process of rising-to-high in a sufficiently general way as to be explanatory.

The importance of an analysis in which sequences of high tones come up as a result of having a single tone associated to a sequence of syllables is that it explains why this high toned syllables do not undergo upstepping. Upstepping applies to tones, defined as autonomous elements on their own tier, and not to syllables, which are only tone-bearing units. To the extent that sequences of high toned syllables can be analyzed according to the Level Tone Hypothesis, the Upstepping Hypothesis will hold true of Acatlán Mixtec as it was formulated in the previous section. The difference in behavior between bisyllabic morphemes with a sequence of mid tones and other bisyllabic morphemes regarding class C morphemes can be considered evidence in

[6] The fact that morphemes that have a sequence of low toned syllables do not end up with a sequence of high toned syllables precludes from the beginning the use of a rule employing alpha notation.

favor of the Level Tone hypothesis. Under the analysis I have presented of the process of rising-to-high, words like *kʷà?à* "many" or *dī?ī* "mother" end up with a single high tone linked to the two syllables that compose the word when the change prompted by a preceding class C morpheme takes place.

3.2. Sequences of mid tones across boundaries

The kind of representation I am arguing morphemes like *di?i* "mother" have is also consistent with the predictions the OCP makes. According to the OCP, any morpheme with a sequence of syllables bearing the same tones should have a single tone multiply linked. Otherwise, a sequence of like melodic units would arise. The OCP successfully rules out sequences of mid tones as far as the lexical entries of the morphemes in Acatlán Mixtec are concerned. Now I have to show that sequences of mid tones are also ruled out derivationally. I will show that sequences of mid tones that arise across morpheme boundaries also behave as if they were a single tone on the tonal tier. The next sentence shows how that works. In example (22), the morphemes *nī* "not even" *?i̱i̱* "one" and *ᵐbēlú* "hat" yield a sequence of four mid tones. The whole sequence is preceded by a class C morpheme, *kò?ò* "there is not". This morpheme causes the whole sequence to rise to high:

(22) k o ? o n i - ? i i ᵐb e l u
L L M MM M H
L L H HH H ↑H
there.is.not not.even-one hat
there isn't even one hat

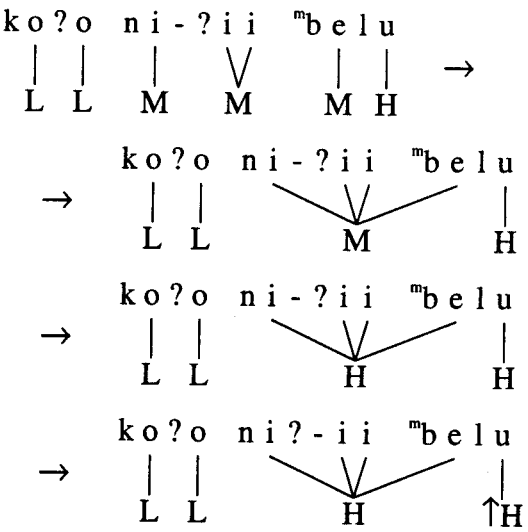
The last syllable of *ᵐbēlú* "hat" is upstepped after the tone that precedes it rises to high, as predicted by the upstepping rule.

In the last example, all the mid tones contributed by the morphemes in the sequence are fused into a single mid tone. To account for this process, a new rule is needed. The rule of mid tone fusion will look like this:

(23) XX → XX
| | ⋁
MM M

When this applies to the sequence of mid tones contributed by the morphemes in (22), it will fuse them into a single multiply linked mid tone. This mid tone rises to high after the class C morpheme. The rules of Mid Tone Fusion and Rising-to-high yield the following derivation for example (22):

(24)



Again, if one were to analyze this process as an iterative rising of mid tones regardless of how many mid tones intervene between the tone that is changed and the class C morpheme, the failure of the Upstepping rule to apply to these cases had to be explained. If mid tones are not fused across morpheme boundaries by a rule like (23), and they rise to high iteratively, a sequence of high toned syllables would arise, giving the rule of Upstepping an opportunity to apply. Since there are independent reasons to have an upstepping rule in the system of Acatlán Mixtec (i.e. the fact that every syllable which is initially or underlyingly associated to a high tone changes it to an upstep tone when preceded by another high), an analysis in which a sequence of high toned syllables is regarded as a single high tone with multiple linkings is to be preferred.

The behavior of mid tones is characteristic of the kind of constraint the OCP imposes on the phonological system of a language. Sequences of adjacent mid tones on the tonal tier are disallowed, both in the lexicon and in the derivation. In the lexicon, one does not find a morpheme whose lexical entry contains a sequence of mid tones. In the derivation, there is a rule that changes sequences of mid tones into a single mid tone that inherits the original association lines. These two facts are logically independent from one another. It is conceivable that a grammar may not have morphemes with a sequence of mid tones in their lexical entries, and still allow sequences of adjacent mid tones in the course of the derivation. The OCP is the principle of the grammar that makes the connection between the restrictions one finds in the lexicon and the restrictions one finds in the derivation.

3.3 Mid tone assimilation

Sequences of mid toned syllables arise in Acatlán Mixtec not only as the result of concatenation of morphemes. There is a process in this dialect by which a low tone assimilates a preceding mid tone when it is followed by another low tone or by pause. A monosyllabic morpheme with a basic low tone, like *vè* "Baby Pronoun" or *nà* "thing pronoun", will show up wit a mid tone when preceded by another mid tone and followed by pause, as the following examples show:

(25.a) k u d i - v e
L M M
will.get.dirty-baby.pron
the baby will get dirty

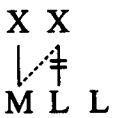
(25.b) ? i i - ɲa
MM M
one thing.pron
one of them

But when a low toned morpheme is followed by a mid tone, as *vè* is in example (26.a), or is not preceded by a mid tone, as *ɲà* in example (26.b), the morpheme bears its low tone to the surface.

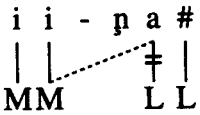
(26.a) k u d i - v e t a a
L M L MM
will.get.dirty-baby.pron tomorrow
the baby will get dirty tomorrow

(26.b) ? u i - ɲ a
LL L
two-thing.pron
two of them

These data can be accounted for by a rule that will assimilate a low tone to a preceding mid tone if the low tone is followed by pause or another low tone. In order to simplify the conditions on the right environment of the assimilatory process, I will assume that there is a low tone associated with the sentence boundary. In autosegmental phonology, assimilatory processes are represented by structure-changing rules, that add and delete association lines. According to this conception, Mid tone assimilation will take the form of tone spread. The rule will look as follows:

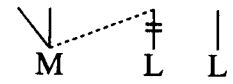
(27)


A mid tone spreads to a neighboring syllable if this syllable bears a low tone and is followed by another low tone. According to this rule, then, an example like (25.b) is going to have the following representation:

(28)


This assimilatory process also takes place in bisyllabic morphemes. If a morpheme has the melody low-low, its first low tone will assimilate a preceding mid. Morphemes with the melody low-mid or low-high do not assimilate a preceding mid. This can be seen in the following example where the word *dita* "tortilla", that has the melody low-low, shows up with a mid-low melody after a mid tone. If *dita* were preceded by a low tone or a high tone, its melody would not have changed.

(29) ? i i d i t a



M L L

one tortilla

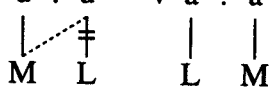
The assimilatory process can be extended to yet another case. When a morpheme with the melody mid-low is in sentence-final position, or followed by a low tone, it will surface with the melody mid-mid. An example of this is the morpheme *ɲu?u* "fire". In example (30.a), when followed by a low tone, it shows up with the melody mid-mid. In example (30.b), when followed by a high tone, it keeps its basic melody:

(30.a) ɲ u ? u v a ? a
M M L M
fire good
a good fire

(30.b) ɲ u ? u n i ? i
M L H M
fire flaring
a flaring fire

The derivation corresponding to example (30.b) is as follows:

(31) ɲ u ? u v a ? a



M L L M

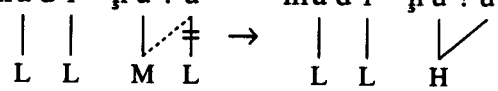
The assimilatory process creates a sequence of mid toned syllables that are linked to a single mid tone. Consequently, one would expect that any time that a low tone assimilates a mid tone that is preceded by a class C morpheme, the whole sequence will rise to high. The next examples show that the prediction is borne out. In (32.a), after a class C morpheme, *ɲu?u* "fire" has the melody high-high. In (32.b), when *ɲu?u* follows the same class C morpheme and a mid tone appears to its right, the melody is not high-high, but high-low:

(32.a) m a d i ɲ u ? u
L L H H
neg.spec fire
not a fire

(32.b) m a d i ɲ u ? u t i i
L L H L M M
neg.spec fire small
not a small fire

In (32.a), assimilation takes place before rising-to-high. Rising-to-high applies then to a mid tone that is linked to the two syllables in the word *ɲu?u*, yielding a representation in which the two syllables are linked to a single high tone. In (32.b), the absence of a low tone to the right of *ɲu?u* prevents the application of assimilation, so that the input to rising-to-high is a mid-low melody. This melody changes to high-low, as expected. The derivation for example (32.a) is like this:

(33) m a d i ɲ u ? u → m a d i ɲ u ? u



L L M L L L H

Sequences of mid toned syllables that arise as the result of mid tone assimilation across morpheme boundaries also rise to high as a whole after a class C morpheme. In Pike and Wistrand there are few actual examples of this case, and their complexity makes it very hard to incorporate them in my exposition. However, in the next example one can see the sequence of mid tones in the phrase *?ɨ̄ɨ̄ ɲā* "one thing", the derivation of which has been given in (31), rising to high as a whole. This happens after fusing with the mid tone borne by the morpheme *nī* "not even", which in turn is preceded by a class C morpheme *tē* "3 masc. fam.". Leaving the details of the derivation aside, the finished representation of the sentence *he does not carry even one of them* in Acatlán Mixtec will look like follows:

(34) k o - š i k o m i i - t e n i - ? i i - ɲ a

H L L H ↑H ↑H

he does not carry even one of them

Sequences of mid tones coming out as the result of assimilation, then, also behave as if they had a single mid tone on the tonal tier. This is the result one would expect, if assimilation is to be regarded as spreading of a tone to a neighboring syllable. This is evidence that adds to the validity of the Level Tone hypothesis.

In this section I have looked at three different ways in which sequences of mid toned syllables can appear in Acatlán Mixtec. Sequences of mid toned syllables can be found, in the first place, in the lexical entries of some morphemes of Acatlán Mixtec. Second, morpheme concatenation also renders sequences of mid toned syllables. A third case involves an assimilatory process, by which a low toned syllable changes to a mid tone when preceded by another mid and followed by a low tone or pause. In every case, I have analyzed these sequences of mid toned syllables as having a single mid tone linked to the whole sequence. The evidence for this is that any time one of these sequences of mid toned syllables is preceded by a class C morpheme, it rises to high as a whole. Every sequence of high toned syllables in Acatlán Mixtec can be ultimately traced to a sequence of syllables linked to a mid tone that undergoes rising-to-high[7]. To the extent that this claim is valid, the Upstepping Hypothesis is valid too, and the tonal system of Acatlán Mixtec can be given a very simple and elegant analysis.

[7] There is an exceptional case that deserves further attention. Pike and Wistrand mention a class of morphemes with the melody LH, like *sa?nu* "old", that take part in a very complex set of sandhi processes. For instance, a mid tone will change to high after *sa?nu*, yielding a sequence of high toned syllables. The same thing happens if *sa?nu* is followed by a low tone that is in turn followed by pause or another mid tone. To account for these cases, I have to assume that the tone associated to the last syllable of morphemes like *sa?nu* is a mid tone underlyingly, that rises to high. Moreover, there are reasons to believe that the tonal melody of morphemes like *sa?nu* is subject to some syntactic constraints. Most morphemes of this kind are modifiers, and if followed by another modifier or certain clitic pronouns the melody LH will change to LL. This suggests that the high tone associated to the last syllable of *sa?nu* may be a property of phrase juncture, and not of the morpheme itself. Also, it is worth noting that *sa?nu* and other morphemes of its kind can be shown to be inherently toneless, according to the arguments given in the next section.

4. Low tones, toneless syllables and some exceptions to the OCP.

4.1. Sequences of low tones in Acatlán Mixtec

A class C morpheme affects a sequence of mid toned syllables that follows it in a way that suggests that there is a single mid tone linked to the whole sequence of syllables. But when a class C morpheme is followed by a sequence of low toned syllables, the resulting changes point to an analysis in which there is not a single low tone linked to the whole sequence of syllables, but probably an independent low tone for each syllable in the sequence. If, for instance, a bisyllabic morpheme with the melody low-low comes after a class C morpheme, it will not show up with the melody high-high, but rather with the melody high-low. When a low-low morpheme follows a class C morpheme, only the first low tone changes to high. In example (14.a), repeated below as (35.a), the word *kù?ì* "sister" changes from low-low to high-low after a class C morpheme. The same happens to *čà?mà* "will be crushed" in (35.b).

(35.a) k^{w}a ? a k u ? i
L L L L
L L H L
many sisters

(35.b) d a - č a ?m a - s i ^{m}be l u
L L L
L H L
caus-will.be.crushed-animal.pron hat
the animal will crush the hat

The derivation of (35.a) would look like follows:

(36) k^{w}a ? a k u ? i → k^{w}a ? a k u ? i
L L L L L L H L

If *kù?ì* "sister" had a single low tone linked to its two syllables, one would expect to find the melody high-high, and not high-low.

Similarly, when a sequence of low tones arises in the course of the derivation, they are not treated as a block by the rule of rising to high. In Pike and Wistrand there are no actual data to illustrate this particular sandhi process, but they describe it. Schematically, the change goes like this:

(37) $C+L+L \rightarrow C+H+L$

In this sense low tones are different from mid tones also. When a sequence of mid tones arises across morpheme boundaries, the rule of mid fusion renders a single tone on the tonal tier. This mid tone rises to high, yielding a sequence of high toned syllables. Again, the behavior of sequences of low toned syllables after a class C morpheme suggests that for each low toned syllable there is a separate low tone. These observations tell that sequences of low tones are beyond

the scope of the OCP. Adjacent low tones on the tone tier can be found morpheme internally, as in *kù?ì* "sister", and also in the course of the derivation. This is an unexpected result, given the effect the OCP has on high tones and mid tones.

4.2. Default low tones

I should point out that the low tones found in morphemes like these are specified in their underlying form. It is important to take this facts into consideration, because otherwise the erratic behavior of low tones with respect to the OCP could be attributed to their status as default tones. In Acatlán Mixtec, low tone is also the default tone, but toneless syllables behave very differently from syllables that are initially associated to a low tone. In Pike and Wistrand's original paper, morphemes that are listed with a basic low tone are arbitrarily assigned to two different classes, according to their sandhi properties. For instance, the monosyllabic morphemes *ⁿdà* "we incl." and *ɲà* "thing pronoun" behave differently after a class C morpheme even though they are both normally realized with a low tone. *ɲà* "thing pronoun" rises to high, as expected, and if preceded by a class C morpheme that ends in a high tone, it will show up with an upstep tone eventually. But *ⁿdà* "we incl." changes in a different way. After a class C morpheme it will not change its low tone to a high tone, but if preceded by a mid tone, it will assimilate it. The differences are shown in the following examples:

(38.a) t a ? v i - t e - ɲ a
L L M L
L L H ↑H
breaks-3.masc.fam-thing.pron.
he is breaking it

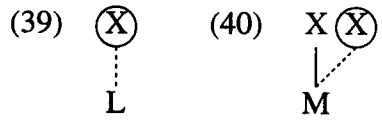
(38.b) kʷ i k o - ⁿd a
M M L
M M M
will.carry-we.incl.
we will carry

In (38.a), *ɲà* has an upstep tone at the end of the derivation because it follows a class C morpheme that rose its tone to high too. In (38.b), the morpheme *ⁿdà* does not rise to high. It assimilates the mid tone in the preceding morpheme[8].

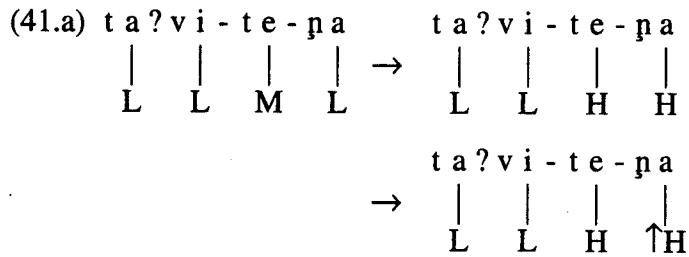
How can the difference between *ɲà* and *ⁿdà* be accounted for? I suggest that the difference comes from the fact that the latter is toneless, whereas the former has a low tone in its initial form. Since the rule of rising-to-high affects syllables bearing a mid tone as well, it is natural to assume that of the two low toned morphemes the one that is changed by a preceding class C morpheme is the one that bears a low tone, and not the one that has a toneless syllable. Rising-to-high is a rule that changes, instead of adding, content. It is not surprising, then, that toneless

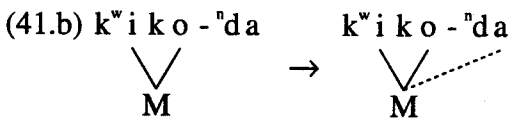
[8] No attention should be paid to the fact that *tē* "3 masc. fam." in (38.a) rises to high. According to PW, if *tē* were to keep its mid tone the following morpheme would also rise to high, and if *kʷīkō* "will carry" were preceded by a class C morpheme, the whole sequence of mid tones would rise to high too.

syllables escape its effects. The low tone in a morpheme like *ⁿdà* "we incl." is assigned to it as a default value, by means of a rule like (39) below (a toneless syllable is indicated by an encircled segment). Another rule is needed to specify that mid tones will spread rightwards to a toneless syllable. This rule is given in (40).



These two rules will provide tones for toneless syllables, yielding the following derivations for examples (38.a-b):





The same reasons that prompt the analysis of monosyllabic morphemes like *ⁿda* as toneless suggest that some bisyllabic morphemes are inherently toneless as well. After a class C morpheme, some morphemes keep a low-low melody instead of changing it to high-low, and if preceded by a class C morpheme ending in a mid tone, their melody changes to mid-mid. An example of this class of morphemes is *do?o* "thus"[9]. After a class C morpheme, *do?o* shows up with a sequence of low tones, as in the following example:

(42) m a d i - d o ? o k a ? a - t e
L L L L H L M
neg.specifier-thus-speaks-3.masc.fam
he does not speak thus

This case contrasts with example (35.a), in which *kù?ì* "sister" shows up with a melody high-low after a class C morpheme.

Toneless morphemes like *do?o* and morphemes with low tones like *kù?ì* behave differently with respect to the rule of mid tone assimilation also. After a mid tone, *kù?ì* will change its melody to ML, but *do?o* will change it to mid-mid. The change in morphemes like *do?o* takes

[9] Pike and Wistrand classify this morpheme as (BIII), and list it with the melody low-high. I have interpreted the high tone that may show up on the last syllable of this morpheme as an edge phenomenon, instead of taking it to be part of the tonal specification of the morpheme itself. See note (6).

place regardless of what tone is in its right environment (the rule of mid tone assimilation is conditioned to apply to a low tone if followed by another low tone). To account for the changes in morphemes like *do?o*, I need to assume that mid tones spread freely onto toneless segments (rule 40).

The conclusion is, then, that morphemes like *kù?ì* cannot be analyzed as toneless. They must have a sequence of two low tones underlyingly[10]. This constitutes a flagrant violation of the OCP, at least as a strong universal principle that constrains phonological representation in general. The same problems arise when morphemes like *ɲà* "thing pronoun", which can be shown to have a low tone underlyingly, are followed by a morpheme bearing another low tone. The way in which a sequence of low tones that arise as a consequence of morpheme concatenation, as schematized in (37), behaves with respect to a preceding class C morpheme suggests that the low tones are not fused previous to the point at which the rule of rising-to-high is triggered. As I said in the introduction, the validity of the OCP has been questioned in several cases, most notably in Odden (1986) and Odden (1988). The behavior of morphemes with a low-low melody in Acatlán Mixtec can be offered as another instance that shows that the OCP is not an absolute constraint on phonological representations. However, as it can be judged from the behavior of mid and high tones in Acatlán Mixtec, the OCP is still useful to capture a generalization, namely, that when sequences of like segments are marked as illegal the condition goes across the lexicon and the derivation.

5. The Obligatory Contour Principle

In this paper I have shown that the number of distinctive units in the tone system of Acatlán Mixtec can be reduced to three -low, mid, and high tones. Upstepped tones are derived by means of a rule that changes a high tone into an upstepped tone when preceded by another high tone. This analysis does not come into conflict with the fact that sequences of high toned syllables can be found in Acatlán Mixtec, since it can be shown that such sequences contain a single high tone that is linked to the whole sequence. Moreover, such multiply linked high tones are always derived from a mid tone that comes to be linked to a sequence of syllables as a result of a variety of processes. Most notably, When a mid tone is preceded by another mid tone, they fuse into a single mid tone that inherits all the linkages of its predecessors. Sequences of low tones, on the other hand, do not undergo any demonstrable changes. The same differences between high, mid, and low tones can be found among the lexical entries of Acatlán Mixtec. There are no attested morphemes with the melody high-high, and when a morpheme has the melody mid-mid it corresponds to a single mid tone linked to the sequence of two syllables. Moreover, morphemes with the sequence low-low seem to have an individual low tone linked to each syllable in the sequence.

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[10] A case may be raised with respect to the status of the second syllable in morphemes with the melody low-low. Is the second low tone linked to the last syllable in the lexical entry of the morpheme, or is it a default low? Two facts suggest that the right analysis is the first one. On the one hand, the second syllable never assimilates a preceding mid, whereas in morphemes that are entirely toneless mid tone assimilation takes place across the board. On the other hand, there are some similarities between a low-low morpheme and a sequence of low tones that arise across morpheme boundaries. Since these low tones can be shown not to be default tones on independent ground, the similarities would remain unexplained if the second syllable of a morphemes with the melody low-low were inherently toneless.

What becomes evident in this analysis is that sequences of like tones in Acatlán Mixtec receive a different treatment, according to the quality of the tones in question. Sequences of mid or high tones are not allowed, but sequences of low tones are tolerated. The way in which mid and high tones are constrained is reminiscent of certain OCP effects. But if the OCP has a role to play in the tonal system of Acatlán Mixtec, this role is at least selective, for it does not seem to have any effect on sequences of low tones. However, the tone system of Acatlán Mixtec still exhibits some properties that one would like to identify as OCP effects. Even though some sequences of syllables bearing the same tone have to be analyzed as having a single tone with multiple linkings and some other sequences of syllables with the same tone have to be analyzed as having an independent tone for each one, there is not an instance in which the two representations contrast with each other. What is striking about Acatlán Mixtec is that not all the possible associations between tones and syllables are instantiated. Even though sequences of low tones are found in Acatlán Mixtec, these sequences do not contrast with single low tones associated to a sequence of syllables. Also, the fact that the selective behavior of the OCP as observed in the derivational component is matched in the specification of lexical entries is something that has to be explained.

Thus, it does not seem reasonable to dispose of the OCP entirely. There should be a way to weaken the OCP enough to accommodate cases such as Acatlán Mixtec, in which the OCP shows a selective behavior, but still retain some of the properties that make of the OCP a successful way of constraining the power of autosegmental phonology. I want to suggest that the OCP should not be defined as a constraint on phonological representations *per se*, but rather as a condition that the association between units in the different tiers should not introduce a contrast that does not have a phonetic correlate. The OCP, characterized in this way, does not say whether sequences of identical melodic elements are allowed or not. It says that either there will be or will not be a sequence of identical melodic elements for each phonetically distinct melodic element. In his discussion of the OCP, Odden (1986) points out that the appeal of autosegmental phonology stems from the coherence it brings to the analysis of tone. Certain properties of tonal systems that were unintelligible under a segmental theory, such as stability, integrity, and so forth, follow naturally from an autosegmental account. But there is a negative side effect to this way of approaching phonology. Autosegmental phonology allows for multiple analyses of identical surface sequences, boosting the power of the theory up to the point of rendering it too abstract. A sequence of two low toned syllables, for instance, can be represented in either of two ways:

(43) a) XX b) XX
| | \/
L L L

But natural languages do not seem to use all the power this theory provides. There is never a contrast between representations like (43.a) and (43.b). Autosegmental representations must be constrained in some way or another, if the theory is to be of any interest at all.

This problem, I think, is not new. The question of how to constrain the power of generative theories of phonology to keep it within the limits of what can be considered explanatory was raised in a now classical paper by Paul Kiparsky (1967). In order to put a limit to the use of underlying features that function only as diacritic marks, Kiparsky proposed a condition requiring that morphemes that do not undergo any phonetic changes be assigned a unique underlying representation. Without this condition, which he called the *Alternation Condition*, abstract

phonetic differences may be allowed to exist without an overt phonetic contrast. The kind of data Kiparsky had to deal with when he proposed the Alternation Condition are very different from the data upon which autosegmental phonology has drawn attention. Nevertheless, the problems are similar in nature. How far can the description of a phonological process go in detaching itself from the surface representation of the data?

The observation that tonal melodies are usually alternating was what first suggested that something like the OCP may exist as a formal principle of grammar organization. In Leben (1978) the OCP took the form of a convention that simplified sequences of like tones, more or less in the shape of (44)

(44) $[\alpha T]\ [\alpha T] \rightarrow [\alpha T]\ \varnothing$

The intuition behind this convention, as Leben puts it, is that on the surface sequences of identical tones are indistinguishable from a single tone with multiple linkings. On the base of this observation, convention (44) can be said to share with the Alternation Condition in spirit, if not in the letter. Both the Alternation Condition and the OCP, as originally conceived by Leben, are an attempt at ruling out abstract phonetic differences where there is no overt phonetic contrast.

This aspect of the OCP made it so appealing that soon it was extended from the study of tone to other domains of phonology. McCarthy (1986) replaced Leben's simplified view of the OCP by making it independent of any rule in particular. He characterized the Obligatory Contour Principle as a universal constraint on phonological representations, stating that "at the melodic level, adjacent identical elements are prohibited" (McCarthy, 1986). In his account, the OCP is a principle that actively motivates a variety of phonological processes that have as a common feature the elimination of sequences of like elements in their output. McCarthy bases his argument mainly on a process he calls "antigemination", by which a syncope rule fails to apply if it yields a sequence of like consonants. Thus, in Afar, a word like *xamíla* "swampgrass" will change to *xamlí* in the genitive, by a rule that deletes an unstressed syllable in peninitial position. But when the consonants that surround the vowel in question are identical, like in *sababá* "reason", the syncope rule fails to apply.

The strong conception of the OCP stemming from Leben's remarks was called into question by Odden (1986), who claims that a closer look at certain counterexamples suggests that the OCP cannot be accepted as "a formal constraint on possible grammars". "The phenomena which motivate the OCP [...] -Odden says- follow from a general principle of grammar selection, by which underlying representations which conform to the OCP are preferred unless explicit evidence shows that such representations are untenable". Odden draws many examples from a variety of African languages to illustrate his claim. In Shona, for instance, a high tone changes to a low tone after an associative morpheme like *né* "with". When this morpheme is followed by two other morphemes bearing a high tone, as in *né-é-hóvé* "with-of-fish", the high tone in the morpheme next to the associative marker will be lowered, but not the high tones that follow. The fact that the lowering rule in Shona yields *né-è-hóvé* and not *né-è-hòvè* shows that the sequence of high tones that follows the associative marker has not been simplified to a single high tone[11].

[11] In a later paper, Odden (1988) provides evidence against McCarthy's antigemination argument. It has been claimed that Odden's counterexamples could be reanalyzed to satisfy the OCP. Prunet and Paradis (1990), for instance, show how to reconcile data similar to Odden's with a universal characterization of the OCP. A similar claim is made in Yip (1988), where the OCP is taken to be a filter that acts as a trigger of rules in which the environment that conditions the application and the focus are identical. Yip's account, as well as Prunet & Paradis', relies heavily on the possibility of simplifying the form of certain rules using the results of underspecification theory and feature

But McCarthy (1986) shows that the interpretation of the OCP as a markedness principle advocated in Odden (1986) is unsatisfactory. Even though certain languages seem to present apparent violations to the OCP, McCarthy says, no language exploits the difference between sequences of melodic elements and multiple associations of a single melodic element as a distinctive property of phonological representations. "The strongest argument for the absolute prohibition expressed by the OCP is the absence of languages contrasting tautomorphemic one-to-many association with tautomorphemic one-to-one association of identical segments" (McCarthy, 1986, p. 256). Then, he goes on to suggest that if the OCP is to be weakened to allow for some violations, it should take the form of a parameter of universal grammar, with the value "on" as the unmarked one.

To a certain extent, Acatlán Mixtec conforms to this version of the OCP. One will not find in the whole tonal system of Acatlán Mixtec a contrast between a sequence of identical tones and a single tone with multiple associations to a sequence of syllables. However, the OCP cannot be considered a parameter that constrains the tonal phonology of Acatlán Mixtec in a uniform way, since there is a difference between sequences of mid-toned syllables and sequences of low-toned syllables that cannot be reduced. Sequences of low-toned syllables must be represented as a sequence of low tones, each with a single association line, whereas sequences of mid-toned syllables have to be represented as a single mid tone with multiple associations. The OCP cannot rule out one configuration in detriment of another in Acatlán Mixtec. But still, the contrast between the two configurations is redundant. The property that introduces a distinction between sequences of mid-toned syllables and sequences of low-toned syllables is not the fact that the former have a single tone underlyingly whereas the latter have a sequence of tones, but the fact that one is mid and the other low. Thus, in order to include cases such as this one, I suggest that the OCP has to be interpreted as a constraint on the function of association lines, stating that association lines cannot be manipulated to introduce phonetic contrasts that do not have an immediate phonetic manifestation. This characterization of the OCP may be broad enough to accommodate the results of my analysis of the tone system of Acatlán Mixtec, as well as most of Odden's observations, but narrow enough to derive most of the so-called OCP effects.

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geometry. Given the straightforward nature of the data in Acatlán Mixtec, any attempt to reanalyze the exceptions to a strong version of the OCP in terms of underspecification and tier structure would lead to artificial results, such as an arbitrary system of tone features and tier structure for Acatlán Mixtec.

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