GP2.0

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1. Introduction

The infancy of Government Phonology (henceforth GP) can be traced back to a period bounded by Glow IV held in Pisa in 1979 and GLOW VI held in Paris in 1982. That period was devoted, almost exclusively, to the study of aspects of constituent structure (aka "syllable structure") of phonology carried out by Kaye and Lowenstamm. At GLOW VI, Vergnaud presented some ideas about the nature of phonological primes to be used in phonological representations starting with A, I and U. These primes were already being experimented with in other theories such as Dependency Phonology (Anderson & Ewen 1987) and Particle Phonology (Schane 1984) although the formalism that appeared in GP at that time was significantly different in a number of regards. The leading idea behind these systems was that phonological primes were privative rather than binary (or ternary). This phase culminated in the publication of the first KLV article in 1985 sporting a 10-element system (Kaye, Lowenstamm & Vergnaud 1985).

Work dating from the late 1980's and early 1990's moved GP still further away from traditional views. Initial assumptions about constituent structure fell by the wayside. Much of the baggage taken on by GP from traditional thinking about these issues had to be jettisoned in the course of time. Two notable examples were the belief (surprisingly still held by many, cf. Flack 2009 for a recent example) that apparently word-final "consonants" were tautosyllabic with the preceding nucleus, and the assumption that word-initial "consonant clusters" were always tautosyllabic and formed part of a complex onset. The weight of the empirical record showed that these assumptions, along with many others, still accepted without question and without evidence, were quite erroneous.

The analysis of vowel-zero alternations by means of empty nuclei and the empty category principle (ECP; Kaye, Lowenstamm & Vergnaud 1990: 219) allowed for the introduction of a strong structure-preserving aspect to the theory. This in turn led to the phonological Projection Principle, stating that constituent structure is immutable. Further refinement on the nature of phonological events and the phonology-morphology interface (Kaye 1995) led to a delimitation of the phonological sphere much at variance

with then current thinking. The exceptionless nature of all phonological phenomena and strict application of the non-arbitrariness principle moved the boundaries between lexical and phonological phenomena to a radical extent. Indeed, an amusing consequence of these moves was that nearly all the allegedly phonological processes of English discussed in the *Sound Pattern of English* (SPE), such as velar softening, trisyllabic laxing of the great vowel shift, were not phonological at all; they were merely lexical alternations on the order of *ring–rang–rung*. This also explains why GP rejects data from diachronic studies. GP is a theory of the mind, and more specifically the aspects of phonological knowledge that are learned and those that are universal. There is no evidence that sound changes involving relexicalisation are learned. Only their consequences in the form of new lexical representations are. Sound changes only reflect the internalised lexical representation of a given form at two or more different periods in the history of the language. There is no reason to suppose that a child learning phonology has any awareness of the history of any particular form it learns and accordingly, there is no reason to suppose that sound changes would be subject to the same kinds of constraints that underlie language-specific phonological parameter settings that, by their very nature, must be learned.

Notwithstanding GP's strong reaction to the analysis of a multitude of phonological systems, a growing number of phenomena resisted analysis within the confines of the current theory. The conclusion was inescapable: these problems were intractable, given the theoretical assumptions that were held at the time. Something had to give and it was what we call GP1.x: the initial phase of the theory. The death-knell of GP1.x was a doctoral dissertation (Pöchtrager 2006) which proposed major modifications to GP – so major that the ideas found there and those ideas which that work inspired warrant a new designation for the theory, to wit, GP2.0. In the following, we will sketch out the salient features of this new theory. The sympathetic reader will bear in mind that, following the computer software metaphor inherent in its name, GP2.0 is an alpha version.

2. What We Keep

Given the radical nature of the changes to GP, it is reasonable to ask why it is still called "GP" of whatever version. In fact there is a core set of beliefs that unite GP2.0 with what came before and in this section we will set out the ideas that we have retained.

What is fundamental to all versions of GP, past and present, is the absence of any level of "phonetic representation" and, indeed, there is nothing corresponding to "phonetic representation" at all. Starting with the issue of phonetic representation, Chomsky & Halle in SPE proposed such a level, differing formally from phonological representation in that it was assumed to be scalar (at least partially) in contrast to phonological representations which were binary (+ or –, but later slightly modified by their theory of markedness).

GP has always maintained that all phonological representations are fully interpretable at any stage in a phonological derivation. There is no formal difference between a phonological representation taken fresh from the lexicon (or wherever its provenance is assumed to be) and the output of the φ function which applies phonology to one phonological string to produce another phonological string. Put another way, any input to φ could just as well be an output (assuming different content of φ, of course) and vice

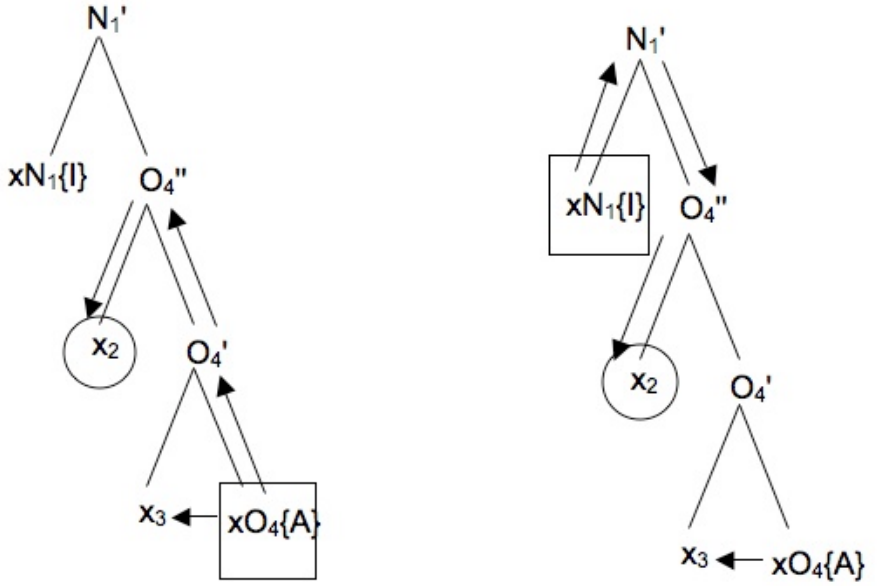
versa. This is due to the privative nature of the phonological primes (the elements), which precludes any form of underspecification. All phonological representations are fully specified.

GP does now, and always has, rejected the idea that phonology serves as "the input to our articulatory machinery" (Bromberger & Halle 1989:53). Such a groundless statement was part of the argument to support the claim that phonology and syntax are fundamentally different. In fact, it is far more in keeping with the observed reality that phonology serves the purposes of being an addressing system for the psychological lexicon (at least the recognition component) and as a parsing aid. Indeed, it is telling that the one piece of *synchronic* evidence advanced by Bromberger & Halle in support of their claim of a fundamental difference between phonology and syntax involves the existence of rule ordering in the former but not in the latter. The Canadian Raising phenomenon was claimed to depend on rule ordering and rule re-ordering: two phenomena which are absent from syntactic theory and hence support their principal claim. But it has been shown that "Dialect B" most certainly never existed (Kaye 1990) and therefore the case for rule re-ordering collapses. The analysis of Canadian Raising and the alleged ordering relation between the rule of nuclear mutation (however formulated) and the flapping rule is also based on a misanalysis of the phenomenon (which is lexical rather than phonological) and on inaccurate or incomplete data (Kaye 2012). This point is well worth making because, as we shall soon see, one of the changes of GP2.0 is its very sharp movement towards an even more syntax-like theory of constituent structure.

GP, since its inception, has excluded rule ordering of any form. The Minimality Hypothesis (Kaye 1992) states that phonological events take place whenever the conditions for their application are satisfied. It follows then that they are exceptionless. Claims to the contrary have simply collapsed under scrutiny. As will be seen in the example to follow and further elaboration of the structure of GP2.0, rule ordering is not only formally impossible within this framework but also unnecessary. Thus, a convincing case demonstrating a requirement for such ordering would certainly be fatal to GP2.0.

Notwithstanding the atavistic tendency to resuscitate a taxonomic phonemic level in modern phonology, contrast plays no role in GP and over 20 years of research in this framework has revealed no reason why it should. The very concept of contrast is inexpressible within GP. This is because, as mentioned above, phonological events take place whenever their conditions are met. These conditions are always defined locally with no possible reference to either earlier stages of the current derivation or possible outcomes of other derivations as would be required by the concept of contrast. A brief example taken from Pöchtrager (2006:116) will serve to illustrate this point. Consider the case of English lenis lengthening whereby the vowel length in a word like *bid* is roughly double that in a word like *bit*. Pöchtrager defines the notion of *m-command* whereby the interpretation of a terminal node A controls the interpretation of terminal node B. Fortis stops in English, such as *t* shown in the diagram in (1) below, involve m-command going from an onset head xO serving as the commander (enclosed by a square below) to a commandee (enclosed by a circle). (The relationship between xO_4 and x_3 in both representations is not one of m-command, but one of control and will be discussed later on. It is irrelevant for length.)

(1)



(b)it *(b)id*

The m-command relation shown on the left is a lexical property of onset heads. Their m-command relations are only present in the lexicon and cannot be created by the φ function. Nuclear heads have no such restriction and when coupled with the requirement that any specifier of an onset must be m-commanded, the vowel lengthening observed in English follows as a natural consequence. This is illustrated on the right. There is a trade-off in length that is expressed by m-command. We would claim that phonological events may be expressed in similar terms as illustrated in Živanovič & Pöchtrager (2010). From this perspective, the impossibility of any conceivable role for a notion like "contrast" should be obvious.

Elements, the primes of melodic expression still exist but their number has been dramatically reduced as we will see in a later section. Many phonological phenomena previously thought to be melodic are now considered as structural. The original theory of constituent structure (Kaye, Lowenstamm & Vergnaud 1990) is the chief "victim" of this theoretical upgrade. In this area of the theory virtually nothing has been carried over from GP1.x. Finally, the theory of the phonology-morphology interface is almost intact but certain small but important modifications have been made. These will not be discussed here. Having presented a brief summary of the features preserved between theoretical versions, we now proceed to a discussion of what has changed. A warning: the changes are substantial.

3. A New Theory of Phonological Constituent Structure

GP1.x developed a rather simple theory of phonological constituent structure. From about the 1990's onwards this was the most stable component of the theory changing very little since it was first proposed. It is ironic that in the current theory described here, this is the part that contains the most significant modifications. As originally conceived, phonological structure contained three different constituents: Onset, Nucleus and Rime. The rime and the nucleus bore a special relation to each other in that every rime immediately dominated a nucleus on the path to its terminal node and every

nucleus was immediately dominated by a rime on the path to the root. It was further stipulated that every nucleus can and must license a preceding onset and that all onsets must be licensed by a following nucleus. This led to the (OR)* conception of constituent structure consisting of one or more pairs of onset and rime. Branching constituents were constrained by the requirements of strict locality and strict directionality. These requirements resulted in the Binarity Theorem to the effect that all constituents were maximally binary; they could dominate at most two terminal nodes.

This theory of constituent structure was "fleshed out" by the presence of a skeleton: a series of timing units designed to represent the units of a phonological string. The skeleton served as a buffer between constituent structure and melodic units (the elements). Both ideas were taken from earlier phonological theories, autosegmental phonology in particular, current in the late 1970's and early 1980's. Melodic units, elements in the case at hand, were free to "do their thing" in blissful ignorance of almost any aspect of constituent structure. The basic fallacy of the segment, leading to the basic fallacy of the skeleton, remained undetected for so many years, presumably as a result of the letter-based view that had pervaded phonological thinking during that period. The reality of the segment has been assumed almost without question certainly since the birth of generative phonology, and doubtlessly for a good number of years before that. After all the phonetic alphabet, supposedly the most "concrete" representation of human speech, is letter-based.

However the more our knowledge of the workings of phonology increases, the more evident it becomes that the segment cannot stand up to close scrutiny and must be jettisoned. The result of this move is that phonological representations begin to look much more like syntactic ones. This can be seen from the sample structures presented above. For all intents and purposes, we are adopting minimalist structures.

This move is not without consequences. Given minimalist injunction against non-branching daughters, it is obvious that we must abandon the skeleton as well as an autonomous melodic tier. In fact, as well shall see below, elements are now annotations on terminal nodes, in no way separate from phonological structure. In addition, we must reduce our constituents to two: onset and nucleus. The idea of the association of rime and nucleus in the way described above is incompatible with the theory of structure we have adopted. We have abandoned the idea of a phonological string that is in any way like a sequence of OR (or CV) pairs. Onsets now find themselves embedded in projections of nuclei. Finally, we stipulate, contrary to earlier versions of GP, that no terminal node can bear more than one annotation and so each element must be associated with a distinct terminal node. The ramifications of all this will become clearer as we proceed to the topics of element theory and the changes it has undergone.

4. The Persecution and Assassination of the Elements

By the mid 1990's the elemental inventory of GP had been reduced to six: A, I, U, H, L and ʔ. In GP2.0 we propose an inventory restricted to three elements: I, U, L. In this section we will discuss what has become of the late elements, H, ʔ and A and how the job they were created for has been taken on by other components of the theory. To start the discussion off, let us take the two so-called manner elements, H and ʔ.

In GP1.x H was used in both the onset and nuclear phonological expressions. Its role in nuclei was chiefly expressing high tone in tone and pitch accent systems. There was always the possibility of employing H in the analysis of "breathy vowels" found in Khmer languages (among others). Such analyses were never produced and it is not at all obvious that such a move would have been correct. The main role of H was to express the property of voicelessness or aspiration in non-nuclear positions. One major concern about the status of this element was the nearly total absence of interactions between onsets and nuclei involving it. While I, U and L gave us plentiful examples of such interactions, virtually nothing of the sort could be found involving H, aside from some claims about tonogenesis in certain South-East Asian languages. This anomalous behaviour raised serious doubts about the status of H and its very existence as part of the inventory of elements.

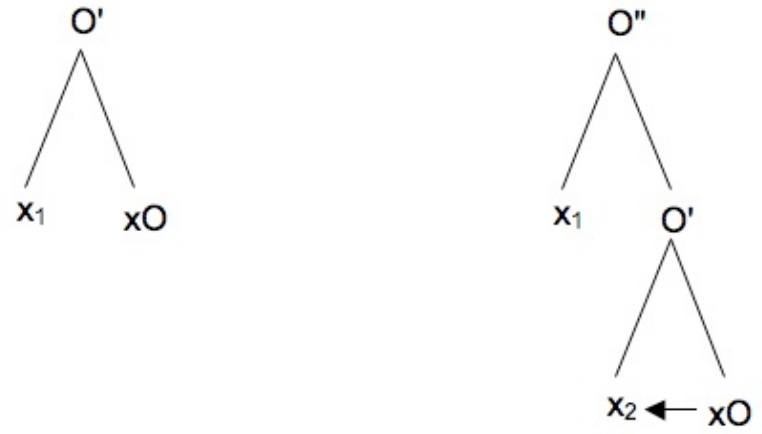
If H raised certain doubts about its status as an element, the "stop element", ʔ, used in the expressions of stops, nasals and *l* was an utter catastrophe. A leading idea of GP was the autonomy of melody and structure. The entire approach of element theory was based on the assumption that any element could occupy any structural position. This expectation was not at all problematic in the case of the elements I, U and L, but ʔ over the years resisted any attempt to impose a uniform distribution with respect to structure. There was simply no plausible candidate for the presence of ʔ in a nuclear expression. While the case for H was hardly robust, at least there was **something** remotely analysable as an onset/nucleus correspondence with respect to this element. This was not the case for ʔ.

In addition to the skewed structural distribution of the elements H and ʔ, there was a growing body of phonological evidence to suggest that the properties that characterised them were structural and not melodic. The alternations in Pulaar (Paradis 1986) involving initial consonant mutation triggered by a set of noun class prefixes as well as simple versus geminate consonant distribution, strongly suggested that the difference between stops and fricatives was structural and not melodic. Some examples of this Pulaar phenomenon as well as the justification for this claim are found in Pöchtrager (2006:40ff). In cases such as the ones below, gemination of a stem-final continuant always results in a stop.

(2)	lewru	lebbi	'month ~ months'
	nofru	noppi	'ear ~ ears'
	lefol	leppi	'pennant ~ pennants'
	kɔsam	kɔtʃːɛ	'milk' ~ (pl.)

Pöchtrager, following an earlier suggestion by Jensen (1994) proposed structural representations for both H and ʔ resulting in their elimination from the inventory of elements. These structures are shown in (3) below.

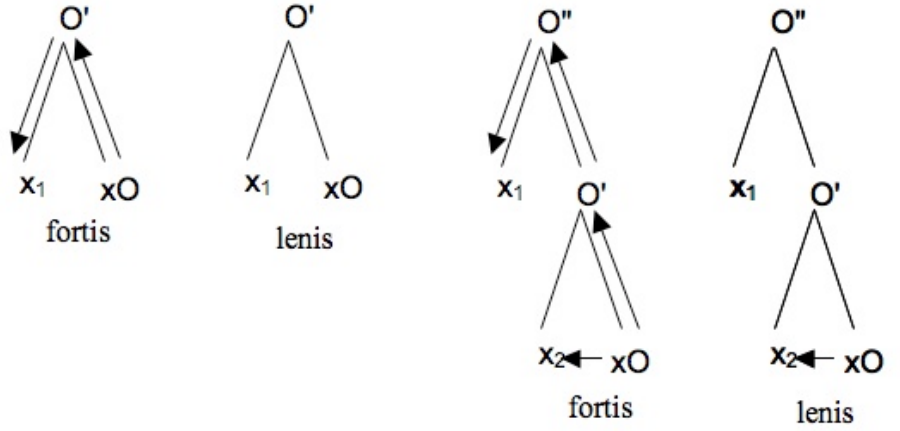
(3)



The single-layered structure on the left is the representation of a fricative and the double-layered structure on the right the representation of what used to contain ʔ (stop). As can be seen above, stops contain one more terminal node, indicative of the extra structure suggested by among other things, the Pulaar facts mentioned above. Note that in the double-layered structure on the right, an arrow connects the constituent head, xO and its complement, x_2. The arrow denotes *control*, a form of licensing that does not contribute to length. Pöchtrager (2006:77) describes control in this manner, "[an] unannotated x in a non-maximal onset projection must be controlled by its xO." In GP2.0 control has been generalised and now incorporates structures occurring in nuclear projections. The general effect is that of making the controlled point inaccessible. This will be illustrated when we turn to a discussion of what has replaced the A element. Notice that the fricative structure shown above on the left requires no control between the head and its sister since both are in a maximal onset projection, unlike the case on the right.

Using the above structures along with the notion of m-command discussed earlier we can now distinguish fortis from lenis objects on a purely structural basis obviating the use of the element H previously used for this task. In the case of fortis stops or fricatives, the constituent head m-commands the specifier of the constituent. M-command by the head is absent in the case of the lenis consonants. This is shown in (4).

(4) *fricatives* *stops*



Recall that ʔ played no role in nuclear expressions, so there is nothing to say in that regard with respect to nuclei. (There is more to say about the notion of control, but this would take us beyond the scope of this article.) H, on the other hand, was used to mark high tones in tone and pitch accent systems. Using a prosodic mechanism along the lines of stress representation may provide a viable alternative to any melodic approach for these cases. We will say no more about that question here.

In the above discussion we have shown that it is possible to replace the elements H and ʔ by structural configurations and thus remove the anomalies associated with these elements from GP. We turn now to the element A which is the last of the elements to be terminated with extreme prejudice.

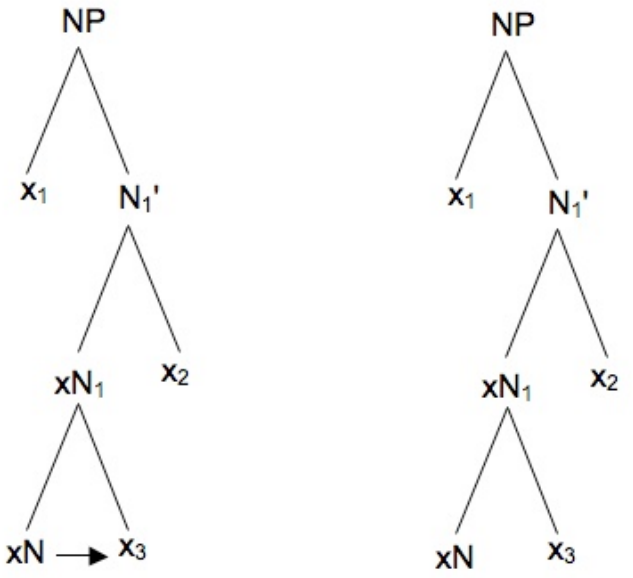
The Element A behaves reasonably with respect to its distributional properties, unlike H and ʔ discussed earlier. It occurs freely in both nuclear and non-nuclear positions. There are enough anomalies in the behaviour of A, however, to place it under suspicion and to entertain hypotheses that eliminate it from the inventory of elements.

The first seeds of suspicion regarding A in the GP framework are to be found in Ploch (1995) where it was shown that only nuclear expressions involving A could display extra length or be nasalised in French. It was a well-known property of English that lexical vowel length could occur before *s*+C clusters only if C contained the element A. This is seen in words like *east*, *boost*, *baste*, *boast* but not **easp*, **boosk*, **baspe*, **boask*. Notice also that in Southern British English, nuclei that contain A by itself can appear before s+C clusters even when one of the final consonants does not contain A, as in *clasp*, *task* and *draft*. Similar distributional quirks can also be observed in English N+C sequences: *count* but not **coump* nor **counk*.

As examples of this sort piled up over time, the message coming through was clear: somehow expressions containing A, nuclei and non-nuclei alike, had more structural space at their disposal. The element A was behaving in a fashion that differed significantly from I, U or L. Something had to be done. As GP2.0 was developing it was becoming more and more syntax-like in its constituent structure. This prompted a proposal drawn from syntax to deal with A: head-adjunction. This proposal is illustrated in some detail in Živanović & Pöchtrager (2010), but we will briefly discuss it here.

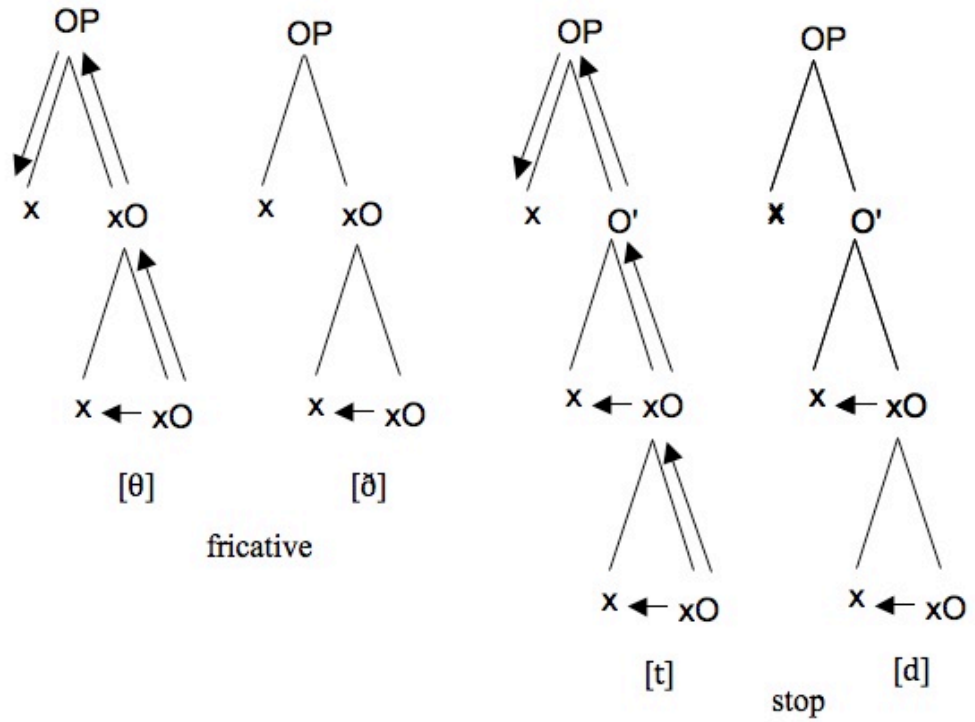
The idea is that A-structures are to be represented as adjunction as is done in syntax.

(5)



Above we see the two types of structure designed to replace the work done by the A element. The head, xN_1, is split in two and combined with another position, x_3 (the adjunction). The two structures differ in that the [a] structure has a control relationship between the head and its complement, while the [ə] structure does not. The presence versus absence of control corresponds roughly to the A-headed versus headless structures in GP1.x, though this is still somewhat unclear. The status of x_3, controlled or not controlled, affects its ability to be m-commanded or not. Crucial use is made of the availability of x_3 in our analysis of Putonghua (Jensen, Kaye, Pöchtrager & Živanovič 2009, Živanovič & Pöchtrager 2010), where a non-controlled point can be coloured by adjacent melody, while a controlled point cannot. Given the extra structure provided by the adjunction in these structures, we should now be able to give a principled account for the distributional skewing that is repeatedly observed in the presence of the former A expressions. Combining the adjunction hypothesis with Pöchtrager's (2006) single and double-layered structures for fricatives and stops, respectively, results in the onset structures displayed below.

(6)

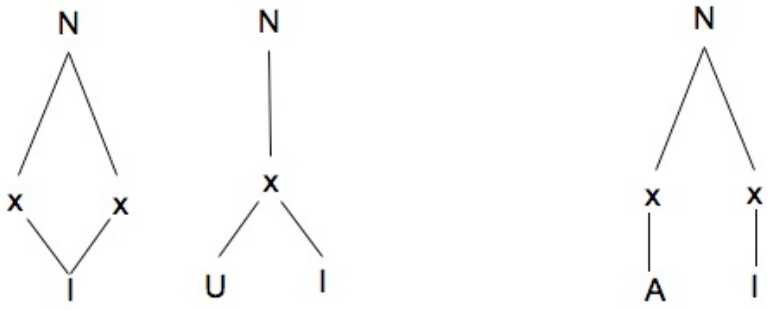


With this discussion of adjunction structures we come to the end of our proposed amendments to the element system. We have eliminated H, ʔ and A from the inventory of elements, all being replaced by structural configurations of one type or another. This leaves us with a total of three elements: I, U and L. In the next section we will explore what implications these changes have made on other aspects of GP.

5. Cutting the Ties that No Longer Bind: The Skeleton and Autosegmental Spreading

There are a number of consequences that follow from modifications to the element inventory and constituent structure. Postulating a skeletal level of structure is no longer tenable. To demonstrate this claim, consider a language containing both a tense long [i:] and a light diphthong [wi]. In GP1.x these would likely have the structures shown on the left below:

(7)



The existence of one-many and many-one relations holding between elements and terminal points of GP trees was one of the principal arguments for the presence of the skeleton in GP structures. Without the intervention of the skeleton, the light diphthong

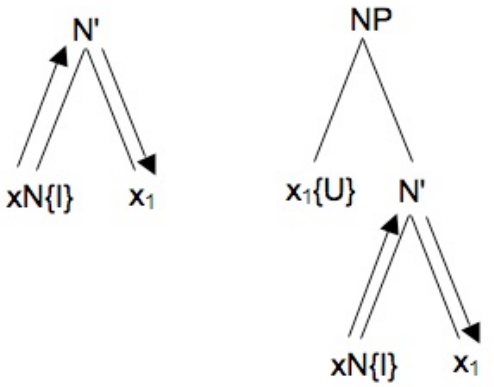
[wi] would be indistinguishable from the heavy diphthong structure [aj] shown on the right. Both structures could only be rendered as

(8)

with no way of determining whether the structure above was a light or heavy diphthong.

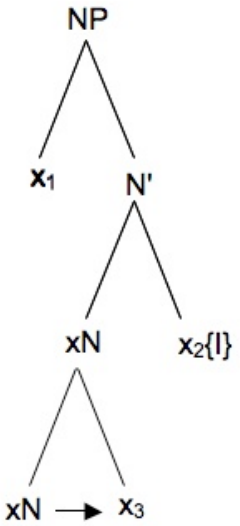
The question now arises as to how such structures can be rendered in GP2.0. The answer can be seen below, where tense [i:] and a light diphthong [wi] are illustrated.

(9)



As can be seen all activity takes place within the tree structure itself. There is no longer any need for autosegmental-style association lines, since there is no more skeletal level and no type of autosegmental spreading. Incorporating the adjunction hypothesis presented in the previous section we can now express the heavy diphthong [aj] as follows:

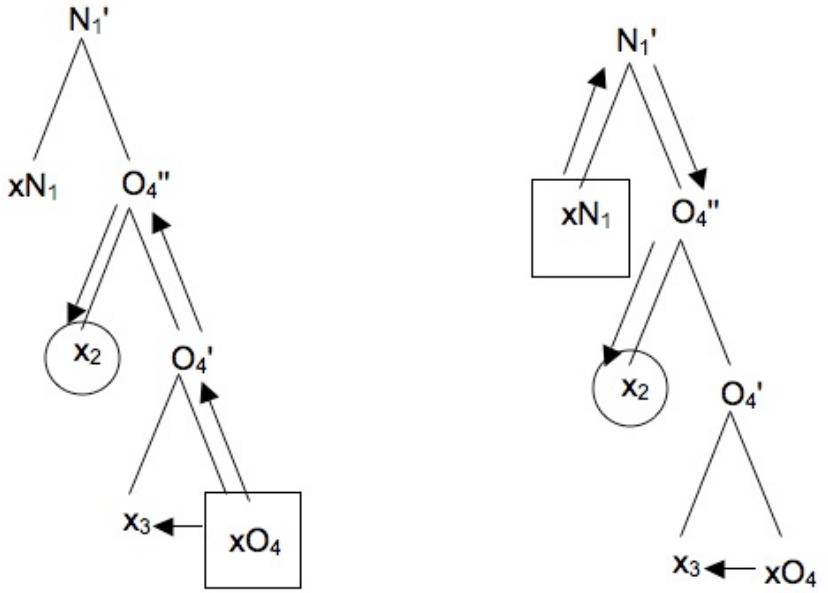
(10)



(Whether the specifier position x_1 is present or not is irrelevant for our purposes here.) The differences between light and heavy diphthongs can still be maintained but without the need for a skeleton.

With the loss of the elements H and ʔ it also became clear that autosegmental association lines had to be replaced by more adequate means. In GP 1.x, an English "k" contained the elements H and ʔ, with the head position being empty. English "g" contained ʔ and also had an empty head. With the elimination of H and ʔ, both objects become identical; what sets them apart in GP 2.0 is whether there is an m-command relationship (fortis *k*) or not (lenis *g*). With this in mind, consider the words *duck* and *dug*. In terms of length, they behave like *bit* and *bid* discussed above. If the final consonant is longer (fortis), the vowel will be shorter and vice versa. The vowel in *duck* and *dug* has no melody in its phonological representation; like the velar stops at the end, it is empty. Consider the (partial) representations of the two words below.

(11)



Length revolves around position x2: If it is m-commanded by xO_4 we will have a final *k* and a short preceding vowel (*duck*); if it is m-commanded by xN_1 we get *dug*. Crucially, length could not be expressed by associating melodic material to one or more positions, as neither vowel nor consonant contain any melody to begin with. All the work is done in the phonological tree with no accompanying skeleton or melodic tier.

6. Afterword

In this article we have sketched out the salient features of the phonological theory of GP2.0. As the reader will have noted the changes from earlier versions of GP are both numerous and radical. They cover virtually every component of the theory. It is equally obvious that this is work in progress and definitely "not ready for prime time". At the moment we have a number of "analysis chunks" — segments of a complete phonology that have internal consistency but await integration into a global theory that can somehow encompass these various parts. Even in the illustrative material contained here, we have been forced to take decisions that we may well ultimately reject with the experience of further research. It is our belief, however, that the overall ideas presented here are essentially correct and further modifications will preserve the major design features found here.

This small "avant goût" is necessarily incomplete given the space constraints to which we are subject. The most detailed implementation to date of GP2.0 is found in Živanovič & Pöchtrager (2010). There, ideas not mentioned here such as binding, islands and C++-command are applied to the phonological structure of Putonghua. As research continues in the framework of GP2.0 we are optimistic that this small introduction to its main features will be replaced by a proper Users' Guide to this theory.

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