

The nanosyntax of Nguni noun class prefixes and concords

Knut Tarald Taraldsen
Center for Advanced Study in Theoretical Linguistics
University of Tromsø

1. Nanosyntax:

It is necessary to start with a presentation of the general view of syntax which the Nguni facts will be taken to support. In doing this, we will try to avoid technicalities as much as possible, but will stress certain aspects of an implementation that become important later on.¹

1.1. The basic idea and some its consequences:

The fundamental empirical claim underlying nanosyntax is explained and illustrated in subsection 1.1.1. Then, we present what we take to be the simplest theoretical interpretation of the factual observations.

1.1.1. Morphemes are not syntactic atoms:

In a sense, the statement made in the heading of this subsection is not really controversial. At least since Chomsky (1995: Chapter 4), it is commonly held that the minimal units driving syntactic computations are features or feature bundles, and a single morpheme will in general correspond to more than a single feature. Yet, this realization creates a measure of tension with the standard view that morphemes lexicalize syntactic heads. Since a morpheme generally corresponds one-to-many to features, a head must then also correspond one-to-many with features, and in fact it is routinely assumed that they do. But since the heads, by definition, are the smallest building blocks of syntactic structures, this means that even though features are the atoms syntactic operations really care about, they are still subatomic when it comes to structure building. A more natural view would be that features are atoms also for structure building, identifying each head with a single feature (as suggested already by Kayne (1994)). But this, as we have seen, is not possible, if morphemes corresponds to heads.

At the same time, it has been widely recognized that sometimes a single morpheme will lexicalize two (or more) heads, as in English *went* vs *walk-ed*. However, this observation is usually accommodated to the standard view of the morpheme/head relation by appealing to some postsyntactic operation like “fusion” (see below in subsection 1.2.2.). But this both introduces a new kind of operation into the system, and allows the continued coexistence of two kinds of syntactic atoms (features and heads).

The alternative view, which we adopt, is that a morpheme can in general lexicalize a whole phrase (a structured non-trivial set of heads). That will deliver the *went/walk-ed* patterns without cluttering the system with the introduction of new grammatical operations (ideally, without a separate morphological component at all). It will also enable us to say that features are also the atoms of structure building, by identifying each head with a single feature. The fact that morphemes correspond to features one-to-many then follows from the fact that morphemes in general lexicalize phrases, not single heads. (Notice that we are presupposing “late insertion”: Lexicalization applies to the output of syntax.)

On this highly compositional view, phrases are expected to be fairly large, fine-grained structures, and can yet be lexicalized by single morphemes. Any approach adhering to this view, will be a form of “nanosyntax”.

Correspondingly, any time we can show that the number of heads in some subtree exceeds the number of morphemes lexicalizing it, we will have found another piece of evidence supporting a nanosyntactic approach. The main empirical claim made in this article will in fact be that the morphosyntax of Nguni noun class prefixes and concords provides a particularly clear scenario of this sort.

1.1.2. The information in lexical entries:

As in other frameworks, a lexical entry pairs a “sign” consisting of a phonological representation and conceptual content (henceforth: a formative) with a piece of information identifying the morphosyntactic structures it can replace. But in a nanosyntactic approach, this information must be able to identify phrases rather than just heads. A straightforward way of achieving this is to link the formative to the representation of a syntactic structure, as in (1) (where *V* should read as shorthand for the phrase containing all the features going into a verb like *go*, corresponding, for example, to *v* etc. in standard analyses, or to *Init* etc. under Ramchand’s (2008) decomposition), using *went* to name the formative:

(1) *went* \leftrightarrow [V Past]

One can imagine a variety of conditions to be imposed on the range of structural representations that can be linked to formatives. Assuming that syntactic heads are totally ordered in a functional hierarchy (henceforth: fseq, short for “functional sequence”) of the sort suggested by Cinque’s (1999) work, a fairly strong restriction would be that the structural representations appearing in lexical entries maintain the c-command relations determined by the fseq. In fact, this restriction would presumably rule out (1), but will not be violated in our analysis of the Nguni facts.

Another restriction would narrow down the range of admissible structures to those whose heads correspond to portions of a single projection of the fseq.² This would allow (1) with *V* corresponding to a lower portion of the fseq raised across *Past*, but would rule out the inclusion of specifiers that cannot be interpreted in a similar way. This restriction too is in fact respected under the analysis proposed in sections 3 and 4.

Instead of exploring this issue further here, we want to offer a clarification regarding the nature of the enterprise. Occasionally, analyses using lexical entries like (1) are met with the objection that the nanosyntactic framework is a kind of Construction Grammar in disguise: Syntactic structures are assembled in the lexicon and given a semantic interpretation by linking to formatives. The objection fails, however. Since the semantic content provided by the formative is limited to conceptual content, i.e. the kind of thing that distinguishes *cat* from *dog*, the real semantic interpretation is computed compositionally from the syntactic heads lexicalized. As for the charge that syntax is being done in the lexicon, this is plainly false if lexical entries must preserve the c-command relations of the fseq, since the fseq is a presyntactic given in any event. If one abandons this restriction, but adopts the restriction to a single projection of the fseq, manipulations will be allowed, but only in a narrowly circumscribed way and certainly with no reference to the set of conditions that define the syntactic component.³

1.1.3. Matching lexical entries with syntactic structures:

The intended interpretation of an entry like (1) is that the formative can replace any piece of syntactic structure matching the structural description the formative is linked to. But exactly what is required for matching?

A natural view, suggested by the way we wrote the entry in (1), is that the substructure lexicalized by the formative must be a constituent within the larger structure in which the set of heads matching the structural description occur. On this view, the sequence of heads contained in V Past can be replaced by *went* just in case the head Past has no sister in the larger structure. This will require that arguments introduced by any of the heads in the decomposed V are raised across V Past before lexicalization occurs, and that the lexicalization procedure can ignore traces.

Alternatively, we can adopt the proposal by Abels & Muriungi (2008) according to which a set of heads can be replaced by a single formative provided they form a “stretch”, a set of “one or more heads that select each others’ maximal projections”, e.g. by virtue of being neighbors in the fseq. Correspondingly, lexical entries should link formatives to stretches rather than to subtrees.

In our analysis of the Nguni noun class prefixes and concords, we will assume Abels & Muriungi’s interpretation, although lexical entries will continue to look like (1). This is just a matter of convenience, though, and no theoretical commitment is intended at this stage. We simply want to avoid discussing the movements that will be needed, if lexicalization is restricted to constituents, since this would involve issues that are orthogonal to our present concerns.

1.1.4. The Superset Principle:

Another important aspect of the nanosyntactic approach to lexicalization relates to the way this approach must handle syncretisms. Consider, for example, the fact that the dative and the locative have the same ending in some paradigms in Czech. The standard approach would be to assume that there is a formative only specified for a set of features common to both the dative and the locative, and allow lexicalization under the Subset Principle:

- (2) A formative F can replace a syntactic head H if and only if the features associated with F are a subset of the features associated with H

But once we recognize that formatives can replace whole phrases (or non-trivial stretches), the Subset Principle can no longer be part of the theory. If it were, any formative matching even just a single head within a larger structure should in principle be able to replace the whole larger structure, essentially allowing any number of heads not to be lexicalized at all. Yet, the theory must have a way of dealing with syncretisms.

This leads to the adoption of the Superset Principle:

- (3) A formative F with the lexical entry $F \leftrightarrow \Sigma$ (where Σ is a syntactic structure) can replace any syntactic structure matching a constituent of Σ .

Or, going by Abels & Muriungi’s formulation:

- (4) A formative F with the lexical entry $F \leftrightarrow \Sigma$ (where Σ is a stretch) can replace any string of heads corresponding to a substretch of Σ .

That is, the heads/features associated with a formative will always be a superset of the heads/features it can lexicalize.

Caha (in preparation) shows how the Superset Principles allows enlightening analyses of Case-syncretisms in Czech and a number of other languages. Essentially, the idea is that there is a fixed hierarchy of Case-features/heads, and different Cases are distinguished by having different portions of this hierarchy merged on top of the DP, leading to subset relations between Cases. For example, the locative might be identified as $[X [Y [Z [W DP]]]]$ and the dative as $[Y [Z [W DP]]]$. Then, the existence of a formative $F \leftrightarrow [X [Y [Z [W]]]]$ will give rise to syncretism under the Superset Principle.

Abels & Muriungi (op.cit.) add an “anchoring” condition, restricting the scope of the Superset Principle: A formative linked to a stretch Σ in the lexicon can only replace substretches of Σ that include its lowest element. That is, formatives are “anchored at the bottom”. Thus, our hypothetical Case-formative $F \leftrightarrow [X [Y [Z [W]]]]$ would be able to lexicalize $[X [Y [Z [W]]]]$, $[Y [Z [W]]]$, $[Z [W]]$ and W , but not, for example $[X [Y [Z]]]$.⁴ The preliminary account of the Nguni concords offered in section 4 will not adhere to this proposal, but the revised analysis in section 5 will.

1.1.5. The Elsewhere Principle:

The mere existence of a lexical entry like (1) doesn’t suffice to make *went* block **goed*. As in other theories, a principle is needed to capture the “elsewhere nature” of the regular inflectional pattern. Within the nanosyntactic approach pursued here, we want a candidate A in a competitor set $\{A, B, C\}$ to be preferred over $\{B, C\}$ for the lexicalization of a syntactic structure Σ any time A can lexicalize the entire structure, while B and C would carve up the territory between them. In the *went*/**goed* case, we would have $\{went, go, -ed\}$ as our candidate set for the lexicalization of V Past, and *went* should win, because it can lexicalize this structure in one go.

We could view this as a matter of minimizing the number of formatives used to lexicalize a given domain, but find it more enlightening to stress the fact that we are just describing scenarios where a more highly specified candidate is preferred to less specified ones. Thus, the structural description in the entry for *went* properly includes both the structural description for *go* (just V) and the structural description for *-ed* (just Past). This brings out a similarity with the basic idea behind the “elsewhere principle” in its various manifestations. Correspondingly, we will refer to the relevant principle as the “Elsewhere Principle”, although we give it the user-friendly formulation in (5):⁵

- (5) If the candidate set for the lexicalization of a syntactic structure Σ contains a candidate A which can lexicalize all of Σ , using A is preferred to using a set of candidates each of which only lexicalize a proper subpart of Σ .

In the next subsection, we determine what happens when there are more than one candidate meeting the description of A in (5).

1.1.6. “Best fit”:

Bobaljik (2007) makes an important observation: Although English adjectives may use suppletive roots to form positive-comparative-superlative triplets, as in *good-better-best*, there is no case where one root occurs both in the positive and the superlative to the exclusion

of the comparative, giving rise to an ABA pattern. Bobaljik accounts for this by saying that the superlative is built by adding structure to the comparative.

However, Caha (in preparation) argues that the exclusion of the ABA pattern is not limited to positive-comparative-superlative triplets, but in fact must extend to all instances of structures X, Y and Z related by inclusion. He then notes that this would follow from a principle like (6), which we will refer to as the “Best Fit Principle”:

- (6) If A and B are in the candidate set for the lexicalization of Σ by the Elsewhere Principle, but the structural description of B properly includes the structural description of A, A wins.

Suppose $Y = [Q [X]]$ and $Z = [P [Q [X]]]$. For an ABA pattern to arise, there must be formatives A and B with the entries in (7):⁶

- (7)a $A \leftrightarrow [P [Q [X]]]$
 b $B \leftrightarrow [Q [X]]$

By the Elsewhere Principle alone, A could now lexicalize both X and Z, while B could lexicalize Y, creating the ABA pattern. But the Best Fit Principle will select B over A both for the lexicalization of Y and the lexicalization of X alone, allowing only BBA.

We would now like to suggest that the Best Fit Principle in (6) reflects a more general principle disfavoring “underassociation” of formatives, to use Ramchand’s (2008) term.

Underassociation occurs whenever a piece of syntactic structure corresponds to a proper subset of the structural description associated with the formative replacing it. Assuming that this principle is subordinate to the Elsewhere Principle, (6) corresponds to its application in a situation where different formatives compete.

But consider now the possibility that the Elsewhere Principle selects the formative F for the lexicalization of structure Σ . Then, F can lexicalize all of Σ , but suppose it nevertheless chooses to lexicalize each head in Σ one by one, an option made available by the Superset Principle. We will want to rule out this possibility in our account of the Nguni patterns in sections 4 and 5, but as yet, we have stated no principle actually excluding it. Notice, however, that in the scenario we want to rule out, each time the formative F is inserted, it necessarily underassociates more than it does when replacing all of Σ in one step. We can therefore obtain the desired result by postulating (8), which subsumes (6) as a special case:

- (8) When the Elsewhere Principle has selected a competitor set for lexicalization of Σ , formatives and lexicalization targets in Σ must be chosen so as to minimize underassociation.

Although we will continue to use the term “Best Fit Principle”, we will assume that something like (8) holds, and that (6) follows from it.⁷

Since this account of the interaction between the Elsewhere Principle and the Best Fit Principle contains certain elements reminiscent of Optimality Theory, we would like to stress that we assume the ranking of the Elsewhere Principle above the Best Fit Principle holds universally.

1.2. Some consequences of restricting lexicalization to terminals:

To complete this sketch of the nanosyntactic framework that will be adopted here, we will now assess some of the consequences of denying the basic assumption that lexicalization can target phrases (or stretches of heads).

1.2.1. Restrictiveness:

To begin with, we should address the issue of restrictiveness. Everything else being equal, a theory that restricts lexicalization to single terminals is of course more restrictive in the sense that it makes narrower predictions about possible lexicalization patterns than a theory allowing lexicalization of both single terminals and phrases.

Remaining at this a prioristic level of discussion, we note that the picture changes slightly when conditions are added. For example, the Elsewhere Principle in (6) has the effect of blocking lexicalization of terminals when “phrasal lexicalization” is an option. Thus, the set of possible lexicalization targets in a theory allowing formatives to replace phrases, but using (6) to control the lexicalization options, is not a simple superset of those predicted when lexicalization is restricted to terminals.

Most importantly, though, things are no longer equal when the empirical facts are taken into consideration. Since it is uncontroversial that there are formatives like *went* which lexicalize (at least) two heads, any theory must accommodate this possibility, and if lexicalization is restricted to terminals, accommodation will be costly. In the end, restrictiveness in one part of the grammar will be more than offset by increased descriptive power in another. To see this, we will now look at how the operation “Fusion” is used to mimic lexicalization of phrases.

1.2.2. Fusion:

As described by Halle & Marantz (1993), Fusion creates one single terminal out of two or more under certain locality conditions. For example, the two neighboring heads T (with the feature +PAST) and V might fuse to accommodate the insertion of *went* under a single terminal.

The locality conditions will ensure that Fusion mimics lexicalization of a phrase by a single formative. But Fusion is not part of the lexicalization procedure. Nor is it a syntactic process. Head movement, for example, would not fuse two heads, but rather adjoin one to the other, maintaining two separate lexicalization targets. Therefore, positing Fusion entails positing a separate morphological component with properties of its own, just to mediate between syntactic structure and lexicalization. If formatives can target phrases, this complication of the overall theory seems superfluous. Thus, denying that lexicalization can target phrases leads to a theory allowing the same range of lexicalization targets as when formatives can target phrases directly, and at the same time, introduces a new powerful component into the system.

Part of the added complexity has to do with the necessity for Fusion to communicate somehow with the inventory of lexical entries. In fact, *went* will block **goed* only if T and V fuse in the first place. But T and P cannot always fuse, witness *walked*. We want them to fuse just in case there happens to be a formative like *went* which can actually lexicalize the fusion product. So, either Fusion can access a list of lexical entries before it makes a decision, or else Fusion generates all the outputs consistent with the locality conditions, in addition to outputs where Fusion has not applied, and leaves the bad ones to be

filtered out, because they contain some head that cannot be lexicalized. Notice that in the theory where formatives like *went* target phrases, this issue simply doesn't arise.

The filtering approach would need to make a specific decision as to how the feature set of the new terminal is computed in the basis of the features of the fused heads. In the *went* scenario it would seem natural to assume that one forms the union of the features of the fused heads. But then, the Subset Principle would entail that any two heads in a local relation which can lexicalize separately as A and B, could also fuse into a single terminal lexicalized as A or B⁸. In fact, adopting something like Siddiqi's (2009) "Minimize Exponence" would enforce Fusion even in this case. Moreover, forming the fusion products feature set by union seems objectionable in conjunction with the Subset Principle for exactly the same reason that adopting the Subset Principle is objectionable when formatives can target phrases: There will be syntactic heads that share no feature with any formative, intuitively a case of "illicit underlexicalization".

Therefore, we think that the feature set which Fusion assigns to the new terminal should be the intersection of the feature sets of the fused heads. Then, the fusion product is lexicalizable just in case there is a formative whose features are a subset of the features common to all the fused heads, and adopting "Minimize Exponence" (subject to complete lexicalization) would be a viable strategy to enforce Fusion in just the right cases. Still, without look-ahead, Fusion will have to apply blindly all over the place, creating outputs that will eventually be weeded out.

Notice also that "intersective" Fusion will work only to the extent neighboring heads can share features at all. In particular, we cannot adopt the conceptually attractive assumption that each distinct head in reality corresponds to a single distinct feature. Then, Fusion would always create a terminal with \emptyset as its feature set, and the Subset Principle would block its lexicalization. In fact, Fusion by union might have allowed us to take all the examples of a single formative associated with more than one feature as byproducts of Fusion, hence made the "one feature per head" doctrine consistent with formatives only targeting single heads. But then, as we have seen, Fusion cannot be controlled by "Maximize Exponence".

In section 5, we return to these issues in the context of an attempt to use Fusion in an analysis of the Nguni noun class prefixes and concords.

1.3. Summary and preview:

We have now presented the basic ingredients of the nanosyntactic approach and looked at how this approach differs from the mainstream approaches, including other theories assuming "postsyntactic lexicalization, like Distributed Morphology. As a final general remark, we would like to point out that the case for nanosyntax grows stronger as syntactic analyses become more fine-grained, postulating increasingly large structures, as in the cartographic tradition. The main purpose of this article, however, is to develop an argument in favor of the nanosyntactic position without relying on specific assumptions about "granularity" or other theoretical issues. We want to show that the data forces a nanosyntactic account of the Nguni noun class prefixes and concords. But to set the scene, we first give a brief informal presentation of the Nguni noun class system.

2. A brief introduction to noun classes in Nguni:

In order to give the reader a general sense of the noun class system in Nguni⁹, we now offer a short overview of its properties and compare them to the properties of languages with classifier systems or simpler gender systems.

2.1. The characteristic properties of the Nguni noun class system:

We first describe the properties of the Nguni noun class system, including properties that will not, as far as we are aware, be relevant to the formal analysis developed in sections 3 and 4. Then, we compare these briefly to the properties of other types of classifier systems and to the gender systems of Indo-European languages.

2.1.1. Formal properties:

In Xhosa, every noun comes adorned with one of the prefixes in (9):¹⁰

(9) Class 1	<i>um-</i>	Class 2	<i>aba-</i>
1a	<i>u-</i>	2a	<i>oo-</i> ¹¹
3	<i>um-</i>	4	<i>imi-</i>
5	<i>i(li)-</i>	6	<i>ama-</i>
7	<i>isi-</i>	8	<i>izi-</i>
9	<i>iN-</i> ¹²	10	<i>iziN- / iiN-</i>
11	<i>u(lu-)</i>		
14	<i>ubu-</i>		
15	<i>uku-</i>		

Zulu has the same inventory of prefixes, but Swati differs by lacking the initial vowel in classes 2, 5, 7, 8, 10, 11, 14 and 15 (see 3.2.2. for discussion), and by having *e-* rather than *a-* as the initial vowel of class 6 (see 6.1.2. for discussion).

The surface shape of some of the class prefixes shows templatic effects. The *-li-* part of the class 5 prefix and the *-lu-* of class 11 only surfaces on monosyllabic roots:

(10)a class 5:	b class 11:
<i>ili-fu</i> “cloud”	<i>ulu-thi</i> “stick”
<i>i-gama</i> “name”	<i>u-sana</i> “baby”

Similarly, the class 10 prefix is *iziN-* with monosyllabic roots, but *iiN-* elsewhere:¹³

(11)a	<i>izi-nja</i> “dogs”
b	<i>ii-mfene</i> “baboons”

Some of these effects are specific to Xhosa, e.g. Zulu and Swati retain class 10 *-zi-* (*-ti-* in Swati) with polysyllabic roots¹⁴, and they will largely be ignored here.¹⁵

A property that the Xhosa noun class system shares with its Nguni sisters, is that it seems to impose a fixed pairing between singular and plural classes. A class 1 noun like *umntu* “person” will have its plural in class 2, i.e. *abantu* “people”, and so on, as indicated by the pairing in (9). This pairing is a property that the Bantu-type noun class system shares with the gender systems familiar from the Indo-European languages.

But there is some flexibility. Some class 1 nouns denoting nationality in fact form their plurals in class 6 rather than in class 2:¹⁶

- (12)a *um-Zulu* → *ama-Zulu*
 1-Zulu 6-Zulu
 “a Zulu” “Zulus”

Likewise, the class 9 nouns *indoda* “man” and *intombazana* “young lady” only have plurals in class 6: *amadoda*, *amantombazana*¹⁷.

On the other hand, the singular classes 11, 14 and 15 are not paired with designated plural classes. Whereas class 14 (infinitives) and 15 (abstract concepts) don’t form plurals at all, presumably for semantic reasons, some class 11 nouns do, and then, go to class 10:

- (13) *ulu-thi* → *izin-ti*
 11-tree 10-tree
 “a stick” “sticks”

Xhosa also displays another property shared with the other Nguni languages. As we will see in more detail below, verbs and adjectives show agreement with a designated noun phrase in the structure, and the shape of these agreement markers (called concords in the Bantuist tradition) reflects the class of the noun phrase controlling agreement.¹⁸ Each class has its own set of concords (a subject concord, an object concord and an adjectival concord).

Thus, even though *igama* “name” and *ifani* “surname” seem to have the same class prefix *i-*, there are two ways we can tell that *igama* is in class 5 (with loss of *-li-* because the root is polysyllabic) and *ifani* is in class 9 (without *-N-* because it is a loanword). The plural of *igama* is in class 6 (*amagama*), while *ifani* finds its plural in class 10 (*iifani*), and they impose distinct concords on agreeing elements, as in (9), where the subject concords (scs) on the possessive linker *a* “of” signal agreement with the possessee:

- (14)a *ngubani igama lakho* ?
 is-who 5-name sc5-your
 “What’s your name?”
 b *ngubani ifani yakho* ?
 is-who 9-surname sc9-your
 “What’s your surname?”

In fact, given the partial flexibility manifested by the singular/plural pairing¹⁹, looking at the concords is sometimes the more reliable way of determining a noun’s class membership. In some of the world’s languages, it is actually the only way. Outside of Bantu, most languages analyzed as having a noun class or gender system don’t have class-specific affixes on the nouns, while the agreement system displays a number of distinct “concords” covarying with classes of agreement-controlling nouns; Aikhenvald (2003:xx). From this perspective, Nguni, and Bantu more generally, stands out as special in that the class distinctions are marked on the noun as well as on agreeing elements.

2.1.2. Noun classes and meaning:

As is well known, class membership is not fixed for all roots, and where some flexibility exists, the choice of class prefix usually affects meaning. (15) provides some examples of this drawn from Xhosa:

(15)a	<i>um</i> -Xhosa	<i>isi</i> -Xhosa
	1-Xhosa	7-Xhosa
	“a Xhosa”	“Xhosa language/culture”
b	<i>i</i> -gama	<i>isi</i> -gama
	5-name	7-name
	“a name”	“a vocabulary”
c	<i>um</i> -ntu	<i>ubu</i> -ntu
	1-man	14-man
	“a man”	“humanity”
d.	<i>um</i> -thi	<i>ulu</i> -thi
	3-wood	11-wood
	“a tree”	“a stick”

This suggests that each noun class is associated with a unique set of semantic properties, while the roots themselves have fairly open-ended meanings compatible with a range of additional semantic properties imposed by different class prefixes. For example, the root *Xhosa* must be compatible both with the singular countable reading ranging over humans imposed by class 1 *um*- and the more abstract interpretation given by class 7 *isi*-, and similarly for *ntu* (with the more abstract meaning coming from class 14 *ubu*-). The pair *umthi* “tree”/ *uluthi* “stick” suggests that the root *thi* has a mass-like denotation, e.g. “wood”, which can be shaped in different ways according as the prefix is class 3 *um*- or class 14 *ulu*-. Indeed, there is a strong correlation between meaning and noun class in some cases. For example, all class 1 nouns denote human beings. Thus, we might safely say that the class 1 prefix *um*- imposes the reference to humans on the root *Xhosa* in (15)a.

Even if there is a fixed meaning associated with each class, it may still be that two or more classes are associated with the same meaning. In fact, some class 9 nouns can refer to human beings too, like *indoda* “man”, *inkosi* “lord” or *intombi* “young girl”. This might mean that the class 9 prefix *iN*-, also induces reference to humans (along with other semantic properties not shared by class 1 *um*-). But it might also mean that *iN*- just restricts reference less than class 1 *um*-, creating noun denotations that are compatible with reference to humans without enforcing it. In fact, the inclusion in class 9 of animal names like *indlovu* “elephant” and *impuku* “mouse” suggests that *iN*- restricts the denotation of the root to animate things rather than humans.²⁰ If this is correct, class 1 *um*- restricts the denotation of the noun to a proper subset of the things class 9 *iN*- allows the noun to denote. Correspondingly, we expect that a root can combine with class 9 *iN*- to form a noun referring to human beings as long as this is not blocked by the existence of the same root combining with class 1 *um*-. Roots like *doda*, *kosi* and *tombi* must then be incapable of cooccurring with class 1 *um*-, for reasons that remain to be discovered.

However, while it may be the case that a given class prefix is associated with a fixed meaning (unique to that class), it seems clear that it doesn’t discenibly superimpose that meaning component on the root in every combination in which it occurs. Thus, (15)a-b suggest that class 7 *isi*- is associated with some kind of abstract/collective meaning, and yet, nouns like *isitulo* “chair” and *isitalato* “street” are in class 7 too. In fact, the class membership of these

particular nouns seems to be a historical by-product of the way Xhosa broke up an inadmissible consonant cluster. *Isitulo* and *isitalato* are both loanwords that originate from adapting Afrikaans *stoel* “chair” and *straat* “street” to Xhosa phonotactics by inserting an epenthetic /i/ between the initial /s/ and the /t/, giving –*si-tulo* and –*si-talato*, which would then take on the initial vowel *i-* of class 7. Thus, this is a case where class membership is due to historical accident, and the class prefix seems to be either semantically inactive or to have shifted its meaning.

On the basis of observations like this, researchers mostly agree that while there may be a core meaning associated with each noun class, there is only a partial correlation between class membership and meaning. At the same time, it is sometimes suggested that the current noun class system of Bantu has evolved from a system in which class membership more transparently determined meaning, through a series of diachronic “accidents” similar to the one that brought loanwords like *isitalato* into class 7.

2.2. The Nguni noun class system in a typological perspective:

We are now in a position to give a rough assessment of the similarity between the Nguni noun class system, and classifier and gender systems.

2.2.1. Noun class prefixes vs noun classifiers:

The Jacalteco example in (16) (from Craig (1992: 284) via Aikhenvald (2003:82)) illustrates the use of what Aikhenvald (2003) calls “noun classifiers”

- (16) Xil naj Xuwan no7 lab’a
saw CI-MAN John CI-ANIMAL snake
“John saw the snake.”

In which ways are these different from the Nguni noun class prefixes?

In Aikhenvald’s typology of “noun categorization devices”, a noun classifier, by definition, doesn’t enter into agreement relations with predicates or DP-internal modifiers, unlike a noun class prefix. But she also lists the following additional contingent properties, which noun classifiers may or may not have in a given language:

- (17)a They are optional and their distribution is semantically determined
b One noun can be used with different classifiers, with a change in meaning
c They may stack
d The inventory of noun classifiers may vary in size (from 2 to several hundred)
e They may be used anaphorically without a noun

For the definitional property of noun classifiers to be useful, it should be the case that when classifier-like elements do enter into agreement relations, like the Nguni class prefixes, one or more of the properties in (17) cease to be contingent. When we look at the list in (17) in the light of the preceding general remarks on the Nguni noun classes, it becomes clear that the Nguni noun class system has all the properties in (17) except (a) and (c). Noun class prefixes are certainly not optional (although their distribution may in fact be meaning-based in part), and they don’t stack.²¹

This suggests that the following generalization may hold:

(18) If classifiers participate in agreement, they are obligatory and don't stack.

The converse doesn't hold, however. Since (17) lists contingent properties of noun classifiers, there should be classifiers that are obligatory and disallow stacking, and yet don't enter into agreement relations.

Why should (18) hold? The most promising line of analysis starts with the assumption that agreement necessarily involves purely grammatical features in the nominal functional sequence rather than components of conceptual meaning. Then, the Nguni noun class prefixes and their counterparts in other languages must lexicalize a fixed portion of the features on the nominal spine. To the extent that the nominal functional sequence always projects, this in turn means that noun class prefixes will be obligatory, and since every feature only occurs once within a single projection of the functional sequence, there will be no stacking.

Notice that on this view, classifiers may be like the Nguni noun class prefixes, and hence be obligatory and reject stacking, without entering into agreement. This depends entirely on whether the language has agreement to begin with. In fact, we suspect that those noun classifiers (by Aikhenvald's criterion) which lack properties (17)a and c, are indeed to be analyzed like the Nguni noun class prefixes, viewing agreement simply as just another contingent property.

The real cut, we believe, is between those classifiers that don't show properties (17)a and c, and those that do. The latter should be treated as ordinary nouns combining with other nouns much as in compounds. In fact, this seems fully consistent with their having the other properties in the list in (17). For example, property (17)e, illustrated in (19) (from Craig (1992:284) as given by Aikhenvald (2003:87)), would on this view reflect the same process of referent tracking we see in the English minidiscourse in (20):

(19) Xil naj no7
saw CI-MAN John CI-ANIMAL snake
"He saw it.."

(20) When John went hunting, a snake appeared. But the **man** grabbed the **animal** by the tail, and ...

That is, *naj* and *no7* would be just ordinary nouns denoting species to which the established discourse referents are known to belong just by virtue of their meaning, not bare noun class markers, as the Nguni concords actually are.

2.2.2. Noun classes and genders:

In certain respects, as already noted, the Bantu noun class systems look quite similar to the gender systems familiar from Germanic, Romance and Slavic. In these Indo-European languages, adjectival agreement marks the gender (and number) of the subject of predication in much the same way as the Bantu adjectival agreement marker (concord) reflects the noun class of the noun phrase controlling agreement.²³

(21)a La donna è alta (Italian)
the woman-f.sg is tall-f.sg
b Umfazi mde (Xhosa)
1-woman ac1-tall
"The woman is tall."

In Romance and Slavic, pronominal clitics are marked for gender (and number), while Bantu pronominal clitics, e.g. the subject and object concords, show the full range of noun class distinctions:

- (22)a *Voglio vederla* (Italian)
 1sg-want see-f.sg
 “I want to see her/it.”
 b *Ndifuna ukumbona* (Xhosa)
 1sg-want 15-oc1- see
 “I want to see him/her/it.”

Observations like these have in fact led some researchers to conclude that a noun class system is really just a gender system with more distinctions drawn; cf. Corbett (1991), Kihm (2001), Ferrari(-Bridgers) (2005,2008).²⁴

Interestingly, Ferrari-Bridgers (op.cit.) also points out that a language like Italian allows the choice of gender to determine the meaning of a noun in certain cases:

- (23) *mela* (f.sg) “apple” *melo* (m.sg) “apple tree” (Italian)
 mele (f.pl) *meli* (m.pl)

This seems quite similar to the cases already considered where the choice of class prefix determines the meaning in Bantu.. As is to be expected, however, since there are at most three genders in Germanic, Romance and Slavic, the relation between genders and meaning categories seems even less transparent than the relation between class prefixes and semantic properties in Nguni.

2.3. Summary and preview

In the next section, we will show that the nominal prefixes in Nguni must cover an internal structure much richer than normally assumed. In particular, there will be a fairly large number of functional heads merged between the initial vowel and the root, exceeding the number of formatives used to lexicalize any given prefix. That is, a typical nanosyntactic landscape will emerge from the analysis.

3. Noun classes and concords in Nguni

To determine the proper decomposition of noun class prefixes, we will use two analytical tools. We will first consider contexts in which some piece of a prefix will not appear. To the extent that these effects are controlled by morphosyntactic factors, we conclude that the pieces that go missing, are morphosyntactically independent of the other pieces that make up the full prefix. Then, we look at the relationship between the different types of concords and proper subparts of the nominal prefixes of the corresponding classes. In Nguni, this relationship is quite transparent in the sense that the shape of a concord is generally the same as a part of the corresponding noun class prefix, and we conclude that this is because the concord lexicalizes the same syntactic heads as the matching part of the corresponding noun class prefix. This line of analysis will be supported by the fact that it leads to the results converging with the results obtained by using the “missing pieces tests”.

3.1. The augment

In Xhosa and Zulu, the first part of a complete noun class prefix is always a vowel. The list of prefixes in (9) (repeated as (24)) shows this for Xhosa:

(24) Class 1	<i>um-</i>	Class 2	<i>aba-</i>
1a	<i>u-</i>	2a	<i>oo-</i>
3	<i>um-</i>	4	<i>imi-</i>
5	<i>i(li)-</i>	6	<i>ama-</i>
7	<i>isi-</i>	8	<i>izi-</i>
9	<i>iN-</i>	10	<i>iziN-</i> / <i>iiN-</i>
11	<i>u(lu-)</i>		
14	<i>ubu-</i>		
15	<i>uku-</i>		

In the Bantuist literature, the initial vowel of the prefix is variously referred to as the augment, the preprefix or simply the initial vowel. Here, we will use the term “initial vowel” as a descriptive device to talk about the initial vocalic segment itself, while the term “augment” will eventually be employed to denote a particular syntactic head.

There is a certain measure of consensus among Bantuists (see, for example, Visser (2008)), that the initial vowel corresponds to a morphosyntactically independent part of the nominal prefix. We will now present some arguments for this position.

3.1.1. No initial vowel in vocatives:

One morphosyntactically definable environment in which the initial vowel does not show up, is the vocative. Thus, the vocative noun in (25) is a class 2 noun whose full form would be *abafundi* “the/some students”, but in the vocative the initial vowel *a-* cannot appear:

- (25) *Molweni, (*a)bafundi !*
be-good-pl 2-student
“Hi, students!”

Quite independently of what the exact account of this should be, it seems obvious that we are looking at a purely morphosyntactic effect. Hence, the initial vowel must represent a piece of structure capable of interacting with morphosyntactic rules and principles. That is, it must represent a morphosyntactic head (or a set of morphosyntactic heads). Referring to this head as the “augment” (A, for short), we therefore have the beginning of a morphosyntactic decomposition of nominal prefixes, as given in (26), a fragment of a full structural template for prefixes:

- (26) [A-layer A [B-layer ...

A class 2 noun like *abafundi* would have its initial vowel *a-* lexicalizing the augment head, while the *-ba-* part of the prefix would be confined to the B-layer of (26). Similarly, a class 10 noun, e.g. *izinja* “the/some dogs”, will attach *i-* to the augment and have *-zi-N-* lexicalizing heads within the B-layer.

It may, however, be possible to be more specific about the nature of the head we call the augment. Its absence in vocatives is arguably similar to the necessary absence of a determiner in English vocatives:

(27) *Hi, **the/some** students!

If the parallelism is real, it suggests that the augment is in fact a D, albeit one that seems neutral with respect to definiteness. Since the issue is largely orthogonal to our concerns, we will remain agnostic, although the effect to be described in the next subsection might actually also ultimately support the view of the augment as a D-type head.

3.1.2. No initial vowel in the scope of negation:

The initial vowel must also fall away on a noun phrase in the scope of negation:

(28) *Andiboni (*a)bafundi*
 Neg-1sg-see 2-student
 “I don’t see any students”

This too is clearly a morphosyntactic effect, supporting the assignment of the initial vowel to an independent morphosyntactic head like the augment in (26).

Again, comparison with other languages would seem to suggest analyzing the augment as a kind of D. In particular, the contrast between (28) and (29), the corresponding sentence without negation, recalls the French pattern exemplified in (30)-(31):

(29) *Ndibona *(a)bafundi*
 1sg-see 2-student
 “I see the/some students.”

(30) *J’ai vu des étudiants*
 I have seen some students

(31) *Je n’ai pas vu d’étudiants*
 I have not seen any students

The parallelism between (28) vs (29) and (31) vs (30) suggests taking the augment as similar to the French “partitive article” *des* in (30), or maybe more accurately as a counterpart of *les*²², assuming the parses in (32)-(33) (and leaving aside the *raison d’être* of the preposition *de*):

(32) [de [**les** [étudiants]]]
 of the

(33) [de [étudiants]]

From this point of view, the augment-less object in (28) would be a bare noun in the sense of “D-less”.²⁵ To explain why an augment-less object must be interpreted in the scope of negation, we can then claim that bare nouns universally have lowest scope, which in turn

might follow from bare nouns having a free variable which must be bound under existensial closure at the VP-level (under Neg).

If closure of the free variable can only occur in the VP, and if an augment is a kind of D providing DP-internal closure, we can also account for the fact that the augment must reappear even in negative sentences when the object is doubled by a pronominal clitic (an object concord):

- (34) *Andibaboni *(a)bafundi*
Neg-1sg-2-see 2-student
“I don’t see the students.”
“There are some students I don’t see.”

Plausibly, doubling is confined to structures where the object is raised out the VP, as is also suggested by the fact that the doubled object in (34) is interpreted outside the scope of negation.²⁶

In sum, we are inclined to think that analyzing the augment as a D is the most promising line of research, but since the issue, though obviously important, is not directly relevant to present concerns, we will not commit ourselves to a particular view of the nature of the augment head.

3.1.3. A cooccurrence restriction linked to the initial vowel:

Visser (2008) has made the intriguing discovery that the morphosyntactic composition of modifiers is determined by the presence of an initial vowel on the head noun. The Xhosa examples in (35)-(36), taken from Visser’s paper, illustrate this:²⁷

- (35) Umfazi unceda **u**mntwana **o**gulayo/***u**gulayo
1-woman sc1-help 1-child that sc1-sick-RM/*sc1-sick-RM
“The woman is helping the sick child.”
(36) Umfazi akancedi mntwana **o**gulayo/ **u**gulayo
1-woman Neg-sc1-help 1-child that sc1-sick-RM/ sc1-sick-RM
“the woman isn’t helping any sick child.”

The *o* of *o-gulayo* “is sick” comes from an underlying *a* coalescing with the subject concord of the following verb. (If the head noun were class 9 *indoda* “man” with the subject concord *i-*, we would get *egulayo*.) Sometimes this *a* is seen as akin to the demonstrative pronoun, e.g. by Zeller (2003), and we have glossed it as *that*, although we suspect that it might be an instance of the linker *a* occurring in possessive constructions²⁸, since the issue doesn’t seem directly pertinent to our rather limited concerns. What we want to focus on, is merely the fact that the *a* must appear, when the head noun has an initial vowel, as in (35), but becomes optional, when the head noun doesn’t have an initial vowel, as in (36). Since the (non)occurrence of *a* must respond to some morphosyntactic requirement, and since this requirement is linked to the presence of an initial vowel on the head noun, we again conclude that the initial vowel corresponds to a separate morphosyntactic head, i.e. the augment in (26).

Thus, we are again led to adopt the decomposition in (26), where the structure going into a full nominal prefix splits up into an A-layer holding the augment and a B-layer hosting the residue of the prefix.

3.2. The SC-layer:

By looking at the behavior of the initial vowel, we arrived at the conclusion that there must be at least two layers of structures on top of the root, as in (26), where the initial vowel lexicalizes the augment and the following part of the prefix goes into the phrase labeled B-layer:

(26) [A-layer A [B-layer ...

This much is probably not really controversial among bantuists. However, we will now endeavor to show that the B-layer of (26) must also split up into at least two structural layers, giving something like (37):

(37) [A-layer A [B-layer ... [C-layer ...

3.2.1. The relation between nominal prefixes and demonstratives:

The table in (38) displays the basic forms of the demonstrative in Zulu²⁹:

(38) Class 1	<i>lo</i>	Class 2	<i>laba</i>
3	<i>lo</i>	4	<i>le</i>
5	<i>leli</i>	6	<i>la</i>
7	<i>lesi</i>	8	<i>lezi</i>
9	<i>le</i>	10	<i>lezi</i>
11	<i>lolu</i>		
14	<i>lobu</i>		
15	<i>loku</i>		

The boldfaced parts all correspond to parts of the corresponding nominal prefixes, e.g. the *ba* of the class 2 demonstrative *laba* recurs inside the class 2 nominal prefix *aba-*. In fact, an independent phonological process (coalescence) provides all the forms in (38), if the basic demonstratives are built according to the template in (39):

(39) [la [A-layer A [B-layer ...]]]

To illustrate, we instantiate (39) for classes 2 and 10:

(40)a [la [A-layer a [B-layer ba]]]
b [la [A-layer i [B-layer zi]]] (and /ai/ → [e])

Notice, however, that whereas what follows *la-* in class 2 seems to correspond to the full class 2 nominal prefix *aba-*, the class 10 demonstrative excludes the *-N-* of the corresponding nominal prefix *iziN-*. More generally, the part of the prefix following the initial vowel in the so-called nasal classes, is never included in the corresponding demonstrative, as comparison of (38) with the list of prefixes in (41) will reveal:

- (41) class 1 *u-m-*
 3 *u-m-* class 4 *i-mi-*
 6 *a-ma-*
 9 *i-N-* 10 *i-zi-N-*

Although all the “subprefixes” excluded from demonstratives contain a nasal, we find it rather unlikely that their exclusion is grounded in phonology. Rather, we will take it that they share a structural property. They are all confined to the lowest structural level in the structural template for nominal prefixes, which we now take to be (42):

- (42) [A-layer A [B-layer ... [C-layer ...

Then, we can say only the two topmost layers of (42) are included in the structure of the demonstratives, as in (39).

As a byproduct of this decision, we are then led to ask what fills the B-layer in the demonstratives corresponding to the nasal classes, e.g. in the class 1 demonstrative *lo*:

- (43) [la [A-layer u [B-layer ?]]]

Our response is to say that the *u-* (the initial vowel) that lexicalizes the augment in class 1 also lexicalizes the heads in the B-layer, as the nanosyntactic approach allows. Now, we want to take note of a beneficial immediate consequence of this analytical decision.

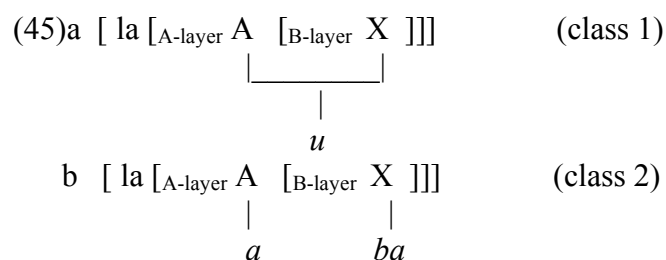
3.2.2. The distribution of the initial vowel in Swati:

Unlike Xhosa or Zulu, Swati nouns don’t come with initial vowels in all classes:

- (44) Class 1 *umu-* Class 2 *ba-*
 1a *u-* 2a *bo-*
 3 *umu-* 4 *imi-*
 5 *li-* 6 *ema-*
 7 *si-* 8 *ti-*
 9 *iN-* 10 *tiN-*
 11 *lu-*
 14 *bu-*
 15 *ku-*

In fact, the initial vowel only occurs in the nasal classes.³⁰

If we say that Swati nouns fail to project the topmost layer of (42), the one holding the augment, this follows from the way we were led to relate formatives to morphosyntactic heads in our account of the demonstratives. According to that account the part of the prefix following the initial vowel must lexicalize the heads in the B-layer except in the nasal classes, where instead the heads in the B-layer are lexicalized by the initial vowel, together with the augment. This gave us the picture in (45):



Consider now the effect of truncating the structure down to the B-layer. In class 2 (and all the other non-nasal classes plus class 10), this simply leaves nothing over for an initial vowel to lexicalize. In class 2 (and the other nasal classes minus class 10), the initial vowel will still appear, lexicalizing the heads in the B-layer, in accordance with the Superset Principle introduced 1.1.4.³¹

Alternatively, we might say that Swati too projects the A-layer, except that A is “colexicalized” with the heads in the B-layer, e.g. by *u* in class 1 and by *ba* in class 2, although this seems harder to reconcile with analysis of Swati demonstratives assumed in footnote 31.

Either way, our account of the demonstratives automatically connects two properties of the nasal classes: The part of the prefix following the initial vowel is excluded from the demonstratives in the nasal classes (minus class 10), and only the nasal classes (minus class 10) have initial vowels in Swati.³²

3.2.3. The relation between the nominal prefixes and the subject concords:

The following two examples illustrate a property of the Nguni subject concords (the formatives marking subject agreement):

- (46) U-m-ntwana **u**-ya-dlala
 1 -child sc1-Foc-play
 “The child is playing”
- (47) A-**ba**-ntwana **ba**-ya-dlala
 2 -child sc2-Foc-play
 “The children are playing”

In (46)-(47), the subject concords transparently match up with a part of the prefix on the noun phrase controlling agreement. This is not a peculiarity of classes 1 and 2, but holds without exception across the noun class, as is apparent from the table in (48), where the boldfaced part of a prefix (listed in the lefthand column) is the part matched by the corresponding subject concord:

(48)	the class prefix	the sc
class 1	<i>u</i> - <i>mu</i> -	<i>u</i> -
1a	<i>u</i> -	<i>u</i> -
2	<i>a</i> - <i>ba</i> -	<i>ba</i> -
2a	<i>oo</i> -	<i>ba</i> -
3	<i>u</i> - <i>mu</i> -	<i>u</i> -
4	<i>i</i> - <i>mi</i> -	<i>i</i> -

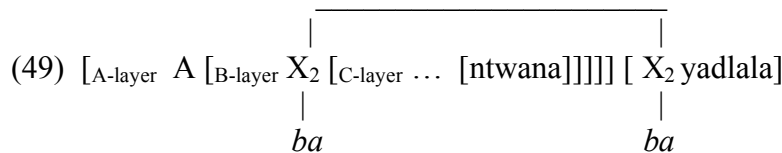
5	<i>i-li-</i>	<i>li-</i>
6	<i>a-ma-</i>	<i>a-</i>
7	<i>i-si-</i>	<i>si-</i>
8	<i>i-zi-</i>	<i>zi-</i>
9	<i>i-N-</i>	<i>i-</i>
10	<i>i-zi-N-</i>	<i>zi-</i>
11	<i>u-lu-</i>	<i>lu-</i>
14	<i>u-bu-</i>	<i>bu-</i>
15	<i>u-ku-</i>	<i>ku-</i>

(48) shows the forms found in Zulu, but the correspondences indicate hold for all Nguni languages, with the exception that the Swati sc6 *a* doesn't match any part of the corresponding class prefix *ema-*, fact discussed in some detail in 6.1.2.

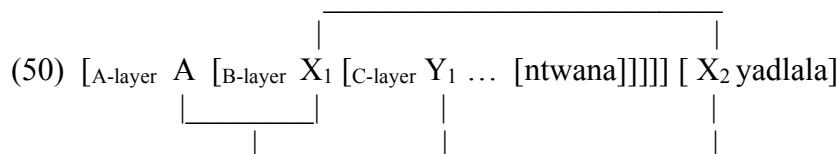
We find it extremely unlikely that this systematic correspondence is accidental. The more reasonable assumption is that the subject concord and the matching part of the corresponding nominal prefix look the same because they in fact lexicalize the same set of heads³³, i.e. they are the same formative.

Based on this assumption, we are entitled to conclude from the correspondance between a subject concord (sc) and a part the nominal prefix of the same class, that that part of the nominal prefix corresponds to an independent head (or set of heads) within the syntactic structure underlying the prefix. Furthermore, we can use the linear position of that part within the prefix to locate the relevant head(s) within the larger hierarchical structure.

Armed with these tools, we then conclude from examples like (47) (or the third line of the table in (48)) that the class 2 subject concord (sc2) picks up on a head (or a set of heads) located below A, as depicted in (49)(where the subscript on X is a diacritic identifying the noun class):

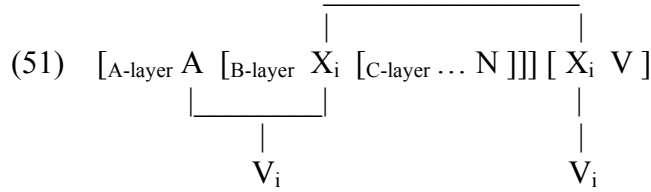


By contrast, the correspondence in example in (46) (recorded in the first line of (48)) might seem to suggest that the sc1 lexicalizes the augment, and this would be true also for classes 3, 4, 6 and 9, i.e. all the nasal classes except for class 10. But since the sc2 *ba-* (and likewise all the scs in classes 5, 7, 8, 10, 11, 14 and 15) cannot be related to the augment, this would lead to the a priori undesirable conclusion that subject agreement is controlled by different heads in different classes, and since we already saw in section 3.2.2. that the initial vowel should be taken to lexicalize heads in the B-layer in addition to the augment precisely in the nasal classes except for class 10, we instead conclude that the agreement relation in example (46) should be seen as in (50):

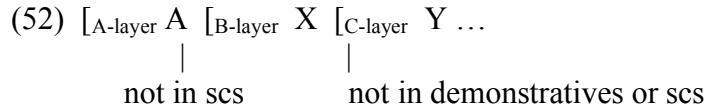


u *m* *u*

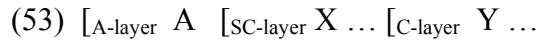
And similarly for all the nasal classes except for class 10:



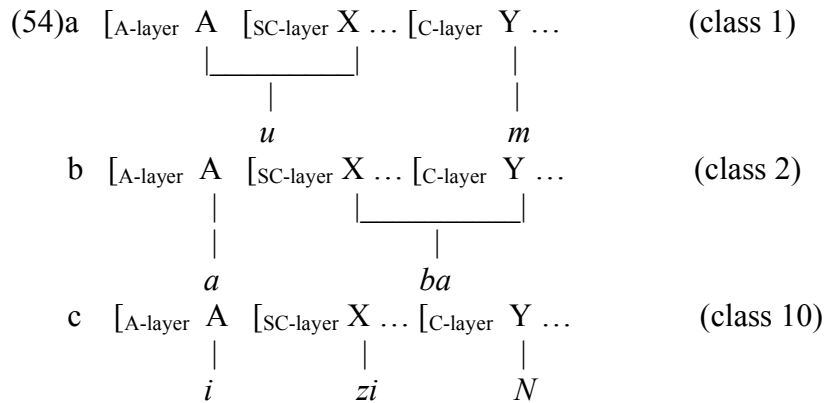
Since no sc includes the nasal part of the corresponding nominal prefix, we also conclude that the scs lexicalize the head (or set of heads) between the top of the B-layer and the top of the C-layer, i.e. the scs make a cut consistent with the analysis of demonstratives in 3.2.2.:



For this reason, we will henceforth refer to the B-layer as the SC-layer. Thus, what the process of decomposition has led to so far, is the following:



For illustration, (54) shows three examples of prefixes segmented according to the partial template in (53):



The lexicalization pattern in (54)a is representative of all the nasal classes except class 10, and the pattern in (54)b is the one followed by all non-nasal classes.

3.3. The OC-layer:

We have already established the structural break-down of nominal prefixes in (55):

(55) [A-layer A [SC-layer X ... [C-layer Y ...

In this section, we first find additional evidence in favor of this analysis, and we will also find support for an assumption smuggled into the representation in (54)b: In all the non-nasal classes, the formative following the initial vowel lexicalizes heads in the C-layer together with the heads in the SC-layer.

Finally, the data to be examined here will tell us that the C-layer too must be split into at least two distinct structural layers.

3.3.1. The relation between the nominal prefixes and the object concords:

The next two examples contain object concords (ocs), actually pronominal clitics that can be doubled by an object DP of the same class³⁴:

- (56)a ndi-ya-**ba**-bona
 1sg-Foc-oc2-see
 "I see them"
 b a-ndi-**ba**-boni a-**ba**-fundi
 not-1sg-oc2-see 2-student
 "I don't see the/some students."
 (57)a ndi-ya-**yi**-bona
 1sg-Foc-oc4-see
 "I see them."
 b a-ndi-**yi**-boni **i**-mi-thi
 not-1sg-oc4-see 1-tree
 "I don't see the/some trees."

In these examples, the shape of the oc matches a part of the nominal prefix of the same (the boldfaced parts of the examples). As in the case of the scs, this correspondence is perfectly general, as can be gleaned from inspection of the table in (58) (showing the Xhosa forms), where the boldfaced elements in the lefthand column are the subprefixes matched by the corresponding oc:

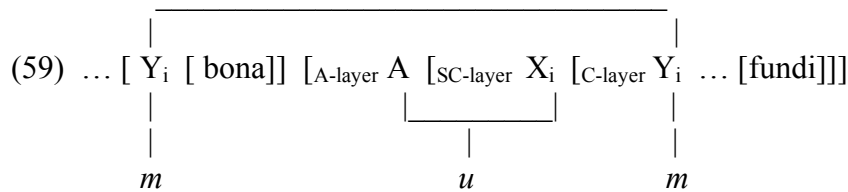
(58)	the class prefix	the oc
class 1	<i>u-</i> <i>m-</i>	<i>m-</i>
1a	<i>u-</i>	<i>m-</i>
2	<i>a-</i> <i>ba-</i>	<i>ba-</i>
2a	<i>oo-</i>	<i>ba-</i>
3	<i>u-</i> <i>m-</i>	<i>u-</i>
4	<i>i-</i> <i>mi-</i>	<i>i-</i>
5	<i>i-</i> <i>li-</i>	<i>li-</i>
6	<i>a-</i> <i>ma-</i>	<i>a-</i>
7	<i>i-</i> <i>si-</i>	<i>si-</i>
8	<i>i-</i> <i>zi-</i>	<i>zi-</i>
9	<i>i-</i> <i>N-</i>	<i>i-</i>
10	<i>i-</i> <i>zi-</i> <i>N-</i>	<i>zi-</i>
11	<i>u-</i> <i>lu-</i>	<i>lu-</i>

12 *u-bu-*
 13 *u-ku-*

bu-
ku-

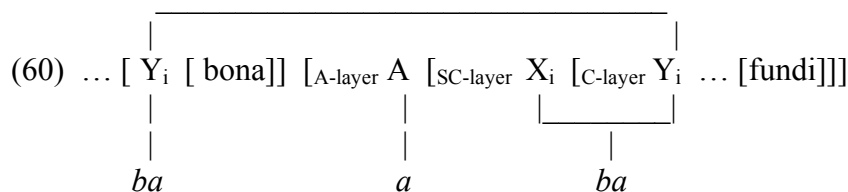
As explained at the beginning of 3.2.3., we will take this match-up as an indication that an oc is the same formative as the matching subpart of the corresponding nominal prefix. This again entails that the heads lexicalized by an oc are a subset of the heads lexicalized by the matching part of the nominal prefix, and we can look at the position of that part within the prefix to determine the location of those heads on the nominal spine, thereby identifying a layer in the structure underlying the nominal prefix.

Since almost all ocs are identical to the scs for the same class, it might at first appear as if the heads relevant to building ocs should coincide with the heads in the SC-layer. But in class 1, the sc and oc are in fact distinct, since sc1 is *u-*, while oc1 is *m-*. Since the analysis of the demonstratives tells us that the *-m-* of the full class 1 prefix *um-* cannot lexicalize heads above the C-layer, and that the heads in SC-layer are lexicalized (together with Aug) by *u-* in class 1, we are therefore driven to the following picture of oc1:



That is, the heads relevant to the formation of the oc1 must be in the C-layer, when they occur inside a nominal prefix. Since there is no independent reason to think that the ocs of the other classes are different in this respect, and since what is descriptively special about class 1 with respect to its oc (that it is distinct from the corresponding sc), will ultimately be accounted for by the lexicalization potential assigned to the formative *-m-*, we conclude that all ocs lexicalize heads found in the C-layer within the nominal prefix.

Going back to examples like (56) (or the third line in (58)), we now also see that the conjecture made in (54)b must in fact hold, since the existence of the oc2 *ba-* now shows that the C-layer in class 2 contains heads lexicalizable by *ba*:

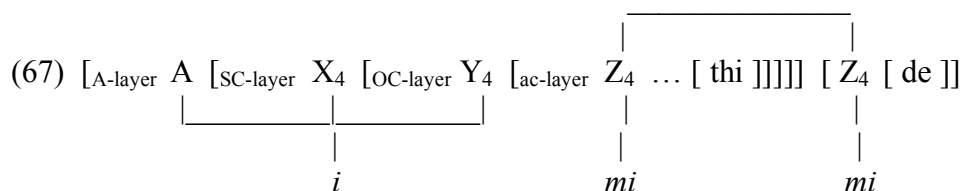


Again, we notice that the concords match a part of the corresponding nominal prefix, and again this is totally general. In (66), all the Xhosa acs are listed side by side with the corresponding nominal prefixes, and the boldfaced part of a prefix is the part that matches the ac of the same class:

(66)	the class prefix:	the ac:
class 1	<i>u-m-</i>	<i>m-</i>
1a	<i>u-</i>	<i>m-</i>
2	<i>a-ba-</i>	<i>ba-</i>
2a	<i>oo-</i>	<i>ba-</i>
3	<i>u-m-</i>	<i>m-</i>
4	<i>i-mi-</i>	<i>mi-</i>
5	<i>i-li-</i>	<i>li-</i>
6	<i>a-ma-</i>	<i>ma-</i>
7	<i>i-si-</i>	<i>si-</i>
8	<i>i-zi-</i>	<i>zi-</i>
9	<i>i-N-</i>	<i>i-N-</i>
10	<i>i-zi-N-</i>	<i>zi-N-</i>
11	<i>u-lu-</i>	<i>lu-</i>
14	<i>u-bu-</i>	<i>bu-</i>
15	<i>u-ku-</i>	<i>ku-</i>

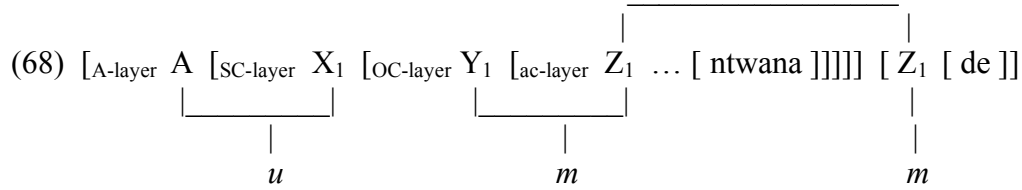
By the reasoning already followed in the analysis of the scs and the ocs and their relationship to the nominal prefixes, we take it that this correspondence identifies a set of heads within the structure underlying the nominal prefixes.

In all the non-nasal classes and also in class 1, the acs are identical to the ocs, and if this were the case throughout, we would conclude that the acs in fact lexicalize heads from the same layer as the ocs. But notice that all the nasal classes have acs corresponding to the nasal part of the corresponding nominal prefixes, or properly including it in the case of classes 9 and 10. Since the nasal subprefixes are not included in the ocs, we have already concluded they lexicalize heads living in an area below the heads that go into ocs, i.e. in the structural layer we labeled the AC-layer in (62), and we now know that the acs must be built from heads in that layer, as depicted in (67) (analyzing (65)):

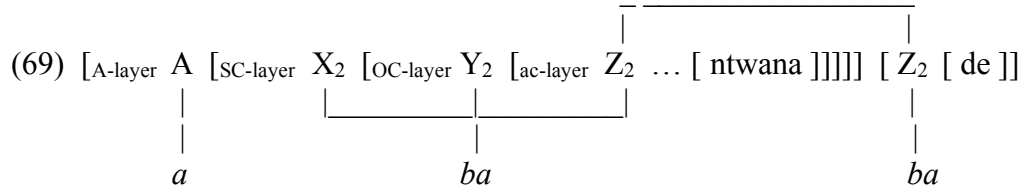


Thus, the correspondence between the shapes of the acs and parts of the nominal prefixes is seen to confirm the morphosyntactic reality of the AC-layer already postulated in 3.3.2.

As before, we assume that all concords of the same type lexicalize heads found within the same structural layer within the nominal prefix, concluding that even the acs that are identical to the ocs of the same class, actually lexicalize heads found in the AC-layer. Therefore, these acs must be formatives that lexicalize the heads in the AC-layer together with the heads in the OC-layer. There are two different instances of this. The *-m-* of class 1 lexicalizes all the heads from the top of the OC-layer down, but not the heads in the SC-layer ($sc1 = u \neq oc1 = m$). This is illustrated in (68), an analysis of the example in (64):

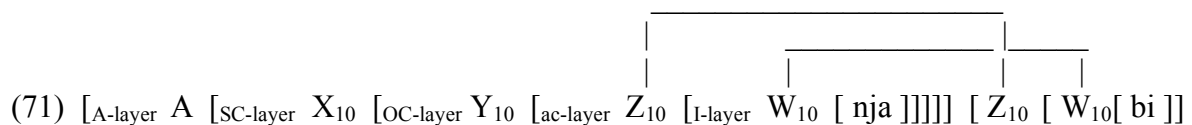


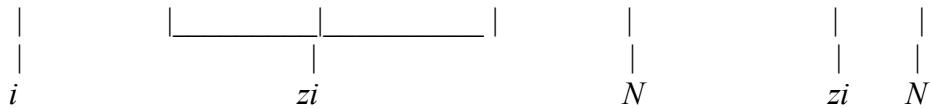
In the other cases where $ocX = acX$, we also have $scX = oc X$ (the classes 2, 5, 7, 8, 11, 12, 13). In these cases, a single formative lexicalizes all the heads starting from the top of the SC-layer. We illustrate this for class 2 in (69), corresponding to example (63):



Classes 9 and 10 represent a special case, however. The acs associated with these classes seem to contain two parts: $ac9 = i-N-$ and $ac10 = zi-N-$.³⁶ The first part corresponds to the oc ($sc9 = oc9 = i$, $sc10 = oc10 = zi$), but the *-N-* is not included in the oc. This forces us to split up the AC-layer into two parts, as shown in (71), depicting the agreement relation and the lexicalization pattern in the example (70):³⁷

(70) Izinja zimbi
10-dog ac10-bad
“The dogs are bad.”





In class 9 too, *-N-* lexicalizes W, while *i* lexicalizes all the higher heads.

What we have labeled the I-layer, containing W, can in fact also be shown to have a morphosyntactic life of its own, independently of the considerations brought to bear here. In the next subsection, we look at the relevant data.

3.4.2. Enumerative adjectives:

The inventory of Nguni adjectives contains a small subset with special properties. The members of this class are known as the enumerative adjectives, and (72) provides a list of three of them in Swati:³⁸

(72) *-nye* “one”, *-phi* “which”, *-ni* “what kind of”

All of these seem to involve the notion of individuation, of individual members of a category of things in the first two cases, and of a subcategory with *-ni*.³⁹

Like plain adjectives, these occur as predicates with a concord prefix.⁴⁰ These look exactly like the acs already given except that they include no *-N-* in classes 9-10:⁴¹

(73)a class 9 *yiphi*
 b class 10 *tiphi*

This means that the special set of acs combining with enumerative adjectives are built exclusively from the heads occurring in the AC-layer above the I-layer. That is, the I-layer too plays a role in morphosyntactic processes.

3.4.3. Splitting the I-layer:

Returning now to the cases where the initial vowel does not appear, we find a reason to split the I-layer too into two parts. In 3.1., we interpreted the disappearance of the initial vowel as a reflex of A not being added to the N-projection in certain syntactically defined contexts. But on the backdrop of the results obtained in the intervening sections, it becomes clear that in these contexts, a number of other heads must be absent as well. Consider, for example the class 9 vocative in (74):

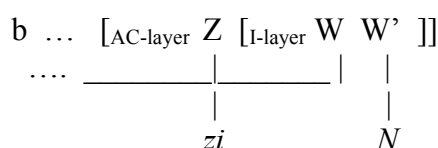
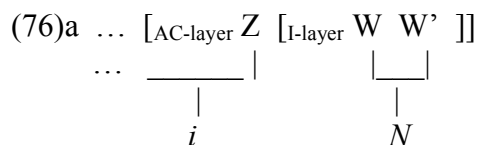
(74) Hamba, (*i)nja!
 go dog

Since we have seen that the *i* of class 9 lexicalizes all the heads down to the I-layer, it now follows that dropping the initial vowel must actually correspond to trimming the structure down to the I-layer (both in vocatives and under negation).⁴²

But in class 10, the forms without the initial vowel still include *zi-*:

(75) Hambani, zinja !
 go-2pl 10-dogs

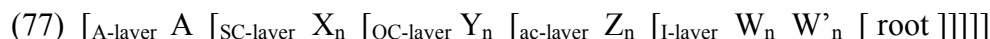
This means that in addition to containing a lower head hosting $-N-$, the I-layer must contain a second, higher head lexicalizable by $zi-$. This is illustrated in (76), showing the full decomposition of the AC-layer with lexicalizations in classes 9 and 10:



In all classes other than 9 and 10, both heads in the I-layer will be lexicalized by the same formative that lexicalizes the higher heads in the AC-layer. Splitting the I-layer is the final step in the decomposition of the structure underlying the noun class prefixes in Nguni.

3.5. Summary and preview:

We have seen that an analysis of the Nguni nominal prefixes and their relation to demonstratives and, in particular, the different concords based on quite uncontroversial general assumptions leads to positing the template in (77) for the structure underlying the nominal prefixes:



We have also seen that a single formative must in general lexicalize more than a single morphosyntactic head. This is because prefixes always contain more heads than formatives, and the discussion has provided numerous examples of how formatives actually map onto non-trivial stretches of heads. This result is obviously in perfect harmony with the view that lexicalization in general targets phrases rather than terminals.

On the other hand, the relationship between nominal prefixes and concords also shows that a given formative can also lexicalize just a proper subset of the full set of heads it is allowed to span. This is in fact true of all the Nguni concords, and bears out the prediction made by the Superset Principle.

Thus, we have provided a plausible case in favor of the clean nanosyntactic view of lexicalization. In section 5, we will strengthen our case by showing that alternative theories of lexicalization cannot do equally well. But first we will discuss the proper way of identifying the different classes, eventually concluding that this is best achieved in terms of the values of a set of contentful binary features rather than in terms of the class features used so far.

4. Distinguishing the classes with binary features:

We first consider some of the consequences of suppressing the class feature diacritics in favor of distinguishing the different noun classes merely in terms of the \pm values of contentful

features inherent to a fixed set of heads merged on top of the root. Then, we will show that this way of differentiating the classes has certain important advantages over using class features.

4.1. An implementation:

Differentiating the Nguni noun classes in terms of binary features will require having a sufficient number of features within the lowest structural layer where the classes are differentiated. We will begin by discussing the consequence of this for our structural representations on the assumption that features are associated with heads one-to-one. Then, we show what the formatives must look like, and finally we discuss a consequence regarding the analysis of concords.

4.1.1. Reorganizing the structural layers:

We will now be assuming that the structures underlying nominal prefixes are built from a fixed sequence of heads each of which corresponds to a single binary feature. The different classes will be told apart merely in terms of the different +/- strings generated by this sequence of heads. Correspondingly, the lexicalization potential of a formative will be characterized in terms of both the size of the substructure in its lexical entry and the distribution of + and – over the heads in that substructure, e.g. the entry for *ba* might now be something like (78):

$$(78) \text{ } ba \leftrightarrow [\text{SC-layer } +X [\text{OC-layer } +Y [\text{ac-layer } -Z [\text{I-layer } +W \text{ } -W']]]]$$

Distinguishing the 13 non-locative classes of Nguni now requires a minimum of 4 heads.⁴³ One of these must be +/- Pl(ural), and we will assume that paired classes, e.g. 3 and 4, have the same value for all features except +/-Pl.

Since we already have been able to individuate 5 distinct heads, the challenge is rather to eliminate generation of unused class distinctions, which can be achieved either by appealing to cooccurrence restrictions on +/-values in certain configurations or to limited lexicalization resources. For example, the fact that nouns in class 11 must form plurals in class 10, may be interpreted as evidence that a cooccurrence restriction prevents the feature values characterizing class 11 from cooccurring with +Pl, so that pluralization comes to entail a change in some of those other feature values too, as reflected in the appearance of the class 9/10 –N- along with the +Pl-marking –zi-.

Since 12 classes remain distinct, when the initial vowel drops, and since we have seen that dropping the initial vowel corresponds to stripping the structure down to the I-layer, we now also conclude that 4 of our heads must actually be in the I-layer, rather than just the 3 assumed so far. So, we are led to revise the structural template for prefixes:

$$(79) [\text{A-layer } A [\text{SC-layer } X [\text{OC-layer } R [\text{AC-layer } Q [\text{I-layer } Y \text{ } Z \text{ } W \text{ } W']]]]]]$$

This brings the minimum number of heads required up to 7, since we still need a head for the ocs (R in (79)) and also a head (Q in (79)) to hold the residue of the AC-layer when the I-layer is left out under formation of the acs with enumerative acs.

However, R introduces just a single differentiation (oc1 = –m- vs oc3 = –u- while ac1 = ac3 = –m-), and we may assume that its value is set by cooccurrence restrictions to + for classes 1 and 2, and to – for the other classes (or the other way round).

Since all the 13 non-locative classes are already differentiated within the OC-layer, we shall want to say that X (and A) must have the same value for all the classes, e.g. +, although we don't understand why this should hold.

4.1.2. The formatives:

Assuming a fixed value for X, e.g. +X, is consistent with X lexicalizing differently in different classes, e.g. as *-ba-* in class 2, but as *-bu-* in class 14, since the relevant formatives will be differentiated "at the bottom", as, for example, in (88):

$$(88)a \quad ba \leftrightarrow [_{SC-layer} +X [_{OC-layer} +R [_{AC-layer} -Q [_{I-layer} +Y -Z +W -W']]]]$$

$$b \quad bu \leftrightarrow [_{SC-layer} +X [_{OC-layer} -R [_{AC-layer} -Q [_{I-layer} -Y -Z -W -W']]]]$$

Suppose the structure to be lexicalized is as in (89):

$$(89) [_{SC-layer} +X [_{OC-layer} +R [_{AC-layer} -Q [_{I-layer} +Y -Z +W -W']]]]$$

The lexical entries in conjunction with the Superset Principle would allow for two possibilities: *-ba-* lexicalizes the whole structure, or *-ba-* lexicalizes everything in the OC-layer, but *-bu-* lexicalizes +X. However, only the first option is consistent with the Elsewhere Principle.

Things become trickier, however, when we consider classes where the formative following the initial vowel does not lexicalize +X, i.e. all the nasal classes except class 10. Consider, for example, the final step in the lexicalization of the structures in (90), where class 4 *-mi-* has lexicalized the AC-layer in a, class 6 *-ma-* has lexicalized the AC-layer in b, and not only X, but also R, has the same value in both cases (+X and -R), in keeping with our earlier suggestion regarding R:

$$(90)a \quad [_{SC-layer} +X [_{OC-layer} -R [_{AC-layer} -Q [_{I-layer} +Y +Z +W -W']]]]$$

mi

$$b \quad [_{SC-layer} +X [_{OC-layer} -R [_{AC-layer} -Q [_{I-layer} -Y +Z +W -W']]]]$$

ma

+X and -R should now be lexicalized (along with A) by the initial vowel *i-* in (90)a, but by *a-* in (90)b. Yet, there is no information available to distinguish the two cases when +X and -R are lexicalized, since neither *i-* nor *a-* lexicalizes into the AC-layer where class 4 is differentiated from class 6.

The only possible response to this is to say that *i-* and *a-* are in fact surface manifestations of a single formative V, an underspecified vowel copying its segmental values from the vowel in the following part of the nominal prefix, i.e. *-i-* in class 4 and *-a-* in class 6.

We will generalize this treatment to all initial vowels, noting that in almost all the classes the initial vowel is a copy of the vowel of the following syllable. The problematic cases are classes 2 and 3, where the prefix following the initial vowel is just *-m-* in Xhosa (but in fact

–*mu*- with monosyllabic roots in Swati and Zulu), and class 9, where no vowel ever follows the –*N*-. We propose handling classes 2 and 3 by taking them to always have underlying –*mu*-, even in Xhosa, and deal with class 9 by taking [i] as the default value for the underspecified V.

With these assumptions in place, we could characterize the inventory of formatives as in (91):

- (91) a *-ba-*, *-li-*, *-si-*, *-zi-*, *-lu-*, *-bu-*, *-ku-* \leftrightarrow [SC-layer +X [OC-layer R [AC-layer Q [I-layer Y Z W W']]]] for different values of R, Q, Y, Z, W and W'
 b *-mu-* \leftrightarrow [+R [Q [Y Z W W']]] for values of Q, Y, Z, W and W' common to classes 1 and 3 and assuming +R for class 1 vs –R for class 3
 c *-mi-*, *-ma-* \leftrightarrow [AC-layer Q [I-layer Y Z W W']] for different values of Q, Y, Z, W and W'
 d *-N-* \leftrightarrow [I-layer Y Z -W W'] with the value of W' common to classes 9 and 10, and assuming +W (= +Pl) for class 10
 e *V-* \leftrightarrow [A-layer A [SC-layer +X [OC-layer -R [AC-layer +Q]]]]

A key feature of the emerging system is that the formatives must access the features in the lower layers of the structure, where the classes are differentiated. We now turn to the repercussions of this for the concords.

4.1.3. The concords:

While a list of formatives conforming to (91) will be able to lexicalize correctly the structures underlying the nominal prefixes, with no recourse to class features, it is also clear that we are now forced to a special commitment to make the concords come out as desired.

So far, we have portrayed the scs, for example, as formatives lexicalizing heads in the SC-layer above the OC-layer i.e. just X. If this were the right picture, obtaining 10 distinct scs would still be easy enough, if classes are distinguished in terms of class features, although at a certain cost to which we will return below. But if classes are distinguished merely by binary features, as we now propose, it becomes downright impossible: If scs lexicalize just X associated with a single binary feature, there should only be 2 distinct scs, or even just one, if we are right that X should always have the same value.

The only way out of this dilemma is to deny that a sc lexicalizes only the single head in the SC-layer above the OC-layer. Instead, we need to make the information only available in lower structural layers available to scs by saying that a sc lexicalizes a substructure containing all the heads in the SC-layer, including the ones in the OC-layer, the AC-layer and the I-layer. That is, the structure underlying a sc will be as in (92):⁴⁴

- (92) [SC-layer +X [OC-layer R [AC-layer Q [I-layer Y Z W W']]]]

By the same reasoning, an oc must lexicalize a structure like (93):

- (93) [OC-layer R [AC-layer Q [I-layer Y Z W W']]]

More precisely, we shall assume that the shape of a sc reflects lexicalizing the whole structure in (92), and even applying certain phonological processes, to determine the value of an underspecified V lexicalizing +X (and R, except in class 1), followed by erasure of the substructure below +X, and similarly for the ocs, *mutatis mutandis*.

This may seem unorthodox enough as to warrant endorsement of the class feature approach, but we think that our proposal actually has certain advantages that should lead one to view its unorthodox nature with a certain measure of indulgence.

We have seen that the Nguni languages allows a single formative to be a sc, an oc and an ac (classes 2, 5, 7, 8, 11, 14, 15), an oc and an ac (class 1) or a sc and an oc (classes 3, 4, 6). But we have found no formative which occurs as a sc and an ac, but not as an oc. In fact, we haven't found such a formative in any Bantu language, which suggests that the gap is not accidental. Yet, the theoretical framework we adhere to, would allow the gap to be filled, if the structure of concords were as in (94) (where we return to class features for the sake of consistency):

- (94)a [SC-layer X_n]
 b [OC-layer Y_n]
 c [AC-layer Z_n [I-layer $W_n W'_n$]]

Suppose we have the lexical entries in (95):

- (95)a $A \leftrightarrow$ [SC-layer X_n [OC-layer Y_n [AC-layer Z_n [I-layer $W_n W'_n$]]]]
 b $B \leftrightarrow$ [OC-layer Y_n]

When the full structure [SC-layer X_n [OC-layer Y_n [AC-layer Z_n [I-layer $W_n W'_n$]]] is lexicalized as part of a nominal prefix, “Minimize formatives” guarantees that the whole thing will be lexicalized as A, leaving no room for B. But the “best fit” principle will make B emerge under the lexicalization of (95)b, while A will lexicalize both (95) a and b. Thus, the sc, the oc and the ac will form the ABA pattern not found in our data.

But if the structures of concords conform to (92) and (93), with silent lower layers, the ABA pattern cannot arise. Without reshuffling heads as required when classes are distinguished by the values of binary features, we illustrate the general point by positing structures as in (96) for the concords:

- (96)a [SC-layer X_n [OC-layer Y_n [AC-layer Z_n [I-layer $W_n W'_n$]]]]
 b [OC-layer Y_n [AC-layer Z_n [I-layer $W_n W'_n$]]]
 c [AC-layer Z_n [I-layer $W_n W'_n$]]

Provided, crucially, that the entire structure is lexicalized in each case, the Elsewhere Principle now blocks lexicalization of the oc by B, and all three concords lexicalize as A. For B to ever emerge as an oc, its entry would have to be as in (97) rather than as in (95)b, but then the Best Fit Principle would force lexicalization of both (96)b and c by B, yielding the documented ABB pattern:

- (97) $B \leftrightarrow$ [OC-layer Y_n [AC-layer Z_n [I-layer $W_n W'_n$]]]

Thus the inexistence of the ABA pattern for concords provides independent evidence for the analysis of concords we need, if the noun classes are to be differentiated by the values of binary contentful features.

The following subsections contain an assortment of different arguments in favor of using the values of contentful binary features rather than class features to differentiate the Nguni noun classes. It will be assumed throughout that contentful features will have the same values across the classes in a system using class features, to avoid (partial) redundancy. In keeping with the “no bundling” desideratum discussed in 1.1.1., we also assume that there is exactly one contentful feature per head.

4.2.1. The initial vowels:

But if this possibility is exploited, the different vocalic *s*cs *u-*, *i-* and *a-* must be treated as different formatives keyed to different class features rather than as phonologically conditioned allomorphs of the same formative. Since the same formatives also occur as the initial vowels of class prefixes, the grammar will therefore fail to express the descriptively valid generalization that the initial vowel is always a copy of the vowel in the second part of the class prefix.

An analysis using class features could presumably endorse our view of the concords as phrases with “silent” subparts, and thereby eliminate the instances of homonymy just discussed by confining the class features to the silent subparts. However, it would then lose the major potential advantage of using class features, and some recalcitrant cases of homonymy would still remain.

Thus, consider the fact that *-zi-* occurs as a formative inside the nominal prefix both in class 8 and class 10, lexicalizing the heads from +X down to and including +W (and also -W' in class 8). This partial syncretism can be accommodated without the postulation of two homonymous formatives *-zi-* on an analysis relying on binary features. It will be sufficient to assume that classes 8 and 10 are characterized by the same feature values in the stretch of heads beginning with X and ending with W, perhaps as in (98):

(98)a [A-layer A [SC-layer +X [OC-layer -R [AC-layer +Q [I-layer -Y -Z +W -W']]]]] (class 8)

- $\begin{array}{c} | \\ V \end{array}$
 $\begin{array}{c} | \\ zi \end{array}$
- b [A-layer A [SC-layer +X [OC-layer -R [AC-layer +Q [I-layer -Y -Z +W +W']]]] (class 10)
- $\begin{array}{c} | \\ V \end{array}$
 $\begin{array}{c} | \\ zi \end{array}$
 $\begin{array}{c} | \\ N \end{array}$
- c $zi \leftrightarrow$ [SC-layer +X [OC-layer -R [AC-layer +Q [I-layer -Y -Z +W -W']]]
- d $-N- \leftrightarrow$ [I-layer Y Z -W W'] with the value of W' common to classes 9 and 10, and assuming +W (= +Pl) for class 10
- e $V- \leftrightarrow$ [A-layer A [SC-layer +X [OC-layer -R]]]

If, on the other hand, noun classes are differentiated by distinct class features spreading over arrays of otherwise identical heads, *-mu-* would lexicalize heads with the diacritic 1 in class 1 and heads marked 3 in class 3, i.e. there would have to be two homophonous formatives, unless some formatives are allowed to be underpsecified with respect to class features, which would, however, increase the system's descriptive power in an a priori undesirable way. On the face of it, the same point is made by the partial syncretism between class 1 and class 3, in both of which *-mu-* lexicalizes the entire AC-layer (in addition to R in class 1):

- (99)a [A-layer A [SC-layer +X [OC-layer +R [AC-layer +Q [I-layer +Y -Z -W -W']]]] (class 1)
- $\begin{array}{c} | \\ V \end{array}$
 $\begin{array}{c} | \\ mu \end{array}$
- b [A-layer A [SC-layer +X [OC-layer -R [AC-layer +Q [I-layer +Y -Z -W -W']]]] (class 3)
- $\begin{array}{c} | \\ V \end{array}$
 $\begin{array}{c} | \\ mu \end{array}$
- c $-mu- \leftrightarrow$ [OC-layer +R [AC-layer +Q [I-layer +Y -Z -W -W']]]
- d $V- \leftrightarrow$ [A-layer A [SC-layer +X [OC-layer -R]]]

The different, but overlapping, lexicalization patterns followed by *-mu-* in (99)a-b would be determined by the lexical specifications in (99)c-d.

However, treating the distribution of *-mu-* as evidence of a partial syncretism between classes 1 and 3 actually has an unfortunate consequence.

The account in (99) assumes that classes 1 and 3 share feature values up to the OC-layer.

Earlier, we have also suggested that paired sg/pl classes are only distinguished by the value of the +/- Pl head (say, W), which must also occur in the I-layer, since sg/pl pairs remain distinct when the initial vowel is absent. Hence, class 1 should differ from class 2 only with respect to the value of W. But by the same token, class 3 should also differ from class 4 by the value of W, and since classes 1 and 3 are identical in the AC-layer, we then expect that

classes 2 and 4 should also be indistinguishable within the AC-layer. However, $ac2 = ba- \neq ac4 = mi-$. So, we have a paradox

To eliminate the paradox, we could deny either that classes 3 and 4 only differ by $\pm W$, or that classes 1 and 2 are only differentiated in terms of $\pm W$. Since some nouns in class 1 actually form plurals in class 6, e.g. singular *umXhosa* “Xhosa” (class 1)/ plural *amaXhosa* “Xhosas” (class 6), and since the Xhosa interrogative *bani* “who” (not restricted to pluralities) suggests that $-ba-$ may not even be $\pm Pl$, we might choose the latter option. But this doesn’t by itself suffice to prevent class 1 nouns from forming plurals in class 4.

A better way of resolving the paradox might emerge from a suggestion by M. Starke (p.c.): The fact that the formatives $-mi-$ and $-ma-$ of the nasal classes 4 and 6 are both confined to the AC-layer, as seen in (91)c, may be captured by taking their shared initial $-m-$ as a separate formative.. Then, $-a-$ and $-i-$ would be independent formatives too, whose lexicalization domains would be “upward bounded” by $-m-$. We now note that if viable, this analysis should be extended to class 3 $-mu-$, which shares the distribution of $-mi-$ and $-ma-$, but not to the class 1 $-mu-$ whose lexicalization domain extends to the OC-layer. Thus, we might actually have a formative $-mu-$ specified as lexicalizing only heads with the feature values defining class 1, while the class 3 $-mu-$ is really bimorphemic. Consequently, we can deny that classes 1 and 3 have the same feature values up to the OC-layer without positing homonyms.⁴⁵ But then, the overlapping patterns of class 1 $-mu-$ and class 3 $-mu-$ no longer provide an argument against using class features.

4.2.3. Singular/plural pairs:

We have seen that with the few exceptions noted, all the nouns in a given singular class form plurals in the same plural class. Within the system based on binary features, we can capture this by saying that a singular class and the plural class it is paired with, are identified by the same feature values except for $\pm Pl$. But if noun classes are identified by class features, it becomes more difficult to give formal expression to the generalization.

Since singular vs plural reference should presumably be determined by the value of a contentful feature, i.e. $\pm Pl$, we should say that two paired classes are associated with the same class feature, but differentiated by $\pm Pl$. (and the motivation for class features starts eroding). The $\pm Pl$ feature must be located in the lower reaches of the structure underlying nominal prefixes since sg/pl pairs are already differentiated within the I-layer. Consider now the consequences of this, if the structure of a sc only contains X, the head in the SC-layer:

(100) [SC-layer X_n]

We have previously assumed that a system using class features could easily deal with this, provided class features percolate to the SC-layer. But now we see that this is not actually so. For if two classes forming a sg/pl pair share the same class feature n , the corresponding singular and plural scs would both be candidates for lexicalizing X_n in (100). Maintaining the structure for scs in (100) (excluding the lower structural layers), an account using percolating class features must also assume that X carries the feature $\pm Pl$ in (100), and that the formatives lexicalizing scs are keyed to this. But since these formatives also lexicalize X when it occurs inside the structure of a nominal prefix, and can do that only if X carries all the features a formative is keyed to, this will entail that $\pm Pl$ percolates to the SC-layer, just like the class feature. In other words, the system will allow percolation of contentful features in addition to percolation of class features.

To the extent that this leads to an undesirable increase in descriptive power, making a piece of syntactic/semantic information accessible beyond its local domain, we conclude that even a system using class features must abandon the structure in (100) for concords, once it tries to account for the pairing of singular and plural classes.

4.2.4. Meaning:

A clear difference emerges between using class features and using binary features when it comes to the question whether different noun classes are associated with meaning, as a number of examples would suggest they are. Consider, for example, the contrast in (101):

- | | | | |
|--------|--------------|---|---------------|
| (101)a | <i>umthi</i> | b | <i>uluthi</i> |
| | 3-wood | | 11-wood |
| | “a/the tree” | | “a/the stick” |

The same root (*thi*) occurs in (101)a and b. So, the meaning difference must somehow be related to the difference in class membership reflected in the prefixes.

There is a natural way of capturing this, if noun classes are characterized in terms of a set of binary contentful features with different values across the classes. We can then say that the meaning shift correlating with the shift in class membership derives from the way a meaning component is constructed incrementally from those features.

If we choose a system individuating classes by class features, however, this solution becomes unavailable. In such a system, the heads making up the structure of nominal prefixes, should have invariant feature values across the classes. Otherwise, class features would be redundant. But since class features are just diacritics encoding membership in a distributional class, we will then have no real understanding of what we see in (101). Instead, one would have to say that there are two homophonous roots *thi* corresponding to the two meanings in (101), one of which is classified as class 3, while the other is class 11. Whether or not this is an acceptable result, ultimately depends on one’s theory of root meanings. If we are to have one root *thi* meaning “tree” and another one meaning “stick”, root meanings must be fairly rich. They will also have to some internal structure, if we want to express a relation between the two *thi*’s by listing them as having a shared meaning component in addition to different components which the classificatory system can access. By way of contrast, an account identifying noun classes in terms of contentful binary features is consistent with a lean constructionist view of root meanings.

The impact of (101) depends in part on how pervasive such class/meaning correlations really are. If what (101) exemplifies is the exception rather than the rule, a treatment accepting homonymy might in fact be appropriate (with the consequence noted).

There is a link between this and the issue of selection. Many roots only appear in a single noun class. To capture this, an account relying on class features could associate a list of roots with every class feature, and say that the lowest functional head selects for the roots in the list associated with the class feature it has. Alternatively, one could say that class features percolate up from the roots, but can be transferred to concords under agreement.

When noun classes are defined in terms of the values of binary features distributed over heads one-to-one, other solutions must be found, since the lowest functional, which would be the selector, has only two feature values, and since we obviously don’t want the feature values of the functional heads to percolate up from the root either. Instead, one would like to be able to say that any root can in principle be in any class, except that for some roots, only one

combination of feature values allows the functional heads to create a meaning component easily compatible with the root meaning. Whether or not this is actually doable, will be discussed in the next subsection along with an alternative approach equally compatible with using binary features to characterize noun classes.

4.2.5. Typological issues:

We have seen that Nguni derives expressions meaning “tree” and “stick” by adding a number of different heads on top of the root we glossed as *wood*, and we have suggested that this may be taken as evidence that the heads added must be contentful, introducing different meaning components as determined by their feature values. These meaning components will then restrict the meaning of the root, giving things translatable as “tree” or “stick”.

This view would follow from Borer’s (2005) general claim that the meaning of roots is always a rather vague, amorphous thing, a “blob” shaped in different ways by classifier-like heads added to the root. But taking this constructionist position on noun meanings raises two important questions, one internal to Nguni and one regarding the relation between Nguni and languages like English.

As already mentioned, there seem to be many Nguni roots that only occur in a single sg/pl pair, whereas a strict constructionist approach would seem to predict that any root should be able to occur in any class, provided the root’s meaning can be coerced into composing with the meaning components determined by the feature values of the heads on top of it. As far as we know, this prediction might actually hold. Verifying it would require experiments with native speakers which, to the best of our knowledge, have not yet been carried out. If, however, it doesn’t hold to any significant degree, we will be forced to say that a fair number of roots are only listed together with functional heads with a certain fixed array of feature values.⁴⁶ In the absence of the decisive empirical data, we leave this issue aside, and turn instead to the cross-linguistic question.

If roots have blob-like meanings that give rise to meanings like “tree” or “stick” only in combination with a number of functional heads with the right feature values, how come English *tree* and *stick* come to mean what they do? One answer to this would be that root meanings are more richly structured than in Nguni. But this would look like an undesirable weakening of the constructionist hypothesis, and certain Nguni facts suggest a more interesting answer.

Proper names and kinship terms are usually classified as belonging to class 1a in Nguni. Although they are associated with the usual class 1 concords, they differ from common nouns in class 1 with respect to the shape of the nominal prefix. Some kinship terms, like *uyise* “his/her father” in Swati, have the initial vowel, but lack the *-m-* part of the full class 1 prefix. Other kinship terms as well as the proper names have no prefix whatsoever. Within the general approach followed here, it seems natural to account for this by saying that the class 1a nouns are associated with the full set of heads that visibly appear on top of common nouns, except that the roots themselves lexicalize a part of or all of those heads. A root like *yise* will then be specified as in (102)a, while a proper name like *Somdlovu* would be specified as in (102)b, assuming the feature values to be the ones characteristic of class 1:⁴⁷

- (102)a *yise* \leftrightarrow [OC-layer +R [AC-layer +Q [I-layer +Y -Z -W -W’]]
 b *Somdlovu* \leftrightarrow [A-layer A [SC-layer +X [OC-layer +R [AC-layer +Q [I-layer +Y -Z -W -W’]]]]

In particular, this allows one to maintain that the concords always copy morphosyntactic heads present on top of the root.

Once we allow for the possibility that parts of the nominal functional structure may be lexicalized by the root, the possibility arises that English *tree* and *stick* actually come with the same array of contentful heads as in Nguni, but we don't see them, because all English nouns are like *Somdlovu*, i.e. the root itself lexicalizes all the additional heads. So, an English noun like *tree*, for example, would correspond to the lexical entry in (103)a, while *stick* might be as in (103)b, assuming the heads established for Nguni:⁴⁸

- (103)a *tree* \leftrightarrow [SC-layer +X [OC-layer -R [AC-layer +Q [I-layer +Y -Z -W -W']]]
 b *stick* \leftrightarrow [SC-layer +X [OC-layer -R [AC-layer +Q [I-layer +Y -Z -W -W']]]

The fact that English agreement fails to reveal the presence of these heads (contrary to agreement in Nguni) would then be an independent fact about English agreement.⁴⁹ In this respect, English would simply be like languages with noun class membership marked on the noun, but no agreement marking reflecting non class membership; cf. 2.2.1.

Conversely, the Norwegian nouns *tre* and *stokk*, like their English counterparts, come without any piece of morphology revealing their class-membership, but do in fact give rise to different agreement inflections on modifiers and predicative adjectives, with the consequence that *tre* is classified as neuter gender and *stokk* as common gender. We would now claim that the relevant agreement processes pick up on one of the functional heads "covered" by the root. If so, Norwegian is akin to those languages where classifiers determine the interpretation of nouns, but actually only show up overtly marking agreement on verbs. Notice that gender agreement in languages like Norwegian provides an argument for concealed functional heads which is independent of the constructionist approach to root meanings. It is possible to claim that roots have more structured meanings than the constructionist approach would allow, while still maintaining that roots have no features relevant to syntax (as in Marantz (1997) and elsewhere in the DM literature). To the extent that gender agreement is a syntactic process, this would seem to entail that gender features do not come from the root itself.

Now, consider languages in which gender is marked on the noun itself in addition to being reflected under agreement, as in the Italian examples in (104):

- | | |
|----------------------|----------------|
| (104)a <i>albero</i> | b <i>canna</i> |
| tree-m.sg | stick-f.sg |
| c <i>alberi</i> | d <i>canne</i> |
| tree-m.pl | stick-f.pl |

Italian is standardly analyzed as having two genders (masculine and feminine), lexicalized together with number by portmanteau formatives in (104). But accepting the constructionist view of root meanings will force the assumption that the structures underlying the nouns in (104) contain more heads than the two lexicalized by *-o*, *-a*, *-i* and *-e*., and we may now accommodate this by saying that these nouns actually have the full structure assumed for their Nguni counterparts and the roots lexicalize all the heads except two, one of which must be +/- Pl. More generally, we can say that any two-gender system similar to (104) arises from having the roots lexicalize all heads except +/-Pl and one additional head with a single binary feature.⁵⁰

The general analysis suggested for (104) can also accommodate nouns like those in (105), in which gender is not marked on the noun, but shows up under agreement⁵¹:

- | | | | |
|--------|-------------|---|--------------|
| (105)a | <i>cane</i> | b | <i>noce</i> |
| | dog-m.sg | | nut-f.sg |
| c | <i>cani</i> | d | <i>nocci</i> |
| | dog-m.pl | | nut-f.pl |

We would achieve this by saying that the roots in (105) lexicalize all heads except +Pl, and posit $o \leftrightarrow [_{\text{PIP}} -\text{Pl} [_{\text{HP}} -\text{H}]]$, $a \leftrightarrow [_{\text{PIP}} -\text{Pl} [_{\text{HP}} +\text{H}]]$, $i \leftrightarrow [_{\text{PIP}} +\text{Pl} [_{\text{HP}} -\text{H}]]$, $e \leftrightarrow [_{\text{PIP}} +\text{Pl} [_{\text{HP}} +\text{H}]]$.⁵² Since the structure nevertheless contains +/-H even in (105), we correctly expect to see a feminine/masculine contrast (determined by +/-H) emerging under agreement.⁵³

The general claim made by this analysis is that the number of noun classes or genders reflected in nominal morphology should bear a fixed relation to the number of heads not lexicalized by the root. For Nguni, we found distributional evidence for 6 distinct heads on top of the root, easily accommodating 13 distinct noun class under an analysis based on binary features distributed one-to-one over the heads. For Italian, there is no evidence for more than 2 heads in addition to the root, and that will give a maximum of 2 gender/number combinations.

This correlation cannot be captured if we abandon an analysis of the Nguni noun classes based on binary features in favor of class features, since the number of noun classes would stand in an arbitrary relation to the number of heads in an analysis relying on class features. For example, there would be no principled reason why a language with only 2 heads, +/-Pl and H, on top of the root, as in Italian, couldn't have 12 different noun classes/genders reflected in the lexicalization of those two heads, corresponding to 6 different class features assignable to H.

Conversely, the analysis based on binary features also predicts that a language in which we identify 6 different heads on top the root, cannot have just two genders (modulo assumptions about the cooccurrence restrictions on feature values). An account based on class features makes no such prediction, since there would be no principled reason for the grammar to have more than a two distinct class features to index those 6 heads with.

At present, we still don't know whether this prediction is borne out, since verification requires detailed analysis of a number of languages. But the fact that the analysis in terms of binary features makes a strong empirical claim which as yet is not falsified, makes it preferable to the analysis based on class features, from which no such prediction emerges.

4.3. Summary and preview:

We have tried to evaluate the merits of an analysis that would identify the Nguni noun classes with different arrays of feature values on the heads on top of the root. In particular, we have argued that on balance, this approach holds more promise than an account relying on class features, and that the advantage the latter might have for the analysis of the concords, is in fact lost when the full range of relevant considerations is brought to bear. In the next section, this conclusion will be used as one of several arguments against adopting a DM-compatible analysis of the Nguni nominal prefixes and concords.

5. Nanosyntax vs Distributed Morphology:

We will begin by considering what an analysis adhering to the tenets of DM would have to say to account for the fact that a formative is able to lexicalize a proper subset of the features/heads associated with it in the lexicon. That will subsequently lead us to the **bababantu* problem, which is tractable within DM only if syntactic heads are obligatorily fused into a single terminal in a number of cases. Finally, we will see that there is no way of predicting where Fusion will apply, and where it won't. Instead, it will appear that fusion essentially replicates the idiosyncrasies of lexical entries.

We should emphasize that the need to introduce Fusion, a new kind of grammatical operation, would count against DM, even if an analysis of the Nguni facts using Fusion could be shown to work smoothly. Nevertheless, we find it useful to review the difficulties that arise, since they ultimately highlight problems intimately connected with positing readjustment rules mediating between syntax and lexical insertion.

5.1. The need for fusion:

Lexicalization needs a way of telling the different noun classes apart. In this section, we will provisionally continue to use the device already employed to distinguish the noun classes, indexing all the heads on top of the root with a class feature. The class features should be thought of as diacritics added to the contentful features defining a given head under agreement or percolation from the lowest head above the root. The conclusion will be that using this device is crucial in a DM-compatible analysis.

5.1.1. Underspecification and the **bababantu* problem:

We have seen that a formative like class 2 *ba* can lexicalize the structure of a sc, an oc and an ac. Suppose first that scs, ocs and acs have the structures in (106)a-c, respectively:

- (106)a [SC-layer X_n]
 b [OC-layer Y_n]
 c [AC-layer $W_n W'_n$]

Thus, for the purposes of this discussion, we assume that classes are differentiated by class features, and use the representations posited before the shift to binary features.

Within the framework we have adopted, a lexical entry like (107), will allow *ba* to lexicalize each of (106)a-c in addition to the full structure of a nominal prefix below A:

$$(107) \text{ } ba \leftrightarrow [\text{SC-layer } X_2 [\text{OC-layer } Y_2 [\text{ac-layer } Z_2 [\text{I-layer } W_2 W'_2]]]]$$

In a system consistent with the Subset Principle, on the other hand, the lexical entry for *ba* must assign it a set of features shared by X_2 , Y_2 and (the fusion of) W_2 and W'_2 . But then, *ba* should also be able to lexicalize each head in (108) below A one by one:

$$(108) \begin{array}{ccccccc} [\text{A-layer } A & [\text{SC-layer } X_2 & [\text{OC-layer } Y_2 & [\text{ac-layer } Z_2 & [\text{I-layer } W_2 & W'_2 & [\text{root }]]]]] \\ | & | & | & | & | & | & | \\ a & ba & ba & ba & ba & ba & ba \end{array}$$

So, why doesn't this actually happen?

One might try to say that it actually does, but the result is then repaired by a haplology rule at PF. But this would be hard to carry off, since Nguni languages appear to tolerate repetition of the same syllable elsewhere. Consider, for example, the boldfaced parts of the forms in (109), which illustrates how adjectives are inflected in participial environments in Swati.⁵⁴

- | | | | | | |
|-------|---------|-------------------------|---------|-------------------------|---------|
| (109) | class 1 | <i>a-mu-dze</i> | class 2 | <i>ba-ba-dze</i> | (Swati) |
| | | sc1-ac1-tall | | sc2-ac2-tall | |
| | 3 | <i>u-mu-dze</i> | 4 | <i>i-mi-dze</i> | |
| | 5 | <i>li-li-dze</i> | 6 | <i>a-ma-dze</i> | |

Similarly, a demonstrative routinely combines with a noun giving rise to repeated syllables:⁵⁵

- (110) abazali **ababantwana** bagulayo
 2-parent *a*-sc2 sc2-sick-RM
 "parents whose children are sick"

Given an entry for *ba* as in (107), the Elsewhere Principle excludes lexicalizing the heads of (108) separately. A DM-compatible account, however, must somehow make fusion up to A mandatory in (108) to eliminate **bababantu*.

5.1.2. Commitment to class features:

Before we turn to the question why fusion should ever be obligatory, we want to point out an important consequence of allowing fusion at all. In section 1.2.2., we argued that the features assigned to the fusion product must be the intersection of the feature sets associated with the fused heads. Now, we will see that this commits us to differentiating noun classes with class features rather than in terms of the values of binary contentful features.

Using four distinct binary features, 16 classes would be individuated merely on the basis of the +/- combinations for those features. We assume, as in section 4, that the four features are distributed one-to-one over the four lowest heads in the structure, but in order not to prejudice the issue whether fusion can work by intersecting feature sets, we now allow for those heads to have additional shared features as well. Applying this to the structure underlying the *ac2 - ba-*, for example we get the picture in (111), where F represents a feature set common to all the heads in the OC-layer:

- (111) [OC-layer Y [ac-layer Z [I-layer W W']]]
- | | | | |
|--------------|---------|---------|---------|
| | | | |
| {+A, F} | {-B, F} | {+C, F} | {-D, F} |
| | | | |
| └──────────┘ | | | |
| | | | |
| <i>ba</i> | | | |

Suppose now that fusion applies to all the heads in (111), as required for *ba* to replace a single terminal. Since the fusion product is associated with the intersection of the feature sets of the fused nodes, its feature set will be just { F }. But since the information needed to

distinguish noun classes is carried only by the features A, B, C and D, this means that the lexicalization procedure won't be able to tell whether the terminal created by fusion should be lexicalized by *-ba-* or any other ac, e.g. the ac14 *-bu-*. Thus, a system in which the feature set associated with the fusion product is determined by intersection, must rely on class features rather than binary contentful features to differentiate the noun classes.

Therefore, the arguments in 4.2. against differentiation by class features are also arguments against using fusion in the analysis of the Nguni nominal prefixes, and, ultimately, against the DM tenet that only terminals are targeted by lexicalization.

5.2. Getting fusion to apply in the right cases:

We first determine the range of cases in which all heads below A must fuse. Then, we show that the emerging picture corresponds to a generalization which is automatically captured in the analysis assumed here, and consider how this could be mimicked in a system using fusion.

5.2.1. The domain of fusion:

We have seen that lexicalization by *ba* needs to involve fusion of all the heads in (112) up to A:

(112) [A-layer A [SC-layer X₂ [OC-layer Y₂ [ac-layer Z₂ [I-layer W₂ W'₂ [root]]]]]]

The same holds for the formatives *li* (class 5), *si* (class 7), *zi* (class 8), *lu* (class 11), *bu* (class 14) and *ku* (class 15). Since each of these appears as an sc, an oc, an ac and a part of the nominal prefix, like *ba*, they must be assigned feature sets shared by all the heads below A in each class, and so, fusion must apply obligatorily to prevent those heads from being lexicalized one by one.

The nasal classes 3, 4, and 6 present a slightly different picture. Here, the part of the nominal prefix following the initial vowel only recurs in the acs. Hence, one could say that each of *mu*, *mi* and *ma* has features not shared by the heads above the AC-layer, and fusion would need to apply only within the AC-layer.

However, it is also possible that all heads below A fuse and are lexicalized by *-mu-*, *-mi-* or *-ma-* with the initial vowel confined to A. The following scenario would be consistent with this: Fusion within the AC-layer presupposes that *mu*, *mi* and *mu* are associated with a feature set shared by all the heads in the AC-layer in their respective classes, and if these heads also fuse with the higher heads into a lexicalizable new terminal, the higher heads must also share that feature set. So, the Subset Principle will allow this terminal to be lexicalized by one of *mu*, *mi* and *ma*. If the feature sets associated with the higher heads X and Y are proper supersets of the feature set of the terminal created by fusing all the heads up to A, and the formatives *u-*, *i-* and *a-* are assigned the feature sets of X and Y, the alternative lexicalization by one of *u-*, *i-* and *a-* is excluded by the Subset Principle, while the Elsewhere Principle will select *u-*, *i-* and *a-* for lexicalization of X and Y appearing in isolation as scs or ocs. This is exemplified in (113) where the shared feature surviving fusion is taken to be the class feature 3:

(113)a [SC-layer {a, b, 3} [OC-layer {b, 3} [ac-layer {c, d, 3} [I-layer {e, f, 3} {g, 3} [root]]]]]
b [ac-layer {c, d, 3} [I-layer {e, f, 3} {g, 3}]] → [AC-layer { 3 }]

of X, Y and Z. Therefore, it seems reasonable to expect that (115) will follow left-to-right from fusion creating a terminal whose features are just the intersection of the feature sets of the fused heads. Assuming “Minimize formatives up to convergence” would then derive (115) right-to-left.

Actually, the descriptive generalization follows left-to-right only if there are no more highly specified formative A which would be a better candidate than the underspecified F for lexicalizing X or Y as a concord. But we will simply assume that this extra condition holds in the cases where fusion applies. In particular, we will assume that there is no entry $A \leftrightarrow S$, where S is a proper superset of the intersection of the feature sets of X_n , Y_n and Z_n for $n = 2, 5, 7, 8, 10, 11, 14$ or 15 , leaving the underspecified *-ba-*, *-li-*, *-si-*, *-zi-*, *-lu-*, *-bu-* and *-ku* as the only possible lexicalizations of scs, ocs and acs in these classes.

In the classes 3, 4 and 6, *-u-*, *-i-* and *-a-* lexicalize the scs and the ocs, while *-mu-*, *-mi-* and *-ma-* are the acs. To model this, we can assume that X and Y share a feature F not shared by the heads in the AC-layer, and associate *-u-*, *-i-* and *-a-* with feature sets including F in addition to the class feature. However, we also need to say that the feature sets of *-mu-*, *-mi-* and *-ma-* include a feature F' shared by the heads in the AC-layer, but not by the higher heads in order to claim that fusion of Z with the higher nodes would produce an unlexicalizable terminal. Again, we will simply assume that the extra condition holds, and summarize the properties of the emerging system.

We can think of F and F' as features identifying heads as belonging to the SC-/OC- layer and the AC-layer, respectively, and F and F' would be the only features any two heads ever share in addition to the class feature. Then, fusion of Z with the higher nodes creates a terminal whose feature set only contains the class feature, and we will have entries like (116)a, with *n* a class feature, for *-ba-*, *-li-*, *-si-*, *-zi-*, *-lu-*, *-bu-* and *-ku*, while the entries for *-mu-*, *-mi-* and *-ma-* and *-u-*, *-i-* and *-a-* will look like (116)b and c, respectively:⁵⁶

- (116)a $A \leftrightarrow \{n\}$
 b $B \leftrightarrow \{F', n\}$
 c $C \leftrightarrow \{F, n\}$

At this point, it appears that a DM-compatible analysis captures (115) just as easily as its competitor, with the Subset Principle playing a role analogous to the Superset Principle in the account we have adopted. But there are two wrinkles, one of a conceptual nature, the other empirical.

The first wrinkle appears when we return to class 10, where fusion must not apply between W and W', since *-zi-N-* is bimorphemic. We now want to capture this by saying that the fusion product would not be lexicalizable in this case. To do that, we must assume that W has a feature G not shared by W', that W' has a feature G' not shared by W, that $-zi- \leftrightarrow \{\dots, G, \dots\}$ and that $-N- \leftrightarrow \{\dots, G', \dots\}$. But the problem is now that W and W' must fuse into a terminal lexicalizable by *-zi-* in class 8 (where no other formative follows *-zi-* in the nominal prefix). To make this possible in the scenario we assumed for class 10, we must now say that G and G' correspond to the two different values of the same binary feature F, e.g. $G = +F$ vs $G' = -F$, and take W' to be $+F$ rather than $-F$ in class 8. But now we have the beginning of a system differentiating noun classes in terms of the values of binary features, leading to redundancy in a system committed to class features.

The second problem has to do with the upper bound on fusion. So far, we have not considered the possibility that A might fuse with all the lower heads leaving only one

terminal to be lexicalized, so that the full class 2 prefix, for example, would be **ba-* (or **a-*) rather than the bimorphemic *aba-*. In fact, nothing excludes this as long as A at least shares a class feature with the lower heads. The fusion product would then be lexicalized by *-ba-* or other formatives whose entries conform to (116)a.

Denying that A has a class feature, on the other hand, would seem inconsistent with the fact that *u-*, *i-* and *a-* lexicalize the fusion product of A, X and Y in classes 3, 4 and 6. For this to be possible, A must share the class feature of X and Y (as well as F), given entries like (116)c for *u-*, *i-* and *a-*. (One might deny that A is lexicalized together with X and Y in classes 3, 4 and 6, taking it instead to be lexicalized by a separate *V* coalescing with *u-*, *i-* and *a-*, but, at least in Xhosa, the result of coalescence should arguably be a long vowel in this case, as in class 10 nouns with polysyllabic roots, e.g. *iiṃfene* “baboons”; cf. footnote 13.)

It may be instructive at this point to make a comparison with the competing system. Within the framework we have adopted, whether or not A “fuses” with lower nodes is directly determined by the lexical entries. But a DM-compatible analysis must posit fusion to mediate between syntax and the lexicon, thereby introducing a process with a life of its own, and the preceding discussion shows, unsurprisingly, that it is not entirely possible to predict its behavior on the basis of the lexical resources.

5.3. Summary and preview:

In sections 3 and 4, we established the syntactic structure underlying the Nguni noun class prefixes. We have now examined the issues that arise, if this structure is to be lexicalized in accordance with the axioms of DM. The outcome is that four different types of considerations disfavor a DM-compatible account of the Nguni noun class prefixes.

First, the fact that such an account needs to assume fusion, already makes it less optimal than the competing analysis, which does not have to invoke specifically morphological operations to set the scene for lexicalization.

Then, we have seen that adopting fusion forces one to rely on class features to differentiate the noun classes, although the evidence discussed in section 4 rather clearly favors differentiating the noun classes in terms of the values of binary contentful features.

We also saw that although it appeared possible to characterize the fusion patterns in a general way, a DM-analysis would in fact reveal the seeds of internal inconsistency when trying to account for class 10 *-zi-N-* vs class 8 *-zi-*.

Finally, DM-compatible analyses seem to have no principled way of keeping fusion from including A in all the classes. The competing analysis advocated here has no principled way of achieving that either, but delivers the right results on the basis of arbitrary lexical entries. The observation that fusion, allegedly a rule of grammar, needs to show the same arbitrariness, suggests that fusion is an artifact obscuring the direct relationship between syntactic structures and the lexicon.

All in all, we feel justified in concluding that a nanosyntactic analysis of the Nguni noun classes and concords is rather clearly preferable to a DM-compatible one.

6. Prospects:

We now want to discuss some issues largely ignored in the previous section, somewhat artificially dividing them up into issues relating to the size of nominal structures and questions about the nature of the features we have postulated.. What they have in common, is

that further research will be required to determine whether solutions compatible with our analytical assumptions and general theoretical framework can be independently supported.

6.1. Structures:

We will first suggest that the structure of the sc in a participial clause must be only a proper subpart of the structure of an sc in other environments. Then, we propose an analysis of the Swati *a*-to-*e* conversion which rests on the assumption that a possessor nominal must add an extra head on top of A before it can combine with *a* “of”. Finally, we suggest that languages outside the Nguni group which lack initial vowels in all classes, but nevertheless have vocalic scs and ocs, like Nguni, must build less functional structure on top of roots.

6.1.1. The participial sc1 *a*:

In our discussion of the Nguni scs, we glossed over the fact that the sc1 is actually *a*- rather than *u*- in certain syntactic contexts, although *a*-, unlike *u*-, does not also occur as part of the full nominal prefix of class 1, i.e. *um(u)*-. Since we assume that the heads from which scs are constructed are taken from the SC-layer of the full prefix, and heads are expected to lexicalize the same way in all contexts, this fact is initially disturbing.

The clauses in which *a*- appears, are grouped together as participial, and comprise non-subject relatives⁵⁷, adverbial clauses and clauses embedded under negation or certain auxiliary verbs.

The nanosyntactic technology introduced in section provides a way of accommodating the participial sc1 *a*-. What we need to do, is assume that the space in the SC-layer between A and the OC-layer contains at least two heads:

(117) A [SC-layer X [X'P X' [OC-layer ...

Then, we can set up the lexical entry in (118)a for *a*- alongside the entry for *u*- given schematically in (118)b and assume that the participial sc corresponds to X'P rather than the full SC-layer, as in (119):

(118)a $a \leftrightarrow X'$

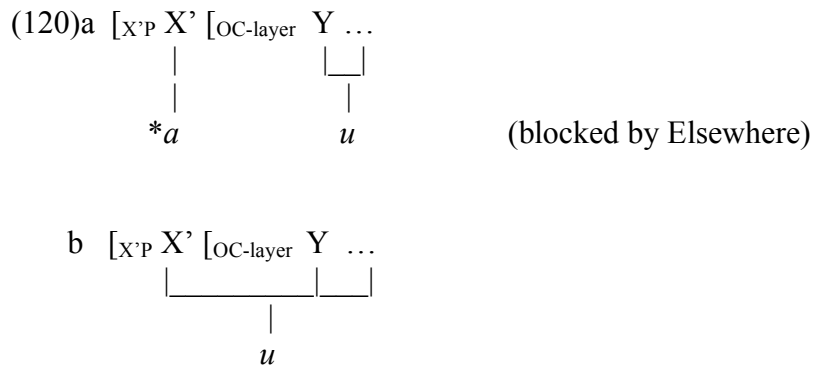
b $V \leftrightarrow [A\text{-layer } A [SC\text{-layer } X [X'P X' \dots$

(119) [X'P X' [OC-layer ...

Given the Best Fit Principle, *a*- will now be the best candidate for lexicalizing the participial sc, while the Elsewhere Principle guarantees that *u*- will be the winner for the regular sc corresponding to the full SC-layer and also for lexicalization of the heads in the SC-layer within the full nominal prefix.

The lexicalization domain of *a*- is downward bounded by the *mu*- that lexicalizes all heads from the top of the OC-layer in class 2, and all the information distinguishing the noun classes is taken to be contained within the OC-layer. Hence, the lexical entry for *a*- cannot key it to any feature value combination identifying class 1. Yet, our analysis doesn't lead to the incorrect expectation that *a*- should be the sc for all classes in participial contexts. In all classes except class 1, the formatives that lexicalize heads in the OC-layer are also specified for lexicalizing the heads in the SC-layer, since for all classes except class 1, the oc and sc are identical. Hence, the Elsewhere Principle guarantees that the X' of the participial sc structure

(119) cannot be lexicalized by *a-* in any other class than class 1. (120) illustrates this for class 3:



In other words, our analysis correctly predicts that only class 1 has a special participial sc. Notice though that this result crucially depends on our assumption that the structures underlying concords contain silent lower layers, as argued for different reasons in section xx. Still, it remains to be seen if further investigation of Nguni morphosyntax will provide independent evidence for the structure we have assumed for the participial scs.

6.1.2. *a/e* in Swati:

A somewhat similar problem surfaces when we try to deal with the Swati *a/e* alternation mentioned in footnote 30. This alternation is seen in two cases. On the one hand, our analysis predicts that the initial vowel of classes 2 and 6 should be *a-*, copying the vowel of *-ba-* and *-ma-*, but it is actually *e-*.⁵⁸ On the other hand, the possessive *a-* “of”, *nga* “with” and *na* “and, with” show up as *e*, *nge*, *ne* preceding possessor DPs of all classes except class 2a and the subclass of class 1a that lacks the initial *u-*.

In Xhosa and Zulu, *a*, *nga*, *na* change to *e*, *nge*, *ne* only in front of nouns whose initial vowel would be *i-*, as in (121):

- (121)a umntwana wendoda
 1-child sc1-of-9-man
 “the man’s child”
 b umuntu wesilisa
 1-person sc1-of-7-manhood
 “a male person”

With possessors in classes with *u-* as an initial vowel, one gets *o*, and the *-a-* either remains when the initial vowel is *a-*:

- (122)a umntwana womfazi
 1-child sc1-of-1-woman
 “the woman’s child”
 b bantwana babafazi
 2-child sc2-of-2-woman
 “the women’s children”

This clearly suggests that *a*, *nga*, *na* in Xhosa and Zulu merge outside the A-position of the possessor noun, and that their surface shapes are phonologically determined. The underlying forms are as in (123) and *a-* coalesces with the initial vowel of the following noun:

- (123)a umntwana wa indoda → /... wendoda/
 b umntwana wa umfazi → /... womfazi/
 c bantwana wa abafazi → /... babafazi/

This, in turn, suggests that we might the Swati *a/e* change seen in (124)a as reflecting the presence of an *i-*, as indicated in (124)b:

- (124)a umntfwana wemfati
 1-child sc1-of-1-woman
 b umntfwana wa imfati → /... wemfati/

But where would that *i* come from, since the initial vowel of class 1 is *u-*?

Again, we might try the strategy used to deal with the participial sc1 *a-*, saying that Swati merges *a*, *nga*, *na* with a nominal structure smaller than the one they combine with in Xhosa and Zulu. For example, we might assume that they combine with the X'P of (125)⁵⁹:

- (125) [A-layer A [SC-layer X [X'P X' [OC-layer ...

Mimicking the proposal for the participial sc1 *a-*, we would then say that *i* is specified for lexicalizing just X' (vs $V \leftrightarrow [A [SC-layer X [X'P X' [OC-layer ...]$), and get (126) by Best Fit:

- (126) wa [X'P i [OC-layer mfati]] → /... wemfati/

Like the participial sc1 *a*, the *i* won't be able to distinguish between different noun classes, but now this is an advantage, since we do in fact want *i* to appear in all the classes except for 2a and a subclass of class 1a. We can even account for the failure of *i* to show up with those nouns in class 2a that don't cause *a* to change to *e*. These are proper names like *Somdlovu*, which occur without the initial *u-*. This property could be interpreted to mean that these nouns are themselves specified for lexicalizing the full structure up to and including D. But then, these must, by the Superset Principle, also be able to lexicalize X', unlike class 1 *-mu-*, whose lexicalization domain does not extend upwards beyond the OC-layer. Thus, we might say that the Elsewhere Principle selects *Somdlovu* rather than *i* to lexicalize X' in (126):

- (126) wa [X'P X' [OC-layer ... → /... wasomdlovu/
 |
 |
 Somdlovu

But of course this crashes as soon as we try to extend the analysis to class 2. Since sc2 = oc2 = ac2 = *ba-*, *ba-* is in effect like *Somdlovu* rather than like *-mu-*, and the Elsewhere Principle would dictate the lexicalization in (127), making *-ba-* block *-i-* for the lexicalization of X':

$$(127) \text{ wa } [_{X'P} X' [_{OC\text{-layer}} \dots \rightarrow */\dots \text{ wabafati//}$$

$$\begin{array}{c} | \\ \hline | \\ ba \end{array}$$

Since tinkering with this to lift the effect of the Elsewhere Principle, would not only be inconsistent with the analysis proposed for *waSomdlovu*, but also undercut the explanation for the missing ABA patterns, we must conclude that the strategy fails.

Therefore, we try to go in the opposite direction, claiming that *a*, *nga*, *na* combine with a bigger structure than the A-layer in Swati. This would give us something like (128):

$$(128) a [_{X'P} X' [_{A\text{-layer}} A [_{SC\text{-layer}} \dots$$

The *i* must now be bigger than any formative capable of lexicalizing from A downwards, so that we can appeal to the Elsewhere Principle to make *i* block them. In fact, *i* should be specified for lexicalizing all heads down to the AC-layer to make sure that no formative lexicalizing heads in the OC-layer can follow *i*, e.g. the class 3 *-u-* (= oc3), given **weu...* Since the feature values are the same for all classes except classes 1 and 2 above the AC-layer, this will actually give the desired result for *a*, *nga*, *na*, except that we now have no lexicalization account of why proper names like *Somdlovu* don't trigger the change to *e*. Whenever a nominal doesn't project beyond A, the Best Fit Principle ensures that smaller formatives block *i*, restoring the forms that the prefixes have outside the possessive construction. Notice also that we can now say that Zulu and Xhosa possessor nominals have exactly the same structure as in Swati, i.e. the one in (128), if Zulu and Xhosa extend the lexicalization domain of *V* upwards to include *X'*, so that Elsewhere would always block lexicalization of *X'* by another formative.⁶⁰

This account will extend to the the initial *e-* of classes 2 and 6 in Swati, if we assume that nominals in class 2 or 6 have the structure in (128) even when the *a* is not the “of” linking the nominal to a possessee.

A possible variant of the account would say that *X'* triggers “initial vowel drop”, which we have analyzed as trimming the nominal structure down to the I-layer, and assume that the Swati *i* actually only lexicalizes *X'*. So far this seems empirically indistinguishable from the version we presented above.⁶¹

At any rate, independent evidence for the structures postulated must be sought through more detailed study of the syntactic properties of *a*, *nga*, *na* as well as a closer investigation of the special properties of classes 2 and 6.⁶²

6.1.3. The relationship between concords and prefixes outside Nguni:

There are Southern Bantu languages outside the Nguni group that don't have initial vowels in any classes. Yet, vowels like the ones we have seen in Nguni show up as scs and ocs with the same distribution as in Nguni. We illustrate this by showing the pairing between nominal class prefixes and scs and ocs in Venda.⁶³

(129)	prefix	sc	oc
class 1	<i>mu-</i>	<i>u-</i>	<i>mu-</i>
2	<i>vha-</i>	<i>vha-</i>	<i>vha-</i>
3	<i>mu-</i>	<i>u-</i>	<i>u-</i>

do occur in concords/clitics.⁶⁵ Whether this is a conclusion we can live with, can only be settled in the context of a broader investigation of DP structure involving the contrasts between Romance and Slavic and similar contrasts in other language groups.

6.2. Features:

We begin by returning to the morphosyntax of the Nguni concords, suggesting a way of accounting for the different sizes of scs, ocs and acs, grounding the analysis in assumptions about the hierarchy of morphosyntactic features (the fseq). Then, we briefly address the question what kind of interpretative content might be associated with the features we take to build the syntactic structures underlying the Nguni class prefixes and concords.

6.2.1. The morphosyntax of concords:

We have proposed that the different types of Nguni concords are to be differentiated in terms of size. There are two different aspects to this. On the one hand, we have taken it that a sc only contains heads in the SC-layer, an oc only contains heads in the OC-layer and an ac only contains heads in the AC-layer. In this respect, we have simply adopted the most straightforward analysis suggested by the actual shape of the various concords. Yet, one should ask how this can be grounded in syntactic theory.

On the other hand, we have assumed that a sc in fact contains not only the heads in the SC-layer above the OC-layer, but also the heads in the OC-layer and the AC-layer. Similarly, an oc contains not only the heads in the OC-layer above the AC-layer, but also the heads in the AC-layer. Yet, the heads in the OC- and AC-layers are not seen in the actual surface form of the scs, and the heads in the AC-layer are not directly detectable in the shape of an oc. The analysis adopted was motivated by specific theory-internal concerns: It is needed to enable the use of binary contentful features to differentiate the noun classes, and to exclude the *ABA pattern for concords. But how does our way of “silencing” the lower structural layers of scs and ocs fit into the general theory of grammar, and why do these layers have to be silent?

Somewhat speculatively, we would now like to suggest that part of the answer to these questions may come from the way features are distributed over syntactic heads of different categories. Starting with the issue concerning the upper bound on the different concords, we would like to relate the inclusion pattern $ac < oc < sc$ to the different structural levels at which these attach to their hosts. An empirical observation supporting this is that ocs attach to the verb stem inside the scs, with tense markers and the focus-related *-ya-* coming between the two. In the Bantuist literature, the combination of an oc with a verb stem is sometimes taken to form a separate morphosyntactic constituent, the “macrostem”.⁶⁶ To take advantage of this, we need a correspondence between the nominal fseq and the adjectival and verbal ones so as to be able to say that the fseq of a concord projects to exactly the same level as the fseq projected by its host.

A particularly elegant way of doing this is provided by a proposal by M. Starke regarding the featural composition of the different “lexical categories”. According to this proposal, the categories V, N and A are not distinguished by any category features. Rather, a category is individuated merely in terms of how big a portion of a category-neutral fseq goes into its construction. From this point of view, an A might just be smaller than a N, which in turn is smaller than a V, as depicted in (131):⁶⁷

(131) [_{fseq} F_m ... [_V F_i ... [_N F_j ... [_A F_k ...

Assuming this subset relation between categories, the possibility arises that a proper subsequence of the heads going into a full verb matches or is even properly included in the sequence of heads from which a noun is built. Taking advantage of this, we suggest that the nominal heads in the OC-layer above the AC-layer correspond to a sequence of heads from the top of the verbal macrostem down to a level we label V' , for convenience. This gives us the picture in (132), where (132)b represents the structure of an oc:

- (132)a $[\text{macrostem } F_k, \dots, [V' F_q \dots]]$
 b $[\text{OC-layer } F_k \dots [\text{AC-layer } F_q \dots]]$

Our proposal is now that an oc merges with the verb at the V' -level, grafting its own sequence of heads from F_k down to the AC-layer onto the V -projection in a way that remains to be understood. In this perspective, a verb with an oc builds its macrostem by using features within the oc.

If this is viable, we should have three beneficial consequences. First, if the oc “takes over” part of the verbal projection up to the macrostem level, and the heads in this part of the verbal structure are involved in licensing DP objects in situ, we should be able to predict that a DP doubled by an oc must raise, as the scope facts in negative sentences indicate. Second, we might account for the fact that ocs cannot occur in imperatives, by saying that imperatives don’t project beyond V' , and finally, the uniqueness of the fseq will predict directly that there can be at most one oc per verb.⁶⁸

Extending this to the scs, we must say that the heads in the nominal SC-layer above the OC-layer match the heads added to the macrostem to form a full verb. The heads in the AC-layer, on the other hand, must correspond to heads from the top of an A-projection down to some A' .

This brings us back to the question why the concords must contain all the structural layers from a certain point down. According to the suggestions just made, the crucial part of an sc is the heads in the SC-layer above the OC-layer, and the crucial part of an oc is just the sequence of heads above the AC-layer. We propose that this is because any projection of the fseq must start at the bottom, although it can stop at any higher point.

If this holds, we are only left with the question why lower layers of structure are not pronounced in scs and acs, and what our account of them presupposes with respect to the architecture of grammar.

Our tentative answer to the first part of this question is that the silent lower layers correspond to those heads that are already projected within the host structure at the point where the concord attaches. Thus, the AC-layer of an oc must only contain heads already used to project V' , and the heads in the OC-layer of a sc must be included in the heads used to build the macrostem.

The questions regarding the technical implementation still remain. We crucially want the lower structural layers to be lexicalized before they are erased, and we even want some phonology to be done prior to erasure, in order to get the right distribution of vocalic scs and ocs (taken to correspond to the underspecified V copying a vowel from a more deeply embedded formative). Therefore, we are left with erasure at the PF-level subject to conditions which are essentially syntactic, and as yet, we have not been able to locate any independent motivation for weakening strict modularity in this way.

6.2.2. The content of features:

An even more pressing concern arises from the fact that we have been led to postulate a fairly large number of heads/features in the nominal domain without being able to assign any well-defined semantic content to them except for +/- Pl. This is partially independent of our decision to differentiate the noun classes in terms of binary contentful features. Even if we were to use class features, we would have minimally five contentful features below A in the structures underlying the nominal prefixes, whereas most traditional analyses would only posit two in this domain (a number feature and a multivalued gender feature).

A particular avenue is suggested by the fact that the choice of noun class sometimes affects meaning. Thus, the meaning difference between Xhosa class 3 *umthi* “tree” and class 11 *uluthi* “stick”, for example, might suggest that some of the heads we have postulated are akin to the classifiers of other languages, individuating objects in terms of their size or shape. But then, the question arises whether features with this kind of descriptive content should have a place in the inventory of features visible to the morphosyntactic component, as opposed to the more clearly formal features. Given the suggestions made in the preceding subsection, the question also arises whether such features could be part of a fseq common to nouns, verbs and adjectives.

In fact, the studies that led to the postulation of a fseq, e.g. Cinque (1999), seem to indicate that some elements of meaning that we would be inclined to view as conceptual rather than formal, may indeed be part of the fseq. Otherwise, the fseq wouldn’t be able to order color adjectives above nationality adjectives, but below size-related adjectives, for example. So, while the borderline between morphosyntactically active features, and purely conceptual meaning components certainly needs to be drawn somehow, it is less clear that an account of the Nguni prefixes as involving classifiers will be entirely inconsistent with the theory emerging from that.

Another issue concerns the failure of the classifier meaning of heads to manifest itself consistently with different roots. After all, the meaning component “long, thin object” which one might be tempted to associate with the class 11 prefix *ulu-* on the basis of *uluthi* and perhaps *usiba* “pen”, is not easily detectable in *usana* “baby” or *uluntu* “community”. This looks like the flip side of the fact that many roots, perhaps most, can only occur in a single class. However, this is frequently true in languages with different kinds of classifiers as well, where many roots only appear with a designated classifier whose meaning often seems lost in the fixed combinations. In this perspective, it appears that our analysis of Nguni nominal prefixes as containing classifier-like heads does not introduce any new problems, but simply underscores the importance of finding ways of capturing the notion of “grammaticalization” in formal grammar.

A different approach to this would be based on the plausible conjecture that no combination of a morphosyntactic feature could yield a meaning component like “long, thin object” directly. Instead, the features we have postulated should be rather abstract and just narrow down the space of possible meaning components to be added to the roots conceptual content. Then, world knowledge might coerce something translatable as “long, thin object” to be selected from this space with the root *thi* “wood”, while other options would be available with different roots. Then, the cases where a root only seems to occur in one class, might just reflect the limits to coercion or perhaps the absence of any communicative pressure to create additional word meanings from the same root. Whether this is correct or not, is an empirical issue. One can easily think of experimental settings that would favor coercion and/or create a need for additional word meanings. But this research still remains to be carried out.

6.3. Summary:

In this section, we have endeavored to indicate ways of tying up some loose ends. The solutions we have proposed for the two analytical problems in Nguni seem consistent with the general assumptions underlying the analysis in sections 3 and 4 and may even be seen as providing additional evidence in favor of that analysis. But the discussion was ultimately inconclusive in both cases, since only further investigation of Nguni syntax can help us decide whether the proposals are well-founded.

The discussion of the relationship between concords and nominal prefixes outside Nguni was even more open-ended, since it abuts an intensely debated general issue about the architecture of nominal expressions. Likewise, the questions regarding the organization and content of morphosyntactic features discussed in subsection 6.2. must remain a matter for future research, although the suggestions offered seem relatively plausible.

7. Conclusion:

We started by describing a morphosyntactic theory borne of a desire for conceptual elegance. The corner stone of that theory is that a single formative may lexicalize a non-trivial sequence of syntactic heads.

But we also noted that there is an empirical side to the issue. The nanosyntactic view we have adopted, is vindicated each time we can show, using basic principles of morphosyntactic analysis, that the heads in some structural domain outnumber the formatives lexicalizing them. It is in this perspective, our analysis of the Nguni noun class prefixes and concords takes on its true significance. The analysis built up in section 3 and refined in section 4 is based on perfectly uncontroversial analytical guidelines, and a nanosyntactic landscape emerges from it.

We are aware of it that many questions have been raised along the way that remain unanswered or may have been answered incorrectly. But we also see no reason to think that they will need to be answered in a way incompatible with the main conclusion we draw from our study of the Nguni nominal prefixes and concords: Morphosyntax is nanosyntax

Footnotes:

- 1 Nanosyntax has grown out of work by M. Starke and G. Ramchand. The basic ideas as well as central ingredients of the implementation outlined here are taken from presentations in CASTL research seminars. A fairly detailed presentations of some of this material can be found in Caha (2007, in preparation),
- 2 This is built into Williams's (2003) notion of "spanning".
- 3 Representations corresponding to downwards movement, for example, would simply never find any syntactic structures to lexicalize.
- 4 Notice that if lexicalization is restricted to constituents and cannot target projecting nodes, X cannot be lexicalized in isolation from Y in ... [X [Y ..., subsuming Abels & Muriungi's anchoring condition for this configuration.
- 5 We assume that two or more "lexical" roots are in the same competitor set if and only if they have the same conceptual component. Thus, *went* and *walk* will never be in the same

competitor set, for example. However, it may turn out that what we now think of as part of the conceptual content actually comes from separate syntactic heads in the relevant cases, e.g. *go/went* and *walk* plausibly decompose in different ways under an analysis like the one in Ramchand (2008).

- 6 The account offered in the text doesn't exclude the ABA pattern arising as a result of homonymy. With the three lexical entries $A \leftrightarrow [P [Q [X]]]$, $B \leftrightarrow [Q [X]]$ and $A \leftrightarrow X$, ABA will in fact be the only possible outcome. So, the more accurate prediction is that the ABA pattern should be as rare as real homonyms sharing the same conceptual component., but differing in the their grammatical properties, i.e. very rare, at best.
- 7 Ramchand (2008) holds that underassociation is legitimate only if the underassociated features of the lexical item are recoverable from pieces of the syntactic structure in which it is inserted. But she also allows a lexical entry to mark parts an items structural description as optional. If she is right, this option would have to be taken for most of the formatives proposed in our ensuing account of the Nguni facts.
- 8 As far as we can see, however, the Subset Principle could be replaced by a version of the Superset Principle even in a theory restricting lexicalization to heads. But this would also make the theory more readily compatible with lexicalization of phrases, since "underlexicalization" could not occur.
- 9 Nguni is a group formed by the closely related languages Xhosa, Zulu, Swati and Ndebele. The morphosyntax of noun class prefixes and concords is essentially the same across Nguni, except for certain peculiarities of Swati which will be taken note of as we go.
- 10 We leave out the three locative classes, which, unlike their Chichewa counterparts, for example, only form a handful of adverbial expressions in Nguni and lack concords of their own. In numbering the classes, we follow the tradition and use the numbers adopted by Carl Meinhof in his comparative study of Bantu. Thus, the gap in the numbering between class 11 and class 14 corresponds to the absence in Nguni of two classes found in other Bantu languages.
- 11 Classes 1a-2a, comprising proper names and kinship terms, are paired with the same agreement markers (concords) as classes 1 and 2, but use different nominal prefixes. In class 1a, the prefix retains the initial vowel *u-* of class 1, but lacks the following *-m(u)-* in Zulu and Xhosa. In Swatii, proper names mostly also lack the initial vowel. Class 2a has the prefix, *oo-* in Xhosa, *o-* in Zulu and *bo-* in Swati, the latter transparently related to the class 2 absolute pronoun; cf. footnote 47.
- 12 The *-N-* of classes 9 and 10 represents a nasal assimilating to the place of articulation of a following stop. There is no *-N-* in loanwords in class 9 and 10, e.g. *ifestile* "window" (from Afrikaans *venster*) and *ifani* "surname" (from Afrikaans *van*).
- 13 Unlike *-li-* and *-lu-*, however, class 10 *-zi-* reappears in contexts were the initial vowel is dropped (see section 3.1.), e.g. under negation as in *andiboni zimfene* – Neg-sc1-see 10-baboons – "I don't see any baboons" (M. Visser p.c.) This plus the fact that *-zi-* cooccurs with polysyllabic roots in class 8, shows that the template cannot be associated with *-zi-*. Nor does the initial *i-* require what follows it to be monosyllabic. Possibly, then, the *-N-* heads a prosodic constituent that can only be preceded by a single syllable, and *-zi-* can be incorporated into that prosodic constituent just in case the root is monosyllabic. With a polysyllabic root, the constraint is satisfied by erasing the *z* of *-zi-* and bringing the *i* together with the initial vowel *i-* to form a single long vowel.
- 14 But Swati and Zulu have *-mu-* in classes 1 and 3 with monosyllabic roots alternating

with just *-m-* on polysyllabic roots.

- 15 Quite possibly, however, the templatic effects may ultimately offer important clues for understanding the constituent structure underlying the nominal prefixes.
- 16 Class 6 also contains a number of mass words lacking corresponding singulars; e.g. *ama-nzi* “water” and *ama-ndla* “power” (possibly related to *is-andla* 7-hand, with the last vowel of the prefix predictably dropping in front of a root-initial vowel)).
- 17 In *ama-N-tombazana* “little girls”, the class 9 noun *i-N-tombazana* seems to retain the *-N-* in the plural formed in class 6.
- 18 To the extent that some of the concords are clitics not necessarily doubled by another (overt) noun phrase, we might not assume that the ingredients of the concords are copied from an antecedent, but rather feature in compatibility conditions regulating the possible reference of the concords.
- 19 In this particular case, this would be because of the 9 → 6 transitions mentioned
- 20 However, class 9 also contains some inanimate nouns like *intaba* “mountain”, *indaba* “matter” and *into* “thing”, i.e. as in other classes, there are members of the class that lack the meaning component one might take to define class membership.
- 21 Swahili and Kikuyu diminutives add an extra prefix (class 7/8 in Swahili, class 12 in Kikuyu) on top of the regular noun class prefix; cf. Carstens (2008). Unlike Carstens, who claims that this involves a covert derivational morpheme licensed by the extra prefix, we think an extra noun (lexicalized by the extra prefix) is involved. This analysis is more transparently appropriate for the Chichewa locatives, which likewise seem to involve stacking of prefixes: In Kitharaka, locatives otherwise rather similar to their Chichewa counterparts are formed by combining nouns like *ngu* “under, the lower side” with another noun in a possessive construction, and we think Chichewa should be analyzed the same way, except the extra noun is lexicalized by the topmost prefix, and the two nouns are put together in a way reminiscent of the Semitic Construct State, lacking the possessive linker *a* “of”.
- 22 This identification is made more plausible by the fact that if (32) is the correct parse of *des*, *les* must be like the augment in that it doesn’t always yield a definite interpretation of the whole DP
- 23 Glossing Nguni examples, we will use the abbreviations acX = adjectival concord, ocX = object concord, scX = subject concords, where X indicates the noun class.
- 24 But unlike what we see in the gender systems of Germanic, Romance and Slavic, Nguni noun class membership is apparently never determined on the basis of biological gender.
- 25 Ultimately, we will take dropping the initial vowel to reflect the absence of not only the augment but also lower heads, but this doesn’t affect the point made
- 26 Leaving open **Andiboni abafundi* (without doubling)
- 27 RM = “relative marker”, an element whose distribution is similar to the distribution of the *-ya* appearing in the indicative present tense, which in turn shows some similarity with the Kitharaka low focus marker discussed by Abels & Muriungi (2008). The special participial sc1 *a-* is analyzed in 6.1.1.
- 28 Except in Swati, it never has the characteristic initial *l-* of the demonstratives, and unlike the demonstratives it never includes a second element following the *a-* (like the class 2 demonstrative (*l)aba*; cf. 3.2.1.), as (i) shows (except when a possessor is relativized):

- (i) *abantwana abagulayo*/**ababagulayo*
 2-child a-sc2-sick-RM/**Dem2-sc2-sick-RM*

“(the) children who are sick”

Also, it does not agree with the head noun, unlike the relativizing d-words of Dutch and German, as seen in the following example from Poulos & Msimang (1998):

- (ii) *indoda othisha abayibizayo/*ebayibizayo*
9-man 2b-teacher a-sc2-oc9-call-RM/*Dem9-sc2-call
“the man who the teachers are calling”

Rather, it is an morphosyntactically invariant *a*, whose phonological form is determined by coalescence with an initial vowel added to the following sc. All of this would appear consistent with identifying the relative *a* with the possessive *a* “of”, with *l-* merged on top of it in Swati.

- 29 The Xhosa demonstratives have an initial *l-* only in the nasal classes:

(i) Class 1	<i>lo</i>	Class 2	<i>aba</i>
3	<i>lo</i>	4	<i>le</i>
5	<i>eli</i>	6	<i>la</i>
7	<i>esi</i>	8	<i>ezi</i>
9	<i>le</i>	10	<i>ezi</i>
11	<i>olu</i>		
14	<i>obu</i>		
15	<i>oku</i>		

- 30 However, class 2 nouns sometimes occur with an initial *e-*; cf. 6.1.2. below where we try to relate this to a more general alternation between *a* and *e* in Swati.
- 31 However, since the Swati demonstratives look like the Zulu demonstratives in (38), Swati must project the A-layer under demonstrative *la-* to provide a position (Aug) for the initial vowel triggering coalescence in the non-nasal classes.
- 32 It is as yet unclear whether the account of the nasal classes offered here will also lead to an understanding of two further peculiarities of the nasal classes: (a) Xhosa demonstratives, as already mentioned, have an initial *l-* only in the nasal classes:

(i) Class 1	<i>lo</i>	Class 2	<i>aba</i>
3	<i>lo</i>	4	<i>le</i>
5	<i>eli</i>	6	<i>la</i>
7	<i>esi</i>	8	<i>ezi</i>
9	<i>le</i>	10	<i>ezi</i>
11	<i>olu</i>		
14	<i>obu</i>		
15	<i>oku</i>		

And (b) the Zulu possessive *ka-* with class 1a or 2a possessors agrees only with a possessee in one of the non-nasal classes; cf. Poulos & Msimang (1998):

- (ii) *ubuhlalu bukamama*
14-bean sc14-*ka*-mother

“my mother’s beans”
 (iii) *umuzi* (***u**)*kababa*
 3-homestead (*sc3-)*ka*-father
 “my father’s homestead”

- 33 Given the Superset Principle, it is also possible that the heads lexicalized by one are a proper superset of the heads lexicalized by the other, but we have so far not found any reason to think that the two sets are not identical.
- 34 Bresnan & Mchombo (1987)
- 35 In Nguni, only a handful of roots classified as adjectives. Most items treated as adjectives in Indo-European, essentially have the morphosyntax of verbs in Nguni. When the Nguni adjectives are used attributively, they add *(l)a* followed by a sc on top of the ac, much like relativized verbs; cf. footnote 28.
- 36 The segmentation is confirmed of by the fact that *zi* also occurs in class 9, but without *-N-*.
- 37 By the same token, an ac must also contain minimally two heads as indicated in (71)
- 38 In addition to the three items listed, the numerals *bili* “two”, *tsatfu* “three”, *ne* “four” and *hlanu* “five” “have a restricted use as enumeratives”, according to Ziervogel & Mabuza (1976: 57). In fact, their examples include *timbili* “two”, where the ac10 includes *-N-*, contrasting with *tiphi* “which”, without *-N-*.
- 39 In the plural, *-nye* means “the same”. Intriguingly, it can also be used as a regular adjective meaning “another”; Ziervogel & Mabuza (op.cit.: 57)
- 40 Unlike other adjectives, the enumeratives are used attributively without adding *la-*
- 41 We do not understand why the enumerative ac9 has an initial glide lacking in the corresponding “plain” ac.
- 42 If the parallelism suggested in 3.1. between dropping the initial vowel and dropping *the/les* is real, the latter should also involve leaving out more than the D (= A). When present these extra lower heads would be lexicalized by either *the/les* or the nominal root.
- 43 Having 4 binary-valued heads overgenerates by 3. If we were to add the three locative classes, we would get a perfect match.
- 44 Notice that we do not analyze the heads forming the concords as being on the host’s spine. Rather, they form phrases occurring as specifiers of heads in the host’s extended projection. This is in accordance with the clitic character of the concords, and the fact that sc5 *li-* and sc11 *lu-* don’t occur on polysyllabic verbs, in spite of the templatic effect noted in 2.1.1., is consistent with it.
- 45 However, adopting Starke’s suggestion will require rethinking certain parts of the analysis developed in section 4. In particular, one would need to have the *-m-* of classes 3, 4 and 6, now a separate formative, originate at the top of the I-layer and raise to the top of the AC-layer to create the acs.
- 46 The value of the Pl feature would be left unspecified to capture the sg/pl pairing, except for cases like *indoda* “man” (class 9) → *amadoda* “men” (class 6), including all nouns in class 11 that have plurals (in class 10), missing a generalization, since all class 11 nouns form plurals in class 10.
 Notice that what is listed is a phrase (a syntactic structure), not a “word”. (Listing of phrases is independently required because of the existence of idioms.)
- 47 The corresponding plurals (class 2a) look like a combination of the proper name/kinship term with a preceding “absolute pronoun” in Swati. The *bo-* of *boSomdlovu* is identical to

the first part of the class 2 pronoun *bona* “they/them”, where the second part, *-na*, is shared with the absolute pronouns of the other classes, e.g. class 3 *wona*. The first part of the absolute pronoun also appears without *-na* in the possessive construction, e.g. *bantfwana babo* -2-child sc2-a-bo – “their children”. Notice that the meaning of a “plural” like *boSomdlovu* is “Somdlovu and company”, i.e. similar to the Afrikaans *Somdlovu-hulle* – Somdlovu-they-. This is true also of the Xhosa and Zulu 2a forms, but the relation between the class 2a prefix and the corresponding absolute pronoun is somewhat less transparent in these languages: *oo-* (Xhosa)/*o-* (Zulu) vs *bona*. Since *bo-*, *wo-* etc consist of a sc followed by *-o-*, the Xhosa/Zulu class 2b prefix could be a *na*-less pronominal stem lacking also the sc.

- 48 This is a simplification. Presumably, the +Pl head should be outside the structure lexicalized by the root to provide source for *-s*. Since the Nguni facts suggest that +Pl is rather deeply embedded, this requires movement. If head movement is not an option, the constituent holding the heads below +Pl might raise across +Pl to become the specifier of a head above +Pl. Then, the remnant headed by +Pl would raise out of the whole structure, followed by a second remnant movement across it. Finally, the root would lexicalize the remnant created by the movement of +Pl. However, this would invalidate a restriction to the effect that a stretch lexicalized by a single formative must correspond to a single unbroken subsequence of the fseq (see 1.1.2.).
Alternatively, we might analyze the head lexicalized by *-s* as part of a specifier of the Pl head, which would then be unvalued Pl (or Num) lexicalized in situ by the root together with the higher and lower heads after its specifier has raised.
- 49 More precisely, the number agreement on English finite verbs must not have the structure we have associated with the Nguni scs, since this would give rise to 13 different classes of agreement markers, in the absence of a nominal root swallowing most of the structure. But this seems similar to the fact that finite agreement markers do not contain gender-related heads in Germanic, Romance and Slavic languages with nominal gender, a fact that must be recognized quite independently of what one chooses to think regarding the relationship between Nguni and English nominals.
- 50 The two heads lexicalize separately in at least one Italo-Romance variety: In the dialect of Colonnata, f.pl forms like *canna* end in *-ia*, where the *-a* is identical to the f.sg ending and *-i-* recurs in the m.pl; cf. Manzini & Savoia (2005: III, 619).
Adapting the account of the English plural marking *-s* suggested at the end of footnote 48, we might say that +/-Pl and +/-H are both inside a phrase starting out as the specifier of H on the noun’s projection line and raising successively to Spec-PL (Spec-Num) and out of the nominal structure eventually lexicalized by the root.
- 51 Some adjectives, e.g. *felice* “happy”, neutralize the gender distinction exactly like the nouns in (105), and should be treated the same way.
- 52 We assume that the final *-e* in *cane* and *noce* is epenthetic: Unlike the f.pl *-e*, it can drop in phonologically definable environments; cf. Cardinaletti & Repetti (2008).
Notice also that only +Pl could be inside a raised specifier in the structures underlying (105).
- 53 The question remains why Italian adjectival agreement only distinguishes two genders, since no nominal root is present to cover the extra heads we would postulate on analogy with Nguni. As in the case of the finite verb agreement markers discussed in footnote 49, we could postulate that the Italian adjectival agreement markers have less structure than the Nguni acs, but can offer no explanation why that should be the case. We know

that at least H and -Pl must be projected on the adjective's functional spine, since the analysis proposed for the nouns in (105) would not otherwise extend to adjectives like *felice*. If these correspond to the two lowest heads in the AC-layer established for Nguni, we expect that the fseq cannot project beyond (-)Pl to the extent that only nominal roots can lexicalize the higher heads. But not projecting the fseq beyond that point ought to violate whatever requirement forces the fseq to include the three higher heads of the AC-layer in the Nguni acs.

Similarly, the Italian pronominal clitics come in only two genders and must contain only the two heads Pl and H.

- 54 In participial clauses, a sc is placed on top of the ac. The participial sc1 is *a* (see 6.1.1. below for discussion).
- 55 The example is from Xhosa. The “relativizing” *aba-* looks like a demonstrative except for the lack of an initial *l-*; cf. footnotes 28 and 29.
- 56 The *n* represents a class feature.
- 57 The relativizing *(l)a-* (see footnote 28) coalesces with a following sc1 to yield *(l)a-*, reflecting sc1 = *a-* in non-subject relatives, but surfaces as *(l)o-* in subject relatives, as the result of coalescence with sc1 = *u-*.
- 58 Class 2 nouns, though, usually have no initial vowel at all; cf. Ziervogel & Mabuza (1976:10), who also note that the class 2 prefix is *be-* with nouns denoting members of an ethnic group, e.g. *belumbi* “whites”, *beTjwana* “Tswanas”.
- 59 Xhosa and Zulu could be the same only if coalescence could be replaced with assimilation across an intervening consonant, e.g. giving *wesilisa* from *wa* [_{X'P} *si-* [*lisa*]]. But the required assimilation rule doesn't seem to exist, e.g. *amahhashi kathisha* – 6-horse of 1a-teacher – “the teacher's horses” (Poulos (xx:146) rather the *...*kethisha*.
- 60 This would entail that Zulu and Xhosa lack the formative *i*, unless we find it in some other morphosyntactic context, since it would be unlearnable.
- 61 This variant would, however, require treating the Zulu and Xhosa constructions with *a*, *nga*, *na* as structurally different from their Swati counterparts. If possessive construction, for example, were formed with X' combining directly with the I-layer in Zulu and Xhosa, either X' would lexicalize as *i*, incorrectly giving *a* → *e* across the board in Zulu and Xhosa too, or it would be lexicalized by the *a*, incorrectly giving forms like **wandoda* (from *wa* [_{I-layer} *n* [*doda*]]).
- 62 Perhaps the lack of *i* with *Somdlovu* and other proper names in Swati can be related to the replacement of possessive *a* with *ka* with class 1a nouns in Zulu.
A special complication is that the Swati *i* must be able to occur also on the top of *a* to produce forms like *nebaSomdlovu* – and-sc2-a-Somdlovu – “and Somdlovu's ones” -, suggesting that *a* introduces a separate projection of the fseq up X' when combining with *nga* or *na*, i.e. *a* must have the properties of a “lexical” head.
The *a* “of” on top of A in classes 2 and 6 could be like the *de* on top of *le, la, les* in the French “partitive articles” or the *van* of Afrikaans *van die mans* “some men”, but why only in classes 2 and 6? And why even with a definite interpretation?
- 63 Venda also has a participial sc1 *a-*, like Nguni.
- 64 Abstracting away from class 15 *u-* vs *hu-*
- 65 Possibly, this is related to the fact that nominal structure projects up to A when embedded under demonstrative *la-* in Swati, even though the functional structure on top of nouns may otherwise stop at the top of the SC-layer.
- 66 See Buell (2005) for a discussion of the macrostem in Zulu

- 67 This is in part reminiscent Baker's (2003) proposal that the lowest structural component of verb is an adjective.
- 68 But some Bantu languages allowing two or more ocs. This may be related to clitic cluster formation in Romance; cf. Cardinaletti (2008).

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