Dogon ATR harmony
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ATR (advanced tongue root)

All Dogon languages have two **harmonic sets** of mid-height vowels, {*e o*} and {*ɛ ɔ*}.
+ATR {*e o*} resemble "closed" {*e o*} in e.g. Italian (orthographic é ó), while -ATR {*ɛ ɔ*}
are similar to Italian "open" {*e o*} (orthographic è, ò). These will be referred to as ATR
harmonic sets here, since the phonetic distinctions appear to be close to those that are
referred to by this feature in other West African languages. However, no careful phonetic
study of the Dogon vowels has been made. Indeed, the literature on ATR systems makes
it clear that "ATR" is not a cross-linguistically unitary phenomenon, either articulatorily
or acoustically. See Casali (2008) for detailed discussion.

 Within uncompounded stems, the general rule in Dogon languages is that +ATR
and -ATR vowels do not co-occur. Stems generally enforce backness harmony as well as
ATR harmony. The effect is that the recurrent vowel sequences in bisyllabic stems
beginning with a mid-height vowel are *CeCe, CɛCɛ, CoCo,* and *CɔCɔ*, i.e. with identical
vowel quality in both syllables. Other stems that respect ATR but not backness harmony
(*CeCo, CɛCɔ, CoCe, CɔCɛ*) are tolerated in some languages but usually not common. See
below for *CoC-e* and *CɔC-ɛ* perfective forms of verbs, and for sequences of high and
mid-height vowel like *CiCe*.

 Syllabic **verbal derivational suffixes** (reversive, mediopassive, transitive)
generally harmonize with the vocalism of the input stem. In effect, the combination of
input stem plus derivational suffix is subject to the same vowel-sequence constraints as
underived stems. In Jamsay, where nonmonosyllabic verb stems may end in any nonhigh
vowel, derivational suffixes copy all quality features of the final vowel of the stem. For
example, the Jamsay reversive has five variants *-ra, -re, -rɛ, -ro, -rɔ*, as in *págá-rá, sógó-
rɔ́*, etc. In other Dogon languages, derivational suffixes harmonize for some features
(including ATR) but not all. For example, the reversive in Toro Tegu has only three
variants *-rá, -ró,* and *-rɔ́*. Suffixes with variable vowel are often cited with "v" for
unspecified vowel, as in *-rv́*, there being no [v] consonant (voiced labiodental fricative) in
most Dogon languages.

 In most of the languages, causative suffix *-mɔ́* is an exception that does not
harmonize with the stem. However, its Jamsay reflex *-wv́* does behave like other
derivational suffixes.

 Verbal **inflectional** suffixes marking aspect, negation, and pronominal-subject
category often do not, but sometimes do, harmonize with the preceding stem (underived
or derived). The details are language-specific and are not summarized here.

effect of nasals on ATR values

Harmonic patterns are impacted in Yorno So and Yanda Dom by local interactions of nasal consonants with the ATR value of adjacent mid-height vowels. It appears that nasal consonants favor -ATR in the following vowel, and +ATR in the preceding vowel.

In Yorno So, and perhaps more generally in the Toro So group, a mid-height vowel must be -ATR after a nasal consonant. This results in mixed forms like *démé* 'heavy'.

In Yanda Dom, based on data from an older speaker, original *CɛNɛ* and *CɔNɔ*, with [-ATR] vowels and a medial nasal, have become *CeNɛ* and *CoNɔ*. In other words, an original unclustered nasal forced the shift of a preceding -ATR vowel to +ATR. However, original *CɛNDɛ* and *CɔNDɔ*, with [-ATR] vowels and a medial homorganic nasal plus voiced stop cluster, have become *CɛNɛ* and *CɔNɔ*. Original *CeNe* (plus *CeNDe*) and *CoNo* (plus *CoNDo*) are preserved as *CeNe* and *CoNo*. So we get three rather than just two combinations for each backness value: *CɛNɛ* versus *CeNe* versus mixed *CeCɛ*, and *CɔNɔ* versus *CoNo* versus mixed *CoCɔ*.

ATR affiliation of high vowels

Cross-linguistically, the high vowels {*i u*} are articulatorily and acoustically similar to [+ATR], since raising the body of the tongue correlates with advancing the tongue root. However, in Dogon languages {*i u*} are in most cases phonologically **extraharmonic** (or **neutral**) in the sense that they may co-occur with vowels of either harmonic set. In particular, stems may have vocalisms of the types *CiCe*, *CiCɛ*, *CuCo*, and *CuCɔ*. These sequences are very common, especially in verbs, which usually do not allow shapes with only high vowels (#CiCi, #CuCu).

One possible analysis is that there is a covert ATR distinction in *i* and *u*, so that for example *CiCe* and *CiCɛ* differ in the underlying ATR value of the *i*, which is then transferred by harmony and made overt in the second vowel. However, there is no phonetic evidence for this.

ATR affiliation of low vowel *a*

The relationship of the low vowel *a* to the ATR system is more variable.

In Toro Tegu, *a* has a clear affinity to *ɛ* and to a lesser extent *ɔ* and so can be classified as -ATR. We see this in vowel sequences (*bèrá* 'get!') and in suffixal alternations.

Outside of Toro Tegu, the best evidence for whether *a* is +ATR or -ATR is in languages that have the E-stem. This stem occurs in some languages in otherwise unsuffixed perfective positives, at least for 3Sg subject. In the E-stem, by definition the

stem-final vowel is replaced by *e* or *ɛ* depending on the ATR-harmonic class of the stem. For example, in Donno So we get E-stem perfectives like those in (1).

(1)　　　　stem　　　　3Sg perfective　　　gloss

　　　a.　*gǒ:*　　　　*gó-è*　　　　　　'exit'
　　　　　tómbò　　　*tómb-è*　　　　　'jump'
　　　　　nùŋó　　　　*núŋ-è*　　　　　'sing'

　　　b.　*tɔ̂:*　　　　*tɔ́-ɛ̀*　　　　　　'sow'
　　　　　dɔ̀nɔ́　　　*dɔ́n-ɛ̀*　　　　　'jump'
　　　　　úrɔ̀　　　　*úr-ɛ̀*　　　　　　'butcher'

The harmonic class, +ATR for (1a) and -ATR for (1b), is already clear (in nearly all cases) from the bare stem and other inflected forms. The perfective ending, *-è* or *-ɛ̀*, respects the lexical ATR class.

　　　　To determine the harmonic class of *a*, we therefore consider the E-stem of *Ca:*, *CaCa*, and other stems with *a*-vowels. Does the E-stem end in +ATR *e* or in -ATR *ɛ*? As noted above, some languages lack E-stems (2a). Some additional languages dodge the issue by using I-perfectives instead of E-perfectives with verbs that have *a*-vowels (2b). For the languages of types (2a-b), therefore, the perfective test is not applicable. In the remaining languages, stems with a-vowels are treated variously as +ATR (2c) or as -ATR (2d).

(2)　　a. languages totally lacking E-stem perfectives
　　　　　　eastern: Jamsay, Ben Tey

　　　b. *CaCa* stems have I- not E-stem perfectives
　　　　　　eastern: Donno So, Tomo Kan
　　　　　　northwestern: Tiranige
　　　　　　southwestern:

　　　c. *CaCa* stems have +ATR E-stem perfective *CaC-e*
　　　　　　eastern: Donno So, Tommo So
　　　　　　northwestern: Najamba, Yanda Dom
　　　　　　southwestern: Bunoge, Penange

Mombo ??
Ampari ??

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d. *CaCa* stems have -ATR E-stem perfective *CaC-ε*
   eastern: Nanga (3Sg only), Bankan Tey (3Sg only), Togo Kan
   northwestern: Tebul Ure
   southwestern:

Dogul Dom ??

Najamba vocalism

In this language, stem-to-suffix ATR harmony is conspicuous in nominal and adjectival as well as verbal morphology. There are apparent cases of dominant [+ATR] suffixes imposing [+ATR] on stem vocalism, but also some cases where the suffix assimilates ATR from the stem, and still others where the stem and suffix do not interact. High {*i u*} pattern as [+ATR] in some contexts, but in other contexts they can be extraharmonic (neutral). Low vowel *a* patterns variably as [+ATR] or (more often) [-ATR] depending on the morphological context.

 About half of the nouns and adjectives are "suffixing" stems that have an unsuffixed form opposed to either a plural with suffix *-mbo* or a singular with a suffix like *-ge* or *-ŋgo*. The stem may have [+ATR] or [-ATR] vocalism and there is usually no harmonic interaction between stem and suffix.

 The other half of the nouns and adjectives are "mutating" stems that end in a final long vowel. For most mutating stems, the final long vowel alternates between a front vowel {*ε: e: i:*} and a back or low vowel {*a: ɔ: o: u:*}, generally keeping the vowel-height level and ATR value constant. The most common alternations are therefore *i ~ u*, *e ~ o*, *ε ~ ɔ*, and *ε ~ a*, though there are also some cases with *u ~ e*. Note that *ε* may correspond to either *ɔ* or *a*, which suggests that *a* is associated with [-ATR]. For each noun, one form is singular, the other plural, but the details differ from one noun class to another. For grammatically animate nouns, the front vowel is singular and the back/low vowel is plural; for most grammatically inanimate nouns, the opposite is true; and there are some inanimates that have the front vowel in both singular and plural. The mutating final long vowels are probably the result of contraction of original stem-final short vowels with perhaps several original *-Cv* classifying suffixes related to nouns with senses like 'thing', 'critter (= animal)', 'land', 'liquid', and their plurals. Synchronically, the singular and plural "suffixes" could be analysed as underspecified short vowels marked only [α back] and [α round], added to stem-final short vowels to produce the observed final long vowels.

 Every verb stem can be assigned to a lexical {*e o*} or {*ε ɔ*} harmonic class. However, the lexical vocalism can be overridden by superimposing an {*e o*} harmonic melody on the entire stem; this is audible only when there is a nonfinal *ε* or *ɔ*.

 The lexical vocalism is transparent in the E-stem of the verb. For all regular verbs, the E-stem ends in a partially lexical choice of *e* or *ε*, and any mid-height vowels that

may occur in prior syllables must harmonize with this stem-final vowel. We therefore get lexical vowel sequences *e...e*, *o...e*, *ɛ...ɛ*, and *ɔ...ɛ*. If there are no harmonically sensitive (i.e. mid-height) vowels in nonfinal syllables, i.e. if the only nonfinal vowels are either high {*i u*} or low *a*, the final vowel is [+ATR] *e*. This suggests that [+ATR] is the unmarked stem vocalism. However, for stems with a nonfinal mid-height vowel, *ɛ...ɛ* and *ɔ...ɛ* are considerably more frequent than *e...e* and *o...e*, so the relative markedness of the two ATR values is a complex issue.

In underived trisyllabic and longer stems, the penultimate syllable almost always has an extraharmonic high vowel {*i u*}. This high vowel is "transparent;" i.e. it does not prevent ATR harmony from applying to the flanking vowels, thus *e...i...e* and *ɛ...i...ɛ* are acceptable, but e.g. #*ɛ...i...e* is not.

The E-stem is used, with zero MAN suffix, as a perfective (positive) inflected stem, to which the usual pronominal-subject suffixes are added. There are two other stem-shapes for each verb. The most important is called the "A/O stem." Lexically [+ATR] verb stems, i.e. those with final *e* in the E-stem, shift this final *e* to *o* in the A/O stem. Lexically [-ATR] verb stems with final *ɛ* in the E-stem shift this final *ɛ* to *a*. Moreover, any [-ATR] vowels in prior syllables switch to [+ATR], thus *ɛ* → *e* and *ɔ* → *o*. In other words, the A/O stem is expressed by the combination of a stem-final vowel shift *e* → *o* or *ɛ* → *a*, followed by the overlay of a [+ATR] melody on the entire stem. This melody has no audible effect on lexically [+ATR] stems, or on lexically [-ATR] stems that do not happen to have a mid-height vowel in a nonfinal syllable. Examples of [+ATR] stem vocalisms are E-stems *CeCe-*, *CoCe-*, and *CiCe-* corresponding respectively to A/O stems *CeCo-*, *CoCo-*, and *CiCo-* (the only audibly changed segment being the final vowel). Examples of [-ATR] stem vocalisms are E-stems *CɛCɛ-*, *CɔCɛ-*, and *CiCɛ-* corresponding respectively A/O stems *CeCa-* and *CoCa-* (with final vowel shift plus shift of nonfinal vowel to [+ATR]) and *CiCa-* (where the only audible change is the final-vowel shift).

The suffixes requiring the A/O stem (and hence the [+ATR] melody), excluding those not including a vowel, have either an [+ATR] vowel or an extraharmonic (high or low) vowel. Examples with *o* are present *-njo*, future *-m* (allomorph *-mbo-*), progressive *-mbo*, and causative -me-. Examples with extraharmonic (high or low) vowel are present/future negative *-ndi*, perfective negative *-l(i-/u-)*, and present/future participial *-ŋga*. One might argue that these suffixes are [+ATR] and that the melodic overlay is a special case of dominant [+ATR] suffixes forcing assimilation on preceding stems.

There is a less important I/U stem, characterized by stem-final *i* (syncopated to zero in some positions) or for some monosyllabics *u*. There are actually two I/U stems with different ATR harmonic behavior. Before verbal noun suffix *-le*, the I/U stem imposes the same [+ATR] melodic overlay on the stem that we have seen with the A/O stem. Thus *CɛCɛ-* → *CeC(i)-le*. This could be regarded as harmonic assimilation of the

stem vocalism to a dominant [+ATR] suffix. By contrast, the verb-to-verb derivational suffixes reversive *-le/-lɛ* and mediopassive *-ye/-yɛ*, which likewise require a shift of the stem-final vowel to *i*, themselves harmonize to the (lexical) ATR value of the stem. Thus *CɛCɛ-* → *CɛCi-lɛ-* (reversive) and *CɛCi-yɛ-* (mediopassive).

Each verb has a "chaining form" used in nonfinal position in serial-verb constructions. For lexically [+ATR] verbs, the chaining form is identical to the stem form (with final *i*) used before the verbal noun suffix. For lexically [-ATR] verbs, the chaining form is the E-stem.

To summarize the behavior of *a* in Najamba: 1) nonfinal *a* in verb stems is associated with stem-final [+ATR] *e* rather than with *ɛ* in the E-stem, as in *CaCe-*, but the reversive derivative is of the type *CaCi-lɛ-* with final [-ATR] *ɛ* ; 2) verbal suffixes with vowel *a*, like *-ŋga-*, behave like those with vowel *o* in requiring the [+ATR] A/O stem of a preceding verb (this is arguably morphologized); 3) in nouns and adjectives, *a* is associated with [-ATR] *ɛ*; 4) stem-final lexical [-ATR] *ɛ* is converted by ablaut to *a* in the A/O stem (where the *a* is presumably included in the stem-wide [+ATR] melody), whereas lexical [+ATR] *e* shifts to *o*. So the status of *a* is equivocal with respect to ATR harmony.

references

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