other non syllables the distinction is used only to account indirectly for shortening (or failure to lengthen) of certain vowels.

Transcriptions in slashes /.../ are underlying or intermediate forms; underlined transcriptions are surface forms. My transcription differs slightly from that in Voegelin (1935a and elsewhere), mainly in eliminating redundant distinctions or unnecessary surface phonetic distinctions which do not bear on the central issues. Primary sources are abbreviated Gr (grammar, Voegelin 1935a) and D (dictionary, Voegelin 1935b).

I begin by discussing certain relatively frozen morphophonemic rules. An iterative reduplication is formed essentially by repeating the full stem. My underlying representation of stems includes stem-final vowels, though synchronically it is rather ambiguous as to whether these vowels belong to the stem or to the following suffix. Iterative reduplications seem to reflect this: an underlying short stem-final vowel is omitted in reduplications, hence /lebom-/, 'to enter', present tense /lebom-lebom-/, has reduplication /lebom-lebom-/, as in present tense /lebom-lebom-lebom-/. However, when the stem ends in an underlying long vowel, this vowel shows up in the reduplication, but with its quality assimilated to that of the surrounding syllables' vowels. From /yurta-/, 'fruit is crushing' we get /yurta-yurta-/, present tense /yurta-yurta-yurta-/. In the ex. with 'enter' (see above) the glottal stop in the reduplication is regular, but in other cases an intrusive glottal stop is added: /nurpa-/, 'to pulsate', reduplication /nurpa-nurpa-/, present tense /nurpa-nurpa-nurpa-/. For these exx. see Gr 108.
A second reduplicative pattern is highly productive, distinguishing durative from punctual stems (a fundamental aspectual distinction in this language); it also occurs with a few nouns as a pluralizer. Interestingly, for some verbs the reduplicated stem is punctual and the unreuplicated stem durative, for others the reverse. A small number of verbs have an invariant stem used in both aspects. Historically, what I think has happened is that two originally distinct (in functional terms) reduplications have been combined in a new way. FNUA (Proto-Northern-Uil) appears to have had a *CV- distributive reduplication and a *CV- punctual reduplication. It appears further that the punctual reduplication was limited to a minority of verbs, and that this minority did not permit the distributive reduplication, so there was no real confusion. Southern Fulae preserves both types, and to the best of my knowledge each verb is attested with at most one of the two. Although the FNUA aspectual system involved a durative as well as a distributive (*CV-reduplication) and punctual (*CV-reduplication for some stems, other morphological expressions for the others), Tubatulabal has collapsed the system into a basic binary durative/punctual opposition on which other aspects are built. For some verbs the present opposition of reduplicated durative and unreuplicated punctual is historically that between distributive *CV- reduplication and unreuplicated (durative and punctual) forms; for others the old distributive reduplication probably was not possible in the first place, and an old opposition of unreuplicated durative and reduplicated punctual has survived. Initial consonants in reduplicative segments have been lost in Tubatulabal, so we now have just a V-reduplication (actually, surface ?V- with initial glottal). In addition, if the stem begins in CVN with some nasal N, the reduplication is of the type ?VN- where N becomes a homorganic nasal; this N cannot occur, or is deleted, when the stem begins with a glottal stop, semivowel, or geminate cluster, and the N is apparently omitted when the first stem vowel (hence the reduplicative vowel) in an underlying long vowel.

Exx. are durative /ti-tikka/- and punctual /ti-tikka/- 'to eat', durative /yu-turta/- and punctual /tu-yurta/- 'to be crushing', durative /pa-na/- and punctual /taa-pa/- 'to close' (Gr 95, D 275-28; Voegelin calls durative "atelic" and punctual "telic"). I will call this pattern "vowel reduplication." From now on I will omit writing morpheme boundaries at the reduplicative boundary in the two reduplication patterns.

Reduplications are of interest in the phonology because they display unusual consonant clusters (iterative), provide useful evidence on the operation of certain phonological rules, and show vowel-length alternations.

Another morphophonemic rule is 1-ablaut. Around half of the major verbal suffixes induce a change of the preceding vowel (at end of stem or of a nonfinal suffix) to 1 or a, preserving its length. I mark such suffixes with superscripted 1, hence causative /1-na/-, desiderative /1-pa/-, etc. In addition, there is one suffix, benefactive /3-na/-, which changes the preceding vowel to a or ai.
Historically, *-ablaut is an old UA process (Heath 1977:29-33). It may once have been really a kind of vowel reduction, with stem-final *ə or other vowel being deleted if syllabic conditions permitted, and with this vowel surviving as a weak epenthetic *a if epenthesis was not possible. However, the rule has evolved considerably in Tubu-Talar and is now a quite abstract changing of vowel qualities before certain suffixes. It applies to all underlying vowels including round vowels, and can apply at the boundary between two suffixes as well as at the stem-suffix boundary; in these respects the scope of the rule has been generalized. On the other hand, *-ablaut with benefactive /a-na-/ is a Tubu-Talar innovation. This suffix is apparently from Proto-UA *-ni-, itself from Proto-UA *-li- or perhaps *-li-.

Stem- and suffix-final *a has become a in most cases in Tubu-Talar by an analogical process we will not go into here. Prior to this development, Proto-UA *-ni- and *-na- (causative) were partly homophonous on the surface (specifically, after stems ending in *a in environments where the suffix vowels *a and *ə could not be differentiated, either due to word-final truncation or to *-ablaut involving a following suffix). It appears that *-ni- evolved into a*-ni- at that time so that, by analogy to oppositions of the type *CVni-na- (benefactive) vs. *CVni- (causative) with final-a verbs, even final-i verbs adopted final *a before the benefactive suffix to keep it distinct from the causative. Although the subsequent transfer of final-i stems to the final-a type (by a further analogy) meant that benefactive /a-na-/ could now be distinguished from causative /a-na-/ without this

special *-ablaut, the (now unnecessary) *-ablaut with /a-na-/ remains as a synchronic curiosity.

One further special morphophonemic rule can be mentioned. Present tense /-tt/, surface -a (seen in some iterative exx. above) can be followed by subject enclitics (pronominals). When the enclitic begins with a stop, the dental stop in /-tt/ disappears but we got gemination of the following stop. Hence leg /-kll/ combines with /-tt/ to give /-kkll/, and there is at least one other ex. of this type involving labials (Cr 121-22). In a sense, this process strengthens arguments for taking forms like /kk/ (on the surface, a fortis voiceless stop) as structurally geminate. However, the contraction involving /-tt/ seems irregular and archaic; indeed, in these combinations the enclitic counts as part of the word in stress-assignment, while ordinarily enclitics are treated separately.

We now turn to the phonological rules proper of the language, which apply to representations which may have already undergone the previous morphophonemic rules. Our first important rule is the alternating-length rule (AL), which in its simplest form has the effect of lengthening alternate odd-numbered short vowels going left to right within a word. Because durative (or punctual) vowel-reduplication adds one syllable at the left, it shows the clearest alternations of vowel length. For example, durative /tawiki-na-na-la-/ and punctual /ʔakawi-na-na-la/ appear on the surface as tawiki-na-na-la and /ʔakawi-na-na-la/. For most verbs, complicating factors prevent AL from operating in such a striking fashion. See Swadesh and Vogel (1957:96) for this ex., glossed 'to go along causing (him) to see'.
In noun stems which permit the vowel reduplication (for plural), all available exx. show constant stem-shape, hence /tattuva-1/ tattuva-1 'man', plural /tattuva-2/ tattuva-2 'men'. It is possible to account for these as regular instances of nonapplication of AL because the base forms do not meet the phonological requirements for the rule, but it is nonetheless worth mentioning that nouns manage to evade the surface effects of the rule. I return to the question of conditioning factors below.

There is one special case of AL which has largely escaped notice but which is of great importance for historical IA. In the ex. above glossed 'to go along causing (him) to see', note that both in the durative and punctual forms the lengthening began with the leftmost vowel and then worked on alternate short vowels going to the right, so that the odd-numbered vowels were lengthened. However, there is a small number of verb stems, all apparently bisyllabic, which show a different pattern: taking the stem as G.1.2, I show below the expected and actually attested forms:

<table>
<thead>
<tr>
<th>unreduplicated</th>
<th>reduplicated</th>
</tr>
</thead>
<tbody>
<tr>
<td>expected</td>
<td></td>
</tr>
<tr>
<td>G.1.2</td>
<td>G.1.2</td>
</tr>
<tr>
<td>actual</td>
<td>G.1.2</td>
</tr>
</tbody>
</table>

Note that the reduplicated form is as we would expect (and as we find for regular verbs), but the unreduplicated pattern for these few irregular verbs shows unexpected lengthening of the second (rather than first) vowel. For example, from /ppl6a-1/ 'to go out' we get /ppl6a-1/ and /tipppl6a-1/. The latter will end up as tipppl6a-

showing the effects of a shortening rule to be discussed below in its first (reduplicative) syllable.

One way to explain this aberrant pattern would be to take /ppl6a-1/ as the base form, with second vowel already long. However, this is not possible, because /ppl6a-1- and /tipppl6a-1/ with stem-final long vowel occur only before a suffix. When the stem itself is word-final, the stem-final vowel in these stems is deleted, which (as we will see below) means that the underlying stem-final vowel must be short (if it were long, it would show up as a word-final short vowel but would escape deletion). Hence unsuffixed past punctual tipppl6a- 'went out', not *tipppl6a-, shows that the base form must be /ppl6a-1/, punctual /tipppl6a-1/. Hence presuffixed /ppl6a-1/, punctual /tipppl6a-1/ must reflect the operation of a lengthening rule, and as we have seen this must be a specialized form of AL since it is always the stem-final vowel which is lengthened for these stems.

Although it looks at first sight as though the /ppl6a-1/ type shows analogical leveling of vowel-length patterns, with the unreduplicated form adjusted to the length pattern of the reduplicated form, in fact this is not the correct historical analysis. Instead, this aberrant set of stems in Tubatulabal goes back to a case of *G1V- verbs in Puna with short vowels and unsegmented medial *G. Such verbs showed mobile stress: word-final *G1V, presuffixed *G1V- except for *G1A- before in ablaut suffixes. Lengthened /ppl6a-1/ simply reflects presuffixed *G1A- with second syllable stress (here, as often, Tubatulabal vowel length reflects older vowel stress). See Heath (1977:27-29).
Stems of the /piša/-type so far identified are /ʔôpa/- 'to dive', /paša/- 'to bring', /ʔôpa/- 'to trap'. Gr 66-67, D1.

In general AL does not lengthen (even in intermediate representations) underlying word-final short vowels; such vowels are therefore subsequently deleted by a rule deleting word-final short vowels. Hence past punctual /ʔaṭṭika/ 'ate' becomes surface /ʔaṭṭika/. If the intermediate form after AL were */ʔaṭṭika/ with final long /a/, we would have gotten surface */ʔaṭṭika/. See D1 226.

However, there is reason to think that AL does lengthen word-final short vowels under certain conditions. The stems involved all appear to end in unsegmented /h/ or /ʔ/ plus vowel. For example, consider /weha/- 'to lick', where durative /weha/ and punctual /weha/- (given in presuffixed forms) show the usual lengthening of odd-numbered syllables. Since AL normally does not apply word-finally, we expect unsuffixed past punctual /weha/ to show up as */weha/ via intermediate /ʔeweha/. In fact, we get /weha/ with word-final vowel preserved. Either we restrict the deletion rule so that it does not apply to the final vowel of such stems, or we accomplish the same thing by permitting AL to apply to the word-final vowel, giving intermediate /weha/, which will then regularly show up as /weha/.

Exx. with /ʔ/ instead of /h/ are partly obscured by later rules. Consider /naqa/- 'to dry (lit)', presuffixed stems durative /naqa/- and punctual /naqa/-. I take the latter as */naqa/ via */naqa-/, showing odd-syllable lengthening as usual. Past punctual /naqa/, not */ʔaqa/, suggests intermediate /naqαa/ with AL applying to the word-final vowel as with /weha/-, see Gr 67, D1.

However, in cases like /ʔaʔa/- 'to defecate', where on other grounds we posit segment ʔʔ (or ĥ), there is no evidence that AL can apply word-finally. Compare presuffixed punctual stem /ʔaʔa/- /ʔaʔa/-, showing third-syllable lengthening, with unsuffixed past punctual /ʔaʔa/ /ʔaʔa/-, where there is no indication of third-syllable lengthening at any stage. D1 226.

Rules given so far for AL work when all underlying vowels in the word are short. Underlying long vowels are a complicating factor, since an underlying short vowel is not lengthened when either adjacent syllable has a long vowel. Hence stems like /caqa/- 'to be burning' cannot lengthen their first vowels by AL, and the effect is that if additional short-vowel suffixes are added every even-numbered short vowel will be lengthened, hence /caqa/-CU-CU-CU/- will become /caqa/-CU-CU-CU-CU-. In /caqa/- the second syllable has a "real" long vowel, not one lengthened by AL in its aberrant form seen above with /piša/-. D1 222, Swadesh and Vogel (1957). The generalization that long vowels prohibit lengthening by AL (though not underlying vowel length) in adjacent syllables is not true in all cases. When the long vowel is in the first syllable of a suffix, and the preceding stem-final short vowel is otherwise eligible for AL, the rule can apply: /ʔanappi-witi/- 'he is crying (collective-intensive)' becomes /ʔanappi-witi/- (Gr 106).

We can now state the AL rule as follows:
1. ALTERNATING LENGTH (AL): lengthen any short vowel, going left to right within a word, if:
   a) it is not word-final, or it is word-final after ungeminated \( h \) or \( j \).
   b) neither adjacent syllable has a long vowel (except for a long vowel in the first syllable of a following suffix).
   c) for certain lexically marked verbs like /\( p p i k a / h \), it is not the first syllable of the stem.

   Formulated this way, the rule takes care of the complications discussed above. Condition b, among other things, prevents the rule from applying to successive short vowels. Condition c prevents the rule from applying to stem-initial vowels of the aberrant stems, and the rule will then automatically apply to the second stem vowel of such stems. In general, enclitics are not counted as part of the word for application of AL, but we will not discuss all details of enclitic phonology here.

   Certain morphemes contain surface sequences of the type \( V_1 V_2 \), which behave like long vowels, e.g. in blocking application of AL to adjoining syllables. I will therefore accept earlier analyses taking such forms as /\( V_1 V_2 /\), with a late rule inserting echo vowels.

   Historically, AL reflects alternating stress rules (still found in some other UI languages, and see below for a Tubatulabal stress rule). Probably stressed vowels in open syllables were automatically phonetically lengthened; now lengthening has become primary.

   I have mentioned stem-alternations involving medial glottals of the type durative \( \text{ku} / h \), punctual \( \text{\#kai} / h \) ‘to dry’. Very bad analyses of this type of alternation have been given in the earlier literature. Another unusual pattern is exemplified by durative \( \text{\#i} / h \) and punctual \( \text{\#\#i} / h \) ‘to get up, fly’ (Swadesh and Voegelin 1937:96, Dk; note that the dictionary points to stem-final /\( j \)/, not /\( y \)/, for the latter stem). Earlier analyses have proposed ad hoc T-deletion rules with subsequent contraction of vowel clusters. A much better analysis involving syncope and postconsonantal or preconsonantal (not intervocalic) T-deletion can be formulated. Hence the derivatives for the two punctual stems are these:

\[
\begin{align*}
\text{\#\#i} & \Rightarrow \text{\#i} \Rightarrow \text{i} \quad \text{base form (prefixal)} \\
\text{\#\#i} & \Rightarrow \text{\#\#i} \Rightarrow \text{\#i} \Rightarrow \text{i} \quad \text{AL} \\
\text{\#\#i} & \Rightarrow \text{\#\#i} \Rightarrow \text{\#\#i} \Rightarrow \text{\#i} \Rightarrow \text{i} \quad \text{syncope} \\
\text{\#\#i} & \Rightarrow \text{\#\#i} \Rightarrow \text{\#\#i} \Rightarrow \text{\#i} \Rightarrow \text{i} \quad \text{T-deletion.}
\end{align*}
\]

   Syncope occurs sporadically elsewhere in the language; some such cases are not directly relevant here, others are. In the first category we briefly mention low-level syncope of some short, medial, unstressed \( h \) vowels, and syncope found in a few petrified compounds.

   More directly relevant cases are these: durative \( \text{\#\#i} / h \) and punctual \( \text{\#\#i} / h \) ‘to give’, durative \( \text{\#\#i} / h \) and punctual \( \text{\#\#i} / h \) ‘to smear’, possibly durative \( \text{\#\#i} / h \), punctual (unsuffixed past punctual) \( \text{\#\#i} / h \) or \( \text{\#\#i} / h \) (Voegelin’s transcription inconsistent), see Gr 80, 108 and Di 224, 225. In the clear cases we have syncope of short vowel between ungeminated consonants of which the second is \( h \), and with long vowels in both flanking syllables at the time of
rule application. Both morphologically and phonologically these cases with ɣ are closely similar to the kind of syncope we need for cases with ʔ like Tâšâh- in the derivation just given.

That the flanking consonants must be ungeminated (and of course not consonant clusters) for syncope to occur is suggested by several exx., such as /ʔâthâhâəi- 'to be falling,' surface (durative) Tâshâh- (not Tâshâh-). Here gemination ı is posited because of nonapplication of AL (cf. shortening rules below) in the first syllable, but it also accounts for nonapplication of syncope.

I think that the evidence for the syncope analysis is quite good in the case of Tâšâh- and similar forms (see list, Gr 67) based on /CVTV/- stems. Evidence for syncope in the case of Tâšâh- from /ʔ0ʔ0ʔhâh-/, where syncope occurs in the environment ʔ CV instead of ɣ CV, is not so formidable. Indeed, in forms of /CVTV/- stems with following suffix, syncope plainly does not occur as a regular rule, hence Tâšâh-hîmâna 'to come along drying it' (Gr 128). If we want to have syncope apply in Tâšâh- it will have to be a subtype of syncope applying only within stem boundaries (treating vowel reduplications as part of stems). Actually, this may not be unreasonable since even in the Tâšâh- type syncope involves stem-medial syllables.

Before stating the syncope rule more formally we must first discuss nasal assimilation. Most cases of ɣ in this language are from *k, and a preceding nasal still becomes velar ɣ before h, as in waʃəh- 'acorns,' compound waʃəh-həvâ- 'he is gathering acorns' (Gr 83). Since this does not apply to the output of syncope, as we see in durative naʃâh-, punctual Tâshâh- 'to give', we must order nasal assimilation before syncope (syncope counterfeeds nasal assimilation).

2. NASAL ASSIMILATION: Nasal consonant directly followed by a stop, ʰ, or certain other consonants assimilates point of articulation features of the latter, with ʰ treated as velar.

3. SYNOPE: A short vowel is deleted if
   a. it is flanked by ungeminated consonants; either the following consonant is ʔ or ʰ or the preceding consonant is ɹ.
   b. adjacent syllables, all within the stem, have long vowels.

It is likely that further complications would have to be built into the syncope rule. If Tâshâh- and Tâshâh- are the only cases involving ɣ, we may need to specify that the preceding consonant is labial. Note that syncope follows AL, which provides the long vowels needed in condition a.

We now turn to the rule reducing or deleting word-final vowels, which I call V-reduce. We disregard enclitics here. As I formulate V-reduce, it deletes short vowels and shortens long vowels. The first effect is seen in Tâšâh 'he ate' from /Tâšâkâk/. Shortening of long vowels is seen in Tâshâ 'he gave' from /Tâshâhək/. Of course, this formulation of V-reduce depends on my decision to set up final /a/ and /a/ in these stems; this is correct historically and reasonably synchronically, but alternative analyses involving different placement of morpheme boundaries could also be considered and these analyses would entail reformulation of several phonological rules.
V-reduce is clearly needed to handle many alternations involving verb stems. In nominal morphology it also seems to work, but details are fuzzy since vowel length in underlying representations for suffixes is not obvious and since most noun stems end in long vowels or consonants (those which clearly end in underlying short vowels always seem to take suffixes in available data and their word-final behavior cannot be analyzed at present). Absence of word-final long vowels in nominal morphology itself suggests that V-reduce is in effect; apparent counterexx. like hanti: his own house (object) (Gr 142) is really hanti-y.

Certain monosyllabic morphemes like nahi: 'where?', wati: 'two', a few exclamatory particles, and a few enclitics like -awi: 'after a while, first' and -nit (first singular) are minor counterexx. to the part of the rule shortening final long vowels (Gr 172, 173, 178, 180).

I am aware of only a handful of exceptions to the part of the rule deleting final short vowels, and they are all verbal suffixes. A notable suffix /-ia/ seems to have underlying short vowel, to judge by nišaginâ-ı̯-baṭâ-t 'he is going along hitting him' (Gr 118), but word-finally shows up as -ia with intact vowel (1184). A small number of other similar exx. can be found from close analysis of the verbal morphology.

4. V-REDUCE: With the exceptions just noted, word-finally a short vowel is deleted and a long vowel is shortened.

As the rules are formulated, V-reduce follows AL since the latter lengthens some word-final vowels, which are thus shortened rather than deleted. However, an alternative analysis is possible in which AL never applies to word-final vowels and in which V-reduce is modified so that it fails to delete certain final short vowels (following ungeminated ı̯ or ĕ).

A metathesis rule affects syllable-final (including word-final) clusters of h plus sonorant. Word-finally, note pash-ı̯: 'the skunk' vs. genitive pash-ba (Gr 86). In gânh 'his gray fish' from /coň-h-ı̯/ with suffix -ın, the h is phonetically an aspirated continuation of the nasal (Gr 87). Nominal cases involve iterative reduplications like lânyâlayâ-ni: from lânyâ-ni: 'to be loose' (Gr 110). Metathesis does not take place when the h and sonorant are themselves followed by ı̯ and another consonant: kâh-nâ-nâ: 'to be thick, broad' (Gr 225), apparently a frozen iterative. However, even in this case I have one exx. showing metathesis: khânh-nâ-i̯-i̯: 'to whisper' (Gr 108), apparently also a frozen reduplication.

5. METATHESIS: In syllable-final position, h metathesizes with a following sonorant with some exceptions involving complex clusters of the type h + sonorant + ı̯ + c.

As the rules are formulated, V-reduce precedes and feeds metathesis in a few exx. like tâyâ̱n-ı̯, past punctual of /yâ̱n-ı̯/ 'to believe (him)'.

We are now ready to introduce the ı̯-deletion rule already alluded to above in connection with the derivations of tâ̱fâ̱n-ı̯- from /tâ̱fâ̱n-ı̯/ and of tâ̱nî̯: from /tâ̱nî̯:/. In the present analysis, ı̯ is deleted not intervocally (as in earlier analyses), rather when directly adjacent to another nonsonyllabic.
A verbalizing suffix which I represent as /-?k?-/ is added to a noun to yield a compound verb meaning 'to wear X' or 'to put on X'. Hence nauwa-7 'apron' (with nominal suffix -1), nōdi-7-1 (durative) 'he is wearing an apron', ?nāw-7 (punctual) 'he put on an apron'. Genitive ?7 is needed to account for the short preceding vowel (see below on V-chart). Now when /-?k?-/ is added to pledi-7- 7 'shirt' (as noun pledi-7 with nominal suffix), we get surface pledi-7-7 (durative) and pledi-7-7 (punctual) without surface 7, except that the unsuffixed past punctual is pledi-7-7. See Gr 131-32. Such data strongly suggest that there is a postconsonantal /-deletion rule which, however, does not apply word-finally.

We may now compare this previously neglected alternation with similar alternations which have been extensively commented on before involving / following nasal or liquid. An ex. is 'to sit, live' which we set up as /ha?i/-/ seen in present (durative) ha?i- and past punctual ha?i-7-7. As in the above ex., the /7 shown up on the surface only word-finally; since other stems have past punctuals ending in consonants like /7 without /7 we cannot have a productive /-insertion rule so we put the /7 in base forms and delete it except when word-finally. (Historically, however, /7 in such cases is probably intrusive, cf. pledi-7, the etymon of /ha?i/-/).

As I have shown (top of this page), we must at least add / to the previously recognized nasals and liquids as consonants which can precede /7 subject to /-deletion. I see no reason not to extend /-deletion to position after other nonsyllables (except /7). I therefore consider /-deletion to be part of the derivations of several vowel-restricted forms like ?anai- from /θanai-7/ (see above) 'to cry', ?achi- from /cθa?i/- 'to hit', ?acc- from /sθai/- 'to bite', and ?awai- from /θa?ai-7/ 'to bruil'. However, /-deletion does not seem to occur after /7, as ?ac?i-7-7 'he went along turning' (It 22).

This analysis is perhaps a marginally synchronic validity, though superior to none other accounts. Synchronously it might well be preferable just to speak of an alternation pattern of the type durative /7V/7V, punctual /7V1V/7V2/ (e.g., ?a?i- from /θai-7/) and leave it at that without worrying about how to formalize the phonological rules. However, since my interests are as much historical as synchronic, and since the present analysis has some hope of being historically realistic, I proceed with the formalization.

Although the exx. above suggest that /-deletion fails to apply only word-finally, it is probably the more general or general area of syllable final position which blocks it. We have previously cited iterative reduplication /θobiθobi/ from /θo?iθi/ 'to enter'.

Voegelin's grammar describes several nominal suffixes as beginning in vowels, but an "inorganic" /7 is added when the preceding stem ends in a vowel instead of consonant. I dispute the distinction between organic and inorganic /7 and represent those suffixes as beginning with /7 (actually /7/) subject to /-deletion.

Basic genitive suffix allomorphs are /-?i?i/- following absolutive (nonpossessed) suffix allomorphs -I/, -t-, or -tt-; and /-?i?i-/ with possessed noun stems. The second allomorph often
directly follows a vowel. For example, with ḫan- /house/ we get
kəna- /of his own house/; shortening of the stem-final vowel here
is due to a derivational vowel /a/ of the following suffix.

Second person possessive suffixes /-ʔʔmʔ/ (singular) and /-ʔʔlʔ/ (plural) are phonologically similar. Exx. are kənt- /your house/ and kənt- /your (Pl) house/.

When these genitive and second person possessive suffixes
follow a consonant, the glottal stop usually disappear. Deletion
occurs in šənaʔ- /of his own fish spear/ with possessed genitive
suffix /-ʔʔmʔ/. However, some of Voegelin's transcriptions show
retention of the glottal stop and there is no discernible pattern
governing retention vs. deletion. For example, šənun- /of his
old man/ shows retention after /n/, whereas we have just seen an ex.
of deletion after this same consonant. The other form showing
retention which I have found is kənu- /of his own fingernail/.

To make matters worse, retention of /ʔ/ seems to affect more
placement in šənun- but not in kənun- /of his own house/. I have no simple
explanation for these puzzling and inconsistent data, but the fact
remains that /ʔ/-deletion following consonants is clearly attested
(even though not rigorously applied) with these genitive and second
person possessive suffixes. These exx. provide further evidence in
support of recognizing a relatively general postconsonantal /ʔ/-deletion
rule, and permitting it to apply to the kənun- /of his own house/- verb type.

However, my derivation of ʔəʔi/- from /ʔəʔi/- via /ʔəʔi/-
requires that the /ʔ/-deletion rule also apply to /ʔ/ before consonants.

Evidence for clearer data for this type of /ʔ/-deletion is not very
strong. However, it is notable that clusters of the type /ʔg/ are
extremely infrequent in Voegelin's transcriptions. In some cases
such a cluster is recognized at a deeper level, but an echo-vowel rule
inserts a vowel between the two elements of the consonant cluster.
(See below, rule 9.) Echo-vowel exx. seem to involve geminate /ʔʔ/
rather than simple /ʔ/, so it may still be possible to formulate a
regular phonological rule deleting simple /ʔ/ before another consonant.

The only exx. I have found with surface /ʔg/ clusters are a small
number of iterative reduplications like kənun- /he is pulsing
repeatedly/ and šənun- /be is blinking/. All attested exx.
involve the clusters /ʔ/ and /ʔ/. When the stem begins with stop or
affricate there is no glottal stop in the iterative reduplication:
kwəkən- /he is scooping up water repeatedly in one place/. Other
attested iteratives lacking glottal stop at the reduplicative boundary
include one each where presence of /ʔ/ would have produced /ʔg/ and /ʔg/
clusters; the latter is kwəkən- /be is skipping/. It might be
argued that underlying /ʔ/ is present here (and perhaps in all
iteratives) but is deleted before stops, affricates, /ʔ/, and (in some
forms) /x/. The alternative is to say that /ʔ/ is added only before /ʔ/
(sometimes) /x/, but the basic point is the same: some /ʔg/ clusters seem
to be acceptable and others do not. For iterative exx. see G 106.

It seems to me, then, that there is evidence for some kind of
rule deleting /ʔ/ before consonants and/or a constraint against certain
surface /ʔg/ clusters. Therefore, at least as a historical analysis
I would like to derive /?i?ai/- from /?o?ol/- by a derivation including AL, syncope, and ?-deletion.

As formulated, the rules given above account for a large number of alternations (including some durative/punctual pairs which cannot be adequately handled in previous frameworks for Tubatulabal phonology). However, there are a small number of residual alternations which are not easily accounted for in any available descriptive theory for this language. For example, durative /?i?ai/- and punctual /?i?ai/- 'to be marked' are problematic, though with a certain amount of juggling we may get the forms to come out right. Swadesh and Voegelin (1957:90) propose durative base form /?o?oa/-, hence implicitly punctual /?o?oa/-.

In my system the derivations would be:

<table>
<thead>
<tr>
<th>Base Form</th>
<th>AL</th>
<th>Syncope</th>
<th>?-Deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>/?o?oa/-</td>
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</tbody>
</table>

Perhaps this is not too outrageous, but I have mixed feelings about playing with base forms in this fashion, and I do not know whether these base forms have any historical basis. Furthermore, the syncope rule would have to be slightly complicated to ensure that it applied in the punctual form.

Two other problematic alternations are durative /?i?ai/- and punctual /?i?ai/- 'to hold, keep' (M 228, Swadesh and Voegelin 1957:90), and durative /?i?ai/- and punctual /?i?ai/- 'to plow' (M 228, Gr 68). No one, to my knowledge, has discussed the latter alternation,

but the former was discussed by Swadesh and Voegelin using a very dubious underlying representation with durative /?i?ai?/-, whose /?i/ is a dummy symbol whose sole effect is to shorten a preceding vowel that would otherwise be long. A similar analysis could be proposed within the set of rules I use but it would be similarly dubious.

6. ?-DELETION: Simple ? or geminated ? is normally deleted after a nonyllable (except ?) when followed by a vowel; simple ? (but not ?) is deleted when it follows a vowel and precedes certain nonyllables (stops and affricates, ?, in some cases ??).

Our next rule shortens long vowels, whether underlying or lengthened by AL, before geminates and certain other consonant clusters. It is distinct from the earlier ?-reduce rule, which applies only to nonyllal vowels. Vowels before geminate stops and affricates are always short. Analogy to this leads us to posit that other consonants which have only one surface form also have an underlying simple/geminate distinction, having the same effect on vowels. For example, future suffix /?a?/- shortens preceding stem-final vowels and is thus not up as /?a?/-.

See GR 12.

Of the nongeminate consonant clusters, some induce vowel shortening and others do not. A single cluster may behave differently in different morphemes. For example, /?anai/- 'to rain' has punctual stem /?andaria/-, which presumably should be /?antana/- after AL, hence /?nt/ seems to have shortening effect. However, /?anta?-/- 'to war',
surface /ahai/-, shows long vowel before the same cluster.
See DL 225, 226 for these exx.

7. V-SHORT: A long vowel is shortened before a geminate cluster,
and in a lexically sporadic fashion before other clusters.

V-short must follow syncope to take care of certain derivations
such as that of the punctual form of /nahai/- 'to give':

?nahai- base form
?nahai- AL
?nahai- syncope
?nahai- V-short

We may want V-short also to follow ?-deletion. Underlying
?C or ?C clusters which undergo ?-deletion do not cause shortening of
preceding vowels (unless the C is a geminate consonant or the like),
so it may be that ?-deletion bleeds V-short. Some surface clusters
of the ?C or ?C types do cause V-short to apply, hence /Ichoim3a/-
'to enter' always has long surface or in the second non-syllable
except when the ? remains on the surface, avoiding ?-deletion, as
in past punctual /hōi/ /wē/. See Gr 80, 108.

Of the remaining rules, the one with the greatest surface effects
is stress assignment. It works from right to left, just the opposite
of AL. Final vowels of words (some enclitics are not counted) are
always stressed. Working back to the left, alternate short vowels
are stressed. All long vowels are stressed, and if such a vowel is
preceded by short-vowel syllables the first stressed short vowel is
in the second syllable to the left of the long vowel. Basically, then,
stress the final vowel and all long vowels, and working right to left
stress any short vowel not adjacent to a stressed syllable.

However, this is not quite enough, since the long consonant
clusters found in iterative reduplications can attract stress to
a preceding short vowel which would otherwise go unstressed. Hence
/kuitau-t/- 'he is barking', past punctual /joujatūn/-, where the short
q before cluster hNw is always stressed. We see this in all relevant
iteratives and it is not a special of this (arguably concatenational) stem.
Yogelin handles this by claiming that the ? has "zero value," but
we find the same thing when ? is absent, as in /jumunīs-?/- 'they
are getting loose repeatedly'. It is reasonable to conclude that these
heavy consonant clusters attract stress to the preceding vowel. It
is probable that further study would show some fluctuation in stress
behavior involving various types of cluster. See Gr 80, 108, 110,
147-48 for relevant data and discussion.

8. STRESS ASSIGNMENT: Stress word-final vowels and long vowels, and
vowels before certain heavy consonant clusters; then working
right to left within the word stress any short vowel not
adjacent to a syllable containing a stressed vowel.

We find some stress patterns which deviate from those indicated
by this formulation, mostly involving nouns with fixed stress regardless
of whether suffixes are present: /kuitau-t/- 'firewood', accusative
/kuitau-t/- instead of regular *kuatu-t-a. I consider /m?it?/ 'cat',
accusative /m?it?/-, to be a similar case and reject Yogelin's
analysis of this as another case of 2 with more value. Clearly
these exx. are simply instances of stress leveling within paradigms.

Stress assignment follows V-short since shortened long vowels
function like underlying short vowels in stress assignment. Similar
arguments apply showing that stress assignment follows AI, syncope,
and V-reduce.

Historically, the present stress rule is a recent innovation,
while AL is an indirect vestige of the original stress rule (other
northern UA languages have left-to-right alternating stress similar
to the alternations of vowel length in AL). Presumably, stressed
short vowels in open syllables were automatically lengthened. By
various small changes and reanalyses, length became more "deep" than
stress and we now have an early AL rule whose output affects stress
assignment. Even now, since all long vowels are stressed, there is
a de facto (partial) coincidence of vowel length and stress.

The echo-vowel rule converts /azy/ into /azy/. It also applies
to /azy/ to give /azy/; I do not know whether it applies similarly
to /azy/, a combination I have not found. Exx. are 2amul 'it
got word out' and 2aheya-lu (presumably 2aheya-lu with stress
signs indicated). Echo vowels do not occur in iterative reduplications
like 2amul-lu 'he is pulsating repeatedly', and I suggest that here
the 2 is not underlingly geminate. Note that in 2amul the echo vowel
(the last y) does not get stress; hence the echo-vowel rule follows
stress assignment.

9. ECHO-VOWEL: In a sequence of geminate 2 plus following
nonsyllable, if the 2 is preceded by a vowel or y (or z ?)
insert a short echo-vowel of the same quality between the
2 and the following nonsyllable.

We now account for the voicing of stops and affricates in
certain positions. At this stage we still have geminated and simple
stops and affricates (and other nonsyllables). Word-initially there
is no opposition on the surface even for stops and affricates; the
same is true of word-final position. Intervocically, geminate
stops/affricates are voiceless and simple ones are voiced. In
clusters beginning with nasals there is no regular voiced/voiceless
opposition (the stops/affricates are voiced), except that in a small
number of cases we do get a distinctive voiceless (underlying geminate)
form, as in n2inw2yuyu- 'to be tamed' (Swadesh and Voegelin 1957:29).

In clusters other than those already discussed, stops and affricates
are usually voiceless, hence n2inw2- 'to ease' (punctual). Also
contrast n2ixu-n22i2- 'he is going to gather wild oats' with
2ixu-n22i 'he is gathering salt', both with /-i2i/- (disregard
anomalous length alternations). In t2i2t- 'man' even a cent vowel
y is enough to prevent voicing of the preceding stop, even though it
is not a geminate (geminates cannot be preceded by long vowels).

However, clusters of the type yC may show voicing, whether or not there
is an intervening y, hence n2ixu-n2- 'to make him go ahead',
yzy2y2- 'to shake from cold'. See DI 222, 225, Cr 132, Swadesh and
Voegelin (1957:30).
10. **Voicing**; stops and affricates (noncontinuant obstruents) are voiced if nongeminate and if flanked on both sides by sonorants (vowels, semivowels, nasals, liquids), with a few exceptions involving y and perhaps other nonsyllabic sonorants; other stops and affricates (including geminates and word-initial and word-final consonants) are unvoiced.

We get reasonable but not perfect results from this formulation and some details require further checking. Voicing followings syncope (which can create clusters), V-reduce (which may make consonants word-final), and presumably metathesis (which could switch a sonorant and h before a stop in an iterative reduplication, though I have no clear exx.).

A low-level rule lengthens or geminates consonants in some positions. It is not connected with underlying gemination and has no significant role in the phonology. Since at this surface level, underlying geminate and simplex consonants are treated identically (and are merged phonetically unless differentiated by the voicing rule), I first give a degemination rule merging the geminate/simple opposition and then give the low-level gemination rule.

11. **Degemination**: A geminate consonant cluster is simplified to a plain consonant.

12. **Geminates**: Voiced stops and affricates are geminated (or we could say: lengthened) after short vowel or word-finally after any vowel. Nasals and liquids are geminated after short vowels in nonfinal position. Fricatives and semivowels are optionally (and usually) geminated after short stressed vowels except word-finally (h counts as fricative here). In clusters, the only gemination possible is with voiceless stops, and h before semivowel or nasal.

I present the rule here following Vogel's grammar. It is of little general significance and I will not explore it further.

Degemination follows voicing as I formulate the rules.

Gemination follows degemination; it also follows syncope, V-short, and probably echo vowel.

For completeness we might as well mention a vowel-assimilation rule, though it does not interact with the other rules. It converts /i/ to o (long or short) if the preceding syllable contains o. It may also convert /i/ to u under similar conditions but I have no good example (I am unaware of any such sequences, however). An ex.

Involving o in o-wearing/oeu-t 'he is wearing shoes' with the /-th/ morpheme seen above in other 'to wear' exx. (Gr 134).

13. **Vowel Assimilation**: /i/ assimilates to quality of rounded vowel in preceding syllable.

I am aware of at least one exception, already cited: /u/- (punctual /u/ 'to fly'. Perhaps the long i of the punctual form has resisted assimilation and the dative form has thus been protected. Rule 13 applies overtly only in the case of a small number of alternations and is mainly a statistical constraint.
Rule order is as follows with some allowance for different ordering possibilities if some rules are formulated in slightly different ways:

1. AL (alternating length)
2. nasal assimilation
3. syncope
4. V-reduce
5. metathesis
6. ?-deletion
7. V-short
8. stress assignment
9. echo vowel
10. voicing
11. degemination
12. gemination
13. vowel assimilation

References


--. 1955b. Tubatulabal Texts. UCFAE 34, No. 3.