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Phonological and Grammatical Studies in Modern Nahuatl Dialects

WITH ARTICLES BY:

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EDITOR'S NOTE

It has been almost two years since we first approached the S.I.L. field workers whose articles are represented here and suggested that we cooperate in the preparation and publication of phonological and grammatical studies in Nahuatl dialects currently spoken in Mexico. Their articles represent four of the seven Nahuatl dialects in which S.I.L. workers are currently working.

Tentative conclusions from the dialect testing teams now engaged in measuring degree of intelligibility between Nahuatl dialects suggest that we must deal seriously with almost a dozen mutually unintelligible Nahuatl areas of speech. Dialects definition is an obvious necessity if S.I.L. is to accomplish its goals of literacy materials and Bible translation for indigenous peoples. The structural justification, however, for such dialect definition is not to be found exclusively in the testing devices for measuring intelligibility; rather, it is this set of descriptive articles, with others to follow in subsequent volumes, which will provide the phonological and grammatical clues for differentiating modern Nahuatl dialects.

A second and related purpose for publishing sets of articles on related dialects of one language family is to provide the raw materials for a pan-Nahuatl grammar based on "competence," not simply on "preformance." (Chomsky, 1965).

Wolgemuth's study, with its heavy reliance upon phonetic detail, presents the bare outline for what may prove to be the crucial factor in defining phonological differences among Nahuatl dialects, i.e., a laryngeal phonemena manifested as glottal action, vowel length, voicelessness, and the phoneme /h/. Robinson's article sets forth an analysis of phonological levels in Nahuat, using Pike's tagememic model of 1955. Each level of the "phonological hierarchy" is defined in terms of a different prosodic feature. Brewer's study of Tetelcingo Nahuatl, perhaps the most divergent of Nahuatl dialects from the viewpoint of testing intelligibility, is an inventory of verb and noun morphemes and constructions, emphasizing co-occurrence restrictions. The final article by Robinson and Sischo on Michoacán Nahual is especially useful because of the sparsity of data available of the so-called "-l" dialect of Nahuatl, i.e., the /l/ corresponds to the /tl/ in other Nahuatl dialects. The underlying grammatical structure shows surprisingly little difference with that of Puebla (Robinson, 1966) and southern Veracruz (Law, 1966). Our thanks to each field worker who cooperated in making this volume a reality.

Dow F. Robinson
Tlalpan, Mexico
April, 1969.

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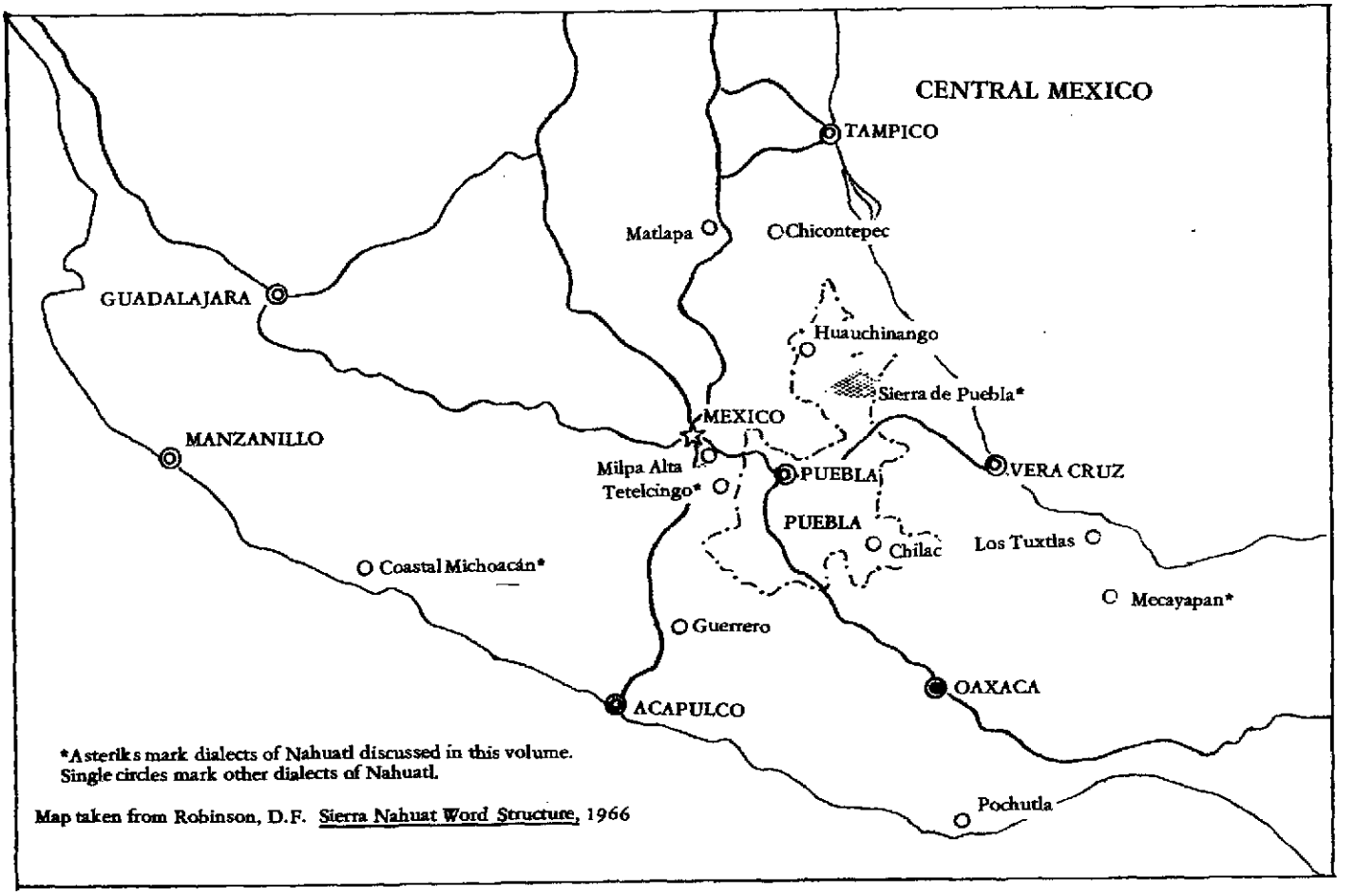

*Asterisks mark dialects of Nahuatl discussed in this volume.
Single circles mark other dialects of Nahuatl.

Map taken from Robinson, D.F. Sierra Nahuat Word Structure, 1966

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I. ISTHMUS VERACRUZ (MECAYAPAN) NAHUAT LARYNGEALS

Carl Wolgemuth

0. This paper describes some salient features and processes of Isthmus Nahuat[1] phonology. The data are presented with a view toward aiding the formulation of more adequate criteria for Nahuatl dialect comparison. Laryngeals is a term used to cover glottal action, aspiration, devoicing, and vowel length. Morphophonemic processes are discussed especially as they relate to these phenomena. In the section on reduction other phonological processes are described not having to do with laryngeals. The o/u variation is described as subphonemic, and some broad patternings of free fluctuation and conditioned variation are noted.

In the phonemic transcription[2] stress is unmarked when penultimate. Clitics, which are atonic and do not affect stress, are separated from the rest of the word by a hyphen.

1. Glottal action is a prominent feature of the phonology. Three types of glottal action are distinguished, the third of which may well be considered a sub-type of the second: 1) that which actualizes a fully contrastive phoneme, a glottal stop; 2) that which occurs predictably as a junctural feature, glottal closure; and 3) that which occurs as pre-glottalization of /t, č, ɬ/, predictable word-finally, but needing further analysis as to the patterning of its occurrence morpheme-finally within compounds.

1.1 Glottal stop /ʔ/ is a phoneme whose distinctive feature is a clear and complete glottal closure with a duration equal to that of the other voiceless stops. The vowel preceding a glottal stop is clearly articulated until abruptly cut off by the glottal action. No laryngealization occurs in the voicing of the vowel either preceding or following glottal stop. No re-articulation of the vowel occurs after a glottal stop.

Glottal stop occurs only in word-final and medial positions, never initially. The majority of its occurrences are in word-final position, where it has altogether replaced what was historically *k and has also largely replaced /t/, with which it is an optional alternate. A glottal stop which occurs in word medial position contrasts with both /t/ and /k/.

1.1.1 Alternation of /ʔ/ with /t/ occurs in nominative forms in which /-t~-ʔ/ is a stem-formative (sometimes referred to as absolutive) suffix. In most of these forms /-ʔ/ is the more frequently occurring alternate both in slow and rapid speech. ta:gaʔ~ta:gat 'man', siwa:ʔ~siwa:t 'woman', kone:ʔ~kone:t 'child, šo:čiʔ~šo:čit 'flower', to:to:ʔ~to:to:t 'bird'. In a small number of words, all monosyllables, /-t/ occurs about as frequently as /-ʔ/. a:ʔ~a:t 'water', tiʔ~tit 'fire', teʔ~tet 'rock', toʔ~tot 'land snail'.

1.1.2 Glottal stop occurs frequently as a tense suffix in verb paradigms. It carries a high functional load in phonemic contrast with /h/, which also occurs as a verb suffix. The absence of a suffix following the final vowel of the verb stem signals yet another paradigmatic form. When such a form occurs in utterance-final position, it is followed by a predictable glottal closure (see 1.2.2) which differs from both /ʔ/ and /h/. Thus there results a three-way contrast involving glottal stop and two acoustically similar sounds, one of which is subphonemic. kitaʔ 'he saw it', kitah 'they see it', kita 'he sees it'; isaʔ 'he woke up', isah 'they wake up', isa 'he wakes up'.

1.1.3 Glottal stop is a morphophonemic alternate of /k/ in the following sets of words: ikalihtiʔ 'inside his house', ikalihtikmeh 'inside their house(s)' (i- 3rd pers poss sg or pl + -kal bound form of kahli 'house' + ihtiʔ ∞ ihtik 'inside' + -meh pl.), tešoʔ~tešok-ti 'mojarra' a specie of fish, (-ti optional atonic stem formative), čipaktiʔ 'clean', čipaktika:ʔ 'clean water' (a:ʔ 'water'), poːʔyowi 'it gets smoked', poːkti 'smoke', kiyeːʔmati 'he likes it', (he feels it to be good), yeːkti 'good'.

1.2 Glottal closure is a juncture feature. It occurs 1) preceding syllable-initial vowels and 2) following vowels before silence. It is phonetically similar but not identical to /ʔ/. After short vowels it differs from /ʔ/ in the following ways: Junctural glottal closure is very brief in duration and often lacks complete closure. Glottal stop has a longer duration and is always distinct. After long vowels the difference is difficult to perceive.

1.2.1 Syllable-initial vowels are pre-glottalized both in word-initial and word-medial positions, except when following stops or /h/. onos a:pis-ti [ónos ˈá:pisti] 'there will be hunger', san-ilpitoʔ [saŋˈilpítoʔ] 'it is just hanging', noohwi [noˈóhwi] 'my path', taočin [taˈóčin] 'young lady', taihtiʔ [taˈíjtiʔ] 'on the inside', moita [moˈíta] 'he sees himself', ki.akiá [kiˈakʸá] 'he puts it in'. (Syllable division in ambisyllabic CiV is indicated by (.). See section 4.3 for discussion of monosyllabic CiV).

1.2.2 Utterance-final open syllables are followed by a predictable glottal closure. This closure has three freely alternating phonetic patterns distinguished by the quality of the release: 1) non-fricative, 2) fricative, and 3) voiced. The three patterns occur as follows:

1) Non-fricative: The voicing stops at the point of glottal closure, and an immediate non-fricative glottal release is heard. The effect is similar to glottal stop and was often mistakenly transcribed as such in the earlier stages of the author's investigation. ki:sa [kíːsaˈ] 'he leaves', moːto [móːtoˈ] 'squirrel'.

2) Fricative: The voicing stops at the point of closure, and an immediate glottal fricative release is heard. The effect is similar to /h/ but differs in that /h/ has

very little friction and never occurs following glottal closure except across word boundaries. [kí:sa'h] [mó:to'h].

3) Voiced: The voicing continues past the point of closure, and a brief nasalized re-articulation of the vowel is heard. This pattern contrasts more clearly with both -V? and -Vh and is often used by the informant when asked to repeat. [ki:sa'a̰] [mo:to'o̰].

1.2.3 In two environments distinction between /?/ and junctural glottal closure [ˈ] is very slight. (Note: ? = fortis, ?̰ = lenis). 1) Following a stressed short vowel the junctural glottal closure is nearly equal to /?/ in sharpness and duration. kipiá [kip^{y}á?] 'he has it', kipiá? [kip^{y}á?] 'he had it'. 2) Following an unstressed long vowel the sharpness and duration of /?/ are reduced. Eg. kone:? [kóne:?̰] 'a child', ikone: [ikóne:ˈ] 'his child'.

Distinctions which are difficult to hear when words such as the previous examples occur in isolation, are easily heard when the words occur utterance-medially followed by a consonant; in this environment junctural glottal closure does not occur. kipiá noga? [kip^{y}á nóga?] 'he has my sandals', kipiá? noga? [kip^{y}á? nóga?] 'he had my sandals, kone:? yeh nepa nento? [kóne:? yeh népa nénto?] 'the child that is walking over there', ikone: yeh nepa nento? [ikóne: yeh népa nénto?] 'his child that is walking over there.

1.2.4 Word-final /t,ɸ,č/ occur pre-glottalized. nakat [naka'ˀt] 'meat', tit [ti'ˀt] 'fire', a:t [a:'ˀt] 'water', okič [óki'ˀč] 'male', ikeč [íke'ˀč] 'his neck', k^{w}apatač [k^{w}apáta'ˀč] 'flat-sided log' (k^{w}a'wood' + patač 'flat object'), kalwi:č [kałwi:'ˀč] 'sooty cobwebs' (kal- 'house' + wi:č meaning obscure), itepoɸ [itépo'ˀɸ] 'his back', e:łwatoɸ [e:łwato'ˀɸ] 'a skinny person', kočwiɸ [kóčwi'ˀɸ] 'sensitive plant' (koč- 'sleep' + wiɸ 'thorn').

Root final /ɸ, č/ sometimes occur pre-glottalized within compounds[3]. mokičmati [moki'ˀčmáti] 'he feels manly' (m- reflexive + okič 'male' + mati 'know, feel'), nehmačtaksatiá [nehma'ˀčtaksat^{y}á] 'he goes creeping along' (nehmač- 'cautiously' (?) + -taksa 'step' + -ti- connective + -ya 'go').

Root final /ɸ, č/ always occur without pre-glottalization preceding stem-formative -ti and derivational suffix -ti?. okič-ti [ókiči] 'a male', tepoɸ-ti [tépoɸti] 'back' (anat), wiɸ-ti [wíɸti] 'thorn', wiɸti? [wíɸti?] 'thorny', patačti? [patáčti?] 'flattened'.

2.0 The /h/ phoneme is the counterpart of saltillo in classical Nahuatl. It occurs occasionally in syllable onset but predominantly in the coda[4]. /h/ is a clear, voiceless, and almost frictionless aspirate having the quality of the preceding vowel and a characteristic duration equal to that of other continuants. This section notes some patternings in its occurrance, especially in its morphophonemic alternation with other phonemes or sequences of phonemes.

2.1 Spanish loans:[5] Spanish words ending in a vowel acquire -h in most cases. mače:teh < machete, k^{w}e:rah < afuera 'outside', moli:noh <molino 'grinder', kristia:noh < cristiano 'human being/Christian', pa:leh < padre 'priest', ko:lpah < culpa 'sin', sie:rtoh < cierto 'certain'. Exceptions are: pe:lo < perro 'dog',

(contrasts with pe:loh < pelo 'hair'), domi:ngo < domingo 'Sunday' (contrasts with domi:ngoh < Domingo a man's name), ko:šo < cojo 'lame', so:lo 'only', ga:yo < gallo 'rooster', pa:nko < banca 'bench', mante:ka? < manteca 'lard'.

2.2 /h/ alternates with /-was -gas, -skeh/ in certain future tense constructions. Eg. tita:tapohtoskeh ~ tita:tapohtoh 'we will be conversing' (stative), kiči:-was ~ kičí:h 'he will do it', kiwahligas ~ kiwahlíh 'he will bring it'. (See Section III on patterns of reduction.)

2.3 After long vowels syllable-final /s/ of the future and desiderative verb constructions is optionally replaced by /h/ word-finally and before /n/ word-medially. /h/ occurs more frequently than /s/. kihli:s ~ kihli:h 'he will tell him', koni:sneki ~ koni:hneki 'he wants to drink', kipetko:s ~ kipetko:h 'he will bruise it', čolo:sneki ~ čolo:hneki 'he wants to flee'. In Spanish loans syllable final /s/ is in many cases optionally replaced by /h/, reflecting the tendency of [h] to manifest syllable-final /s/ in the southern Veracruz dialect of Spanish. Eg. ma:s ~ ma:h < más 'more', die:s ~ die:h < diez 'ten', ti:sneh ~ ti:hneh < tizne 'soot', o:mbres ~ o:mbreh < hombres 'men'.

2.4 Occurrence of /h/ in preterit tenses and derived forms of verbs correlates with regular loss of stem formatives / -wa ∞ -ya ~ -á/[6]. motalowa 'he runs', motaloh 'he ran', motalohka 'he had run', motalohkeh 'they ran', motalohtinemi 'he goes running around', kita:liá ~ kita:liya 'he puts it', kita:lih 'he put it', kita:lihka 'he had put it', kita:lihkeh 'they put (pret.) it', kita:lihto? 'he has it put', (stative). (See section 5.3.2 for occurrance of vowel augment instead of /h/ with future tense and aspectual suffixes.)

Most verbs not undergoing loss of stem formative do not acquire /h/. kita 'he sees it', kita? 'he saw it', kitaka 'he had seen it', kitakeh 'they saw it', kitato? 'he is seeing it' (stative). (Exceptions: kik^{w}a 'he eats', kik^{w}ah 'he ate'/'they eat', kik^{w}ahkeh 'they ate', kima:ma 'he hauls it', kima:mahkeh 'they hauled it', tamahma 'he goes hunting/fishing', tamahmahkeh 'they went hunting/fishing'.)

In certain verbs the loss of /-wa/ preceding preterite plural suffix is optional; however, /h/ occurs whenever -wa is lost. kikowa 'he buys it', kikowa? 'he bought it', kikowakeh ~ kikohkeh 'they bought it'.

The following forms also demonstrate the correlation between occurrance of /h/ and loss of -wa: kikoya:wa 'he widens it', ikoyahka 'its width' (i- 3rd person possessive prefix + -ka nominalizer suffix); toma:waya 'it gets plump', itomahka 'its thickness'. Where no such loss occurs, no /h/ occurs: weyá 'it grows long', iweyaka 'its length'.

Regarding occurrence of /h/ in place of lost syllables, compare Whorf's comments on Nahuatl of Milpa Alta, in which he notes a correlation in the occurrance of saltillo with what he called weakened moras. (He described saltillo as a combination of glottal action and breath [?h].) "However in many cases it [saltillo] seems to stand in place of a former 'weakened' — where weakened means unstressed, feebly articulated, and usually low-toned — mora, or moras, which moras have retained the elements of length (duration, or prosodic quality), glottal action, and breath, but nearly or quite lost those of oral action and sonancy."[7]

Patterning of co-occurrances of /h/ with certain suffixes, and of /:/ (length) with others, remains open to analysis. (See section 5.3.2)

3.0 Voicelessness is a feature of allophonic variants of vowels and resonants.

3.1 Short vowels in post-stress syllables ending in /h/ optionally occur voiceless. In such cases /h/ is indistinguishable from the voiceless vowel. If the preceding consonant is a resonant it also occurs voiceless when the vowel is voiceless. akanah [akánah+ akáNA] 'nowhere', ayoh [áyuh+ áYU] 'squash', tisih [tísih+ tísI] 'they grind', asíkeh [asíkeh+ asíkE] 'they arrive'.

3.2 Syllable final resonants /l,y,w/ occur voiceless in certain environments. A brief voiced onset optionally precedes the devoicing.

Syllable-final /l/ occurs voiceless in all environments. It has a very light fricative quality following /i/ but almost no friction following other vowels. nopilǿi:n [nopíl̥ǿi̥:] 'my offspring', a:ltepe:? [a:ɬtépe:?] 'village', ilwi? [íɬwi?] 'fiesta', čakallili:n [čakaɬlíli̥:] 'small shrimp' pl.,' e:lwatoǿ [e:ɬwátǿ] 'a skinny person', tayo:l [táyo:ɬ] 'shelled corn'.

3.2.2 Syllable-final /y/ occurs voiceless except when followed by a voiced consonant. Eg. čaycaːyi [čaYčáː yi]'centipede', so:tkoy [só:tkuY] 'elbow' (probably borrowed from neighboring Popoluca), kišaygamaka [kišaygamáka] 'he turns a cheek toward him'.

Syllable-final /w/ occurs only word-finally and is optionally voiced. Eg. čoów [čoów ~ čoó W] 'boy!', pi:píw [pi:píw ~ pi:píW] 'Auntie!', hena:rów ~ hena:róW] 'Genaro!'.

(For voiceless variants of these and other resonants as a realization of syllable type RVh see section 4.2)

4. Certain phonemic sequences reduce in normal speech either through loss of a syllable, or alteration of a syllable by fusion of two phonemes into a portmanteau phone. The following are some of the more common types of reduction[8].

4.1 The syllables /ya, wa, wi, ga, gi/ are optionally lost in post-stress position. These sequences occur frequently in verbs and adverbial particles. The result of this type of reduction is word-final stress. kičiːwa~kičíː 'he does it', kimahka:wa~kimahká: 'he lets go of it', kite:ga?~kité:? 'he laid it out', kitegi?~kité? 'he cut it', kimaga?~kimá? 'he hit him', mimiliwi?~mimilí? 'it rolled', moločiwi?~moločí? 'it shriveled', ompiga~ompí 'around there' (out of sight), neiga ~neí 'around there' (within sight), nihiga~nihí 'around here', kiwahliga~kiwahlí 'he brings it', kitato:ya~kitató: 'he went and saw him', kitako:ya~kitakó: 'he came and saw him'.

4.2 Etic syllable patterns are altered through syllabification of resonants. There is an optional loss of an unstressed short vowel following syllable-initial resonants /l, y, w, m, n/, when the resonant is preceded by a vowel. This type of vowel loss is limited to: open syllables, syllables ending in /?/, and those ending in /h/.

1) An open syllable reduces to a single resonant VRV → VR. šikakili [šikakíli ~šikakíl] 'put it in it', kita-ya [kítaya ~ kítay] 'he already sees it', kikowa [kikówa ~kików] 'he buys it', tami [támi ~tám] 'it ends'.

2) A syllable ending in /ʔ/ reduces to a resonant plus glottal stop VRVʔ → VRʔ. kikowaʔ [kikówaʔ ~kikówʔ] 'he bought it' tamiʔ [támiʔ ~támʔ] 'it ended', ɸaya:niʔ [ɸayá:niʔ ~ɸayá:nʔ] 'it split', tomaʔ [tómaʔ ~tómʔ] 'tomato'.

3) A syllable ending in /h/ reduces to voiceless resonant VRVh → VR (/y/ excepted). nikakilih [nikakílih ~nikakíl̥] 'I put it in it' (preterit), kikowah [kikówah ~ kikóW] 'they buy it', kamoh [kámoh ~káM] 'sweet potato', akanah [akánah ~akáN] 'nowhere', kite:mohtinemih [kite:mohtinémih ~kite:MtinéM] 'they go around hunting it'.

In the reduced forms, the resonant though etically occurring in a syllable coda, retains features corresponding to its original emic position in the onset. These features include 1) full voicing (except when manifesting a sequence including /h/), and 2) full contrast between /m/ and /n/. These features suggest the interpretation that R, Rʔ, and Ṛ constitute a set of portmanteau syllabic resonants in which the presence of a vowel is emically manifested, though contrast in vowel quality is neutralized.

4.3 Syllables are altered through reduction of /iy/ following a consonant[6]. The sequence /iy/ preceding /a/ or /o/ in certain environments reduces to palatalization of the preceding consonant, with accompanying loss of a syllable nucleus.

4.3.1 Reduction of 'stressed' /íy/ results in a shift of stress to word-final position. It involves only the sequence Cíya, which reduces to C^{y}á. The full form has two clearly discernable syllable nuclei with stress on /í/, the vowels being separated by a high-front semi-vowel following the pattern VyV common in the language. The shorter form has but one syllable nucleus, and stress occurs on /á/. nikihliya ~ nikihliá [nikihlíya ~nikihl^{y}á] 'I tell him', kilpiya ~kilpiá [kil̥píya ~kil̥p^{y}á] 'he ties it', niya ~niá [níya ~n^{y}á] 'I go'.

This reduction of stressed /íy/ occurs almost exclusively in the verb system. Word-final /-iá/, wherever it occurs in the data, is the phonemicization arbitrarily chosen to represent the form reduced from /-íya/. (Problems of phonemicization are discussed below.) The reduced form occurs in speech far more frequently than the full form.

/íy/ is not reduced following /h/. kihíya 'he dislikes him'.

4.3.2 Reduction of 'unstressed' /iy/ results in loss of a syllable nucleus but does not affect stress placement since it occurs pre-stress. It is demonstrable as a reduction in the following: piomo:l [p^{y}ómo:l] 'chicken gravy' (piyo 'chicken + bound allomorph mo:hli 'gravy'); pioteksis [p^{y}utéksis] 'chicken egg' (piyo 'chicken' + teksis 'egg'); niya:ti ~nia:ti [niyá:ti ~n^{y}á:ti] 'I am going to go' (ni- 1st person subject prefix, -ya v. root 'go', /:/ length feature replacing -wi stem formative, -ti incomplete aspect suffix). One word involving /ey/ rather than /iy/ suggests itself as the morphophonemic source for the same type of reduction: tio:pan [t^{y}o:pan] 'church' (god-place) (teyo:ʔ 'thunder maker', a legendary being responsible for thunder and lightning, + -pan locative). cf. teo:tl 'god' of classical Nahuatl

Many Cia sequences[9] are phonetically identical to the reduced forms cited above in regard to palatalization of the consonant, but have no known bisyllabic morphopho-

nemic alternates or sources involving /y/. piali [pʸáli] 'greetings!', siawi [sʸáwi] 'he tires', mia:wa [mʸá:wa] 'corn tassle', tiawa:? [tʸáwa:?]~kiawa:? [kʸáwa:?] 'rain', nia:wĭšti? [nʸa:wĭšti?] 'dark streaked'. (*piyali, *siyawi, and *miya:wa are unacceptable to the informant as alternates. However, cognates of the latter two appear with /y/ in Tetelcingo Nahuatl[10].) Together with the Cia/Cio sequences that can be shown to result from reduction of /iy/ they form a distinct syllable type.

The above CiV sequences are interpreted as single syllables for the following reasons: 1) they have the durational features characteristic of single syllables, and 2) they are reduplicated as single syllables. miahmiakeh 'many many things', miakeh 'many things', motiohtiomati 'he thinks he's big', tio- 'uncle' (bound form), kipiahpiá 'he has many many'.

As a syllable type mono-syllabic CiV contrasts with bisyllabic vowel sequences. In mono-syllabic CiV the V is not preglottalized; in bi-syllabic CVV the second V is preglottalized. (See section 1.2 on junctural glottal closure.)

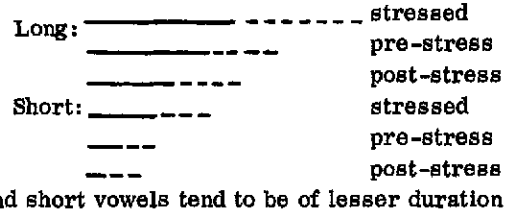
In the traditional phonemicization no distinction is made between mono-syllabic and bi-syllabic sequences. An indication of syllable division is necessary however, to distinguish between minimal pairs[11]. nia:ti][nʸa:ti] 'I am going to go', ni·a:ti [ni'a:ti] 'I am having something to eat/drink'.

5.0 Vowel length is viewed in this paper as a prosodic feature of the syllable nucleus. Every syllable nucleus is either long or short. Contrastive length occurs in all environments, with two limitations noted in 5.3.4. A random sampling of text contains approximately 25% long vowels. Only one word and one bound form found thus far have free variants differing only in vowel length. miso:ta~mi:so:ta 'he vomits', sepan-~se:pan- 'each other'.

5.1 Duration is the diagnostic feature of vowel length. In any given environment long vowels have a characteristic duration of about twice that of short vowels. This is an impressionistic judgment and has not been verified electronically. Vocalic quality is discussed in section 6 and interpreted as not being a diagnostic feature of length.

Environmental factors correlating with etic duration differences are: 1) position in relation to stress, and 2) presence or absence of a post-posed vowel.

1) Greater duration is associated with stress. Both long and short vowels tend to be of greater duration when stressed, lesser when occurring pre-stress, and least when occurring post-stress. The following diagram indicates roughly the relative etic durations as nearly as they can be ascertained from oral and tape recorded data. The dotted line represents the extent of optional variation and serves to illustrate that a stressed short vowel may occur etically longer than an unstressed long vowel.



2) Both long and short vowels tend to be of lesser duration when followed by

another vowel in normal speech. At times length contrast is barely perceptible. Emic contrast however, is retained by occurrence of a more distinct glottal closure following an emically long vowel when it is etically shortened preceding another vowel. kitaahaki:ɬtih [kita'ahakí:ɬtih] 'he dressed him', ima:a:kayo [ima:'a:káyu~ima?a:káyu] 'his arm bone' (lit. 'his arm cane'), taočí:n [ta'óčį:] 'young lady', ikʷa:ohwi [ikʷa:'óhwi ikʷa?óhwi] 'his hair part' (lit. 'his head path'), te: ito:ka:? [té:'itó:ka:? ~ té?itó:ka:?] 'what is his name?'.

Length contrast is neutralized in a stressed syllable which is lengthened for emphasis. er ista:?! [eřʰ'ſ;---sta:?] 'my how white!'

5.2 Vowel length correlates with certain consonant allophones.

5.2.1 The continuants /s, š, h, l/ and flap /ř/, when syllable final before another consonant within words, have a longer duration after short vowels than after long vowels. The sibilants show a lesser degree of lengthening than the nonsibilants; the latter, /h, l/, and /ř/ have a duration approximately equal to that of an entire short syllable when preceded by a short vowel. The lengthened component of /ř/ is aspiration following the single flap. erma:noh [eřʰ:má:noh] 'fellow villager', enfe:rmoh [eɱfé:rʰmoh] 'sick', tamalɸi:n [tamáɬ:ɸį:] 'small tamale', koma:lɸi:n [komá:ɬɸį:] 'small griddle', kihlih [kíh:lih] 'he said it', mi:hli [mí:hli] 'corn field', kosti? [kós:-ti?] 'yellow', pi:sti? [pí:sti?] 'black', košta:lmeh [kuš:ta:ɬmeh] 'cloth bags', a: mo:šk̬ʷita? [a: mo:šk̬ʷita?] 'green scum'.

5.2.2 Word-final nasal /n/[12] has allophones correlating with the presence or absence of length in the preceding vowel and with the articulatory features of the vowel. Following a long vowel /n/ is realized as nasalization of the vowel, with no distinct tongue closure. Following a short vowel the nasal is realized with light tongue closure and nasalization of the vowel. Voicing tends to stop simultaneously with tongue closure. The point of articulation of the closure varies as follows: after low vowels /a, e/, velar [ŋ]; after high front /i/, alveopalatal [n̈]; after back /o/, alveolar [n]. V:N → V̥: VN → V̥n, n → [ŋ] /a e__ #, n → [n̈*/i__#, n → [n /o__#. taye:ka:n [tayé:ca:] 'a nice place', yehame:n [yehámę:] 'they/them', a:yo:ɸi:n [a:yó:ɸį:] 'turtle', a:toto:n [a: tótọ:] 'hot water', wehkapan [wehkápaŋ] 'tall', kipehpen [kipéhpęŋ] 'he gathered it', okʷilin [okʷfliñ] 'worm', ite:nɸon [itę:ɸọn] 'his beard'.

Within words syllable-final nasals are conditioned in the same manner as word-final nasals, with the following exceptions:

1) If preceded by a short vowel the nasal assimilates to the point of articulation of the following consonant. antisih 'you (pl) grind', ampa:kih 'you enjoy yourselves' anka:wih [aŋká:wih] 'you (pl) remain', enfe:řmoh [eɱfé:řʰmoh] 'sick'.

2) When the nasal is followed by /y, w/ there is no distinct tongue closure. anwa:lkeh [aẉá:ɬkeh] 'you (pl) came', itanyo [itáẏu] 'its notched part', senyowal [seẏówaɬ] 'all night'.

A long vowel preceding syllable-final /n/ occurs etically shortened preceding a syllable-initial vowel in the same manner described in 5.1 for a vowel followed by a vowel. That is, since /-n/ is actualized as nasalization of the vowel, the syllable type CV:n behaves as CV: rather than CV:C. ite:na:yo [itę:'á:yu~itę?á:yu] 'his saliva', no:ya:n ono? [nó:yą:'óno?~nó:yą?óno?] 'it is everywhere', inó:n iga [inó:'íga~inó?íga] 'that is why'. In rapid speech the nasal quality may disappear entirely from vowels such as those in the above examples.

5.3 Length functions contrastively both in the lexicon and the grammar. Pairs of words occur in which length is the only phonemic difference. kitoka 'he follows him', kito:ka 'he buries him/he plants it', kimana 'he cooks it', kima:na 'he stretches it out', kipata 'he changes it', kipa:ta 'he beats/softens it', kipolowah 'they lose it', kipo:lowah 'they swarm around it', kitolowa 'he swallows it', kito:lowa 'he bends it down', kitemowiliá 'he gets it down for him', kite:mowiliá 'he hunts it for him' (kitemowiá 'he gets it down', kite:mowa 'he looks for it'), ista? 'salt', ista:? 'white', čičí:? 'bitter', čí:čí? 'he (infant) nursed'.

5.3.1 Patterned morphophonemic changes involving length occur in nouns and verbs. In some idiolects the vowel in the final syllable is lengthened in certain noun forms when the word takes a possessive prefix and loses the stem-formative -t~-?. toma? 'tomato', itoma: 'his tomato', naka? 'meat', inaka: 'his meat', šapo? 'hole', išapo: 'his hole', ɸapo? 'banana', iɸapo: 'his banana'. In other possessed forms this length feature is absent. a:ma? 'paper', iya:ma 'his paper', ilwi? 'fiesta', iyilwi 'his fiesta', šo:či? 'flower', išo:či 'his flower', tet 'rock', ite 'his rock', tit 'fire', iti 'his fire', ohta? 'bamboo', iyohta 'his bamboo'.

5.3.2 In the verb system a length feature correlates with occurrence of future tense and aspectual suffixes when there is a loss of a stem formative suffix -wa or -ya~-á. kihtowa 'he says it', kihto:h 'he will say it', kihto:to 'he went to say it'; kita:liya~kita:liá 'he puts it', kita:li:h 'he will put it', kita:li:to 'he went to put it'. Most verb forms not undergoing loss of a stem formative do not acquire the length feature. Eg. kočí 'he sleeps', kočis 'he will sleep', kočito 'he went (somewhere) to sleep', kimaka 'he gives it to him', kimakas 'he will give it to him', kimakato 'he went to give it to him', kika:wa 'he leaves it', kika:was 'he will leave it', kika:wato 'he went to leave it'; Exceptions: kik^{w}a 'he eats', kik^{w}a:h 'he will eat', kima:ma 'he hauls it', kima:ma:h 'he will haul it', tamahma 'he goes hunting/fishing', tamahma:h 'he will go hunting/fishing'.

The aspect morpheme -to in some of the preceding examples acquires length in the perfective -to:ya, which contrasts with the stative perfective -toya. kikowato 'he went to buy it', kikowato:ya 'he went and bought it', kikowatoya 'he was buying it', kikowato? 'he is buying it'.

5.3.3 Spanish loans normally have one long vowel corresponding to Spanish stress placement. Length remains fixed on that vowel and does not shift with stress when suffixation occurs. me:sah < mesa 'table' (pl: me:sahmeh), kola:l < corral 'fence', šapo:n < jabón 'soap', paša:lowa < pasiar 'take a walk', nase:rowa < nacer be 'born'.

Two Spanish loans have two long vowels each. a:ko:sah < aguja 'needle', a:lpine:l < alfiler pin. A possible explanation for the occurrance of length on the initial vowel in these two loans is their analogousness to high frequency words containing initial /a:/. a:ltepe:? 'village' a:cormi? 'water pot' a:wayoh 'oak grove' a:ca? 'cane' a:čikiwi? 'shrimp trap'.

A few function words borrowed from Spanish have no long vowels. Eg: de 'of', que 'that', o 'or', porque 'because', para 'for'. Others fluctuate between long and short. Eg: pero(h)~pe:ro(h) 'but'.

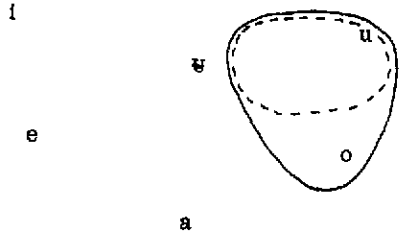
5.3.4 The following limitations are noted in the occurrence of long and short

vowels: 1) Only short vowels occur in clitics. 2) Only long vowels occur in the word-final stressed syllables of a class of adverbials ending in /-n/. ihkó:n (in that way', ihki:n 'in this way', ačó:n 'that much', ačí:n 'this much', alí:n 'a little bit', imaní:n 'quickly', iná:n 'now'. These long vowels contrast with short vowels in analogous environments of stress and syllable final /n/. When stress is shifted they continue to contrast with short vowels in analogous environments. ačo:ntito? 'it stays the same', ihko:npameh 'they are equal', in contrast to iɬontekon 'his head'.

6.0 The o/u variation in the Nahuatl dialects has been a problem of considerable interest to investigators[13]. Data is therefore presented to indicate a patterning of this variation as it relates to vowel length and other phonological factors.

6.1 The /o/ phoneme[14] has a phonetic range which includes [u] at its highest point, approaches [ɔ] at its lowest, and a mid-high[ʊ] at its most central. (See below, chart A)

CHART A



The solid line indicates the approximate range of the /o/ phoneme. Within this range the various phonetic realizations represent a continuum with no discrete break between the higher and the lower. The symbol [u] in the examples given in this section represents the vocalic range roughly included within the dotted line, that is those sounds which are interpreted by speakers of both English and Spanish as being other than [o] and in some way more akin to [u]. The allophones within this range will be referred to as the higher allophones, and the conditioning processes discussed in 6.3 which result in the occurrence of [u] will be referred to as heightening.

6.2 Long /o/ exhibits a pattern of free fluctuation anywhere within the back half of the higher and lower phonetic ranges. čo:ka [čó:ka~čú:ka] 'he cries', to:na [tó:na~tú:na] 'it (the sun) shines', šo:či? [šó:či?~šú:či?] 'flower', kito:lowa [kito:lówa~kitu:lówa] 'he bends it down'.

6.3 Short /o/ exhibits a pattern of conditioned variation related to combined factors of stress and contiguous consonants.

6.3.1 The consonants most consistently occurring contiguous to [u] are /y, š, č, l, m, n, p/. These will be referred to as conditioning consonants. iya:yo [iyá:yu] 'its juice', ko:šo [kó:šu] 'lame', talampoš [talámpuš] (a specie of fish), so:t-

-koy [só:tkuY] 'elbow', kisoloh [kisóluh] 'he ruined it', teyoh [téyuh] 'a rocky place', šošokti? [šušókti?] 'green', yoyotoka [yuyutóka] 'it dribbles', yokayawi [yukayáwi] 'he goes on purpose', nošwiyo [nušwíyu] 'my godchild', moločiwi [molučíwi] 'it shrivels', šolpi? [šúɬpi?] 'it came untied', a:polaki [a:puláki] 'it gets soaked', to:tolsa:wa? [to:tuɬsá:wa?] 'chicken-pox', ko:kočtokeh [ko:kučtókeh] 'they are falling asleep'.

6.3.2 There are varying degrees and kinds of conditioning. The greatest degree of heightening occurs in unstressed positions preceding the alveopalatals /y, š, č/. With the alveopalatals heightening is accompanied by centralization. In stressed positions heightening is usually associated with the occurrence of /l/ following the vowel, or of two contiguous conditioning consonants, one preceding and one following the vowel. Bilabials /m, p/ affect the vowel chiefly through closer lip rounding and usually in co-occurrence with another conditioning consonant contiguous to the vowel. Nasal /n/ appears in the list in syllable-final position only and in co-occurrence with syllable-initial bilabials. The intervening vowel is nasalized and perhaps for that reason merely sounds somewhat closer than its oral counterpart.

The following is a chart of sequences in which the vowel most consistently occurs as [u]. Hyphens indicate syllable divisions within words. Absence of a hyphen before or after a sequence indicates word boundaries except where a single phoneme occurs to the right of a hyphen, in which case that phoneme is the onset of another syllable within the same word. The accent mark (´) indicates stress. The columns are arranged impressionistically in order of degree of vowel heightening perceived in one recorded listing, column 1 being maximum, column 5 minimum. All occurrences of /o/ in this chart are short. (See below, chart B)

CHART B

1	2	3	4	5
šo-š	noš-	poš-	šól-	-yóm-
čo-č	poš-	po-š	kól-	-món-
yo-y	mo-š	ko-y	kóš-	-pón-
-šoš	mo-y	mo-y	šo-k	-šók-
-yoš	-koš-	-mo-l	-yo-m	-yók-
-yoh	-koč-	-ko-y	-po-l	-pó-w
	-poč-	-po-l	-to-l	-sol
	-poš-	-lo-l	-so-l	-so-l
	-koš	-šo-l	-ko-l	-ko-m
	-hoš	-po-y	-to-y	
	-koy	-lo-č	-ϕo-y	
	-loh	-mo-y	-ko-y	
	-šo?	-yo-k	-po?-	
	-yoh	-šo-p	-pon-	
		-kol-	-po	
		-tol-	-ko	
		-yo	-yo	
		-po		
		-koč		

The sequences in this list bear a striking resemblance to those charted by Seiler

and Zimmermann in their study of classical Nahuatl written materials. Only two columns of sequences listed by them are absent here: those ending in s and ɸ, kus, pus, tus, mus, kuɸ, puɸ, muɸ.

6.3.3 The following deductions may be drawn from the configuration of the chart:

1) Short /o/ is conditioned toward [u] by occurrence contiguous to one or more of the following classes of consonants: alveopalatal, lateral, bilabial, and nasal, listed in order of declining conditioning strength. The phonetic features associated with the conditioning are the following, either alone or in combination: heightening, centralization, closer lip rounding, and nasalization.

2) The degree of conditioning toward [u] correlates with the position of the consonants in relation to the vowel. A preceding consonant exerts less influence on the vowel than a following one. A final consonant in a closed syllable affects the vowel of the nucleus most. Conditioning of the vowel is greatest when it is both preceded and followed by an alveopalatal consonant.

3) The degree of conditioning also correlates with the position of the syllable in relation to stress. The vowel is less prone to phonological conditioning in stressed position than in non-stressed.

Conclusion. The o/u variation has the following correlation with vowel length: Long /o/ tends to fluctuate freely within the back range of the lower and higher allophones. Short /o/ tends toward a pattern of conditioned variation within the entire range of the lower, higher, and central allophones.

FOOTNOTES

1 Spoken in the municipio of Mecayapan, Veracruz, about 35 miles north and west of the city of Minatitlán. My introduction to Isthmus Nahuat was through personal acquaintance with Dr. and Mrs. Howard Law, who freely shared their data on the language both verbally and in the form of unpublished materials. These materials, together with the Laws' published works, provided an often-consulted body of reference on the phonology, grammar, and lexicon, and are hereby gratefully acknowledged.

Acknowledgment is also given to the National Science Foundation grant GS934 for a computer-processed concordance which made possible ready reference to every morpheme in 85 pages of native text.

My direct contact with native speakers of Nahuat began with a brief field trip to Mecayapan in January 1964 and was continued during a total of 8 months residence there since Sept. 1965. The principal informants during that time were Hipólito Hernández, age 25, Lucio Bautista, age 22, and Genaro González, age 15. This paper was prepared at a workshop of the Summer Institute of Linguistics at Ixmiquilpan, Hidalgo, held from Sept. 1966 through Jan. 1967, with Epifaneo Bautista age 33, as informant, and with the helpful stimulation, guidance and criticism of Dr. Dow Robinson. Suggestions made by Miss Eunice Pike also aided in clarifying certain aspects of the description.

2 This paper assumes the phonemes to be those listed by Law, including, with the exception of /u/, those which he notes as occurring but which do not appear on

his phoneme chart. The phonemes are as follows: consonants /p, t, k, b, d, g, f, s, š, x, l, ř, ř̃, p^w, f^w, k^w, č, ɸ, m, n, w, y, h, ʔ/; vowels /i, e, a, o/; supra-segmental phonemes /:/ (vowel length) and /ˊ/ (stress). Wherein the conclusions presented differ from those presented by Law, the difference will be due either to linguistic change during the time interval between the two investigations or to a reinterpretation of the data. Phonemic symbolization of all data in this paper reflects the present analysis. Howard W. Law, "The Phonemes of Isthmus Nahuat", El México Antiguo 8:267-78 (1955); "Morphological Structure of Isthmus Nahuat", IJAL 24:108-29 (April, 1958).

3 As suggested by Seiler, a structural interrelation possibly exists between certain glottal phenomena and accent. Note alternation between /ʔ/ and /k/ in the following tešoʔ ~ tešok-ti 'mojarra', teškɸi:n 'tiny mojarra' (sg.), tešoʔɸiɸi:n 'tiny mojarra' (pl). Hansjakob Seiler, "Accent and Morphophonemics in Cahuilla and in Uto-Aztecan", IJAL 31:50-59 (1965).

4 It has been proposed by one of my colleagues that /h/ be considered a prosodic feature, a suprasegmental something that happens to be syllable, rather than a segmental phoneme. This suggestion has a certain intuitive attraction in that CV, CV:, C and CVh do indeed differ mainly in their prosidies. Such an interpretation however is complicated by the fact that CVh does not pattern like CV and CV: in that the latter two may be followed by a consonant syllable coda, while /h/ is mutually exclusive with other consonants in the syllable coda. That is, CVhC is not a permissible syllable pattern, while CVC and CV:C are. Both CVh and CV:h occur. In this respect at least /h/ is entirely analogous to the segmental phonemes.

5 Patterns in lexical borrowing are discussed by Law in "Linguistic Acculturation in Isthmus Nahuat", A William Cameron Townsend en el XXV Aniversario del Instituto Lingüístico de Verano, Mexico D.F., 1961, pp. 555-561.

6 For reduction of these stem formatives in Nahuat de la Sierra de Puebla (Zacapoaxtla), see: Robinson Dow.F.: Sierra Nahuat Word Structure, p. 14-16.

7 Benjamin L. Whorf, "Pitch, Tone and Saltillo in Modern and Ancient Nahuatl", unpublished manuscript in Library of American Philosophical Society, Philadelphia, Pennsylvania.

8 Law notes some of these and other types of reduction involving verb prefixes and auxiliaries, classifying them as syntactophonemic changes at the clause level. Howard W. Law, Obligatory Constructions of Isthmus Nahuat Grammar, the Hague, Netherlands; Mouton and Co. 1966.

9 Cie sequences in Spanish loans also fit this pattern.

10 Forrest Brewer y Jean G. Brewer, Vocabulario Mexicano de Tetelcingo, Serie de vocabularios indígenas Núm. 8, Instituto Lingüístico de Verano, Mexico D.F. 1962.

11 The use of y instead of i in the monosyllabic sequences has been suggested. This solution however would not eliminate the need to indicate syllable division in order to show to which syllable the consonant preceding the y belongs. Consonant allophones differ according to position in the syllable.

12 The symbol /n/ is arbitrarily chosen to represent the nasal phoneme in word-final position. The present analysis is that contrast between /m/ and /n/ is neutralized in that environment.

13 Hansjakob Seiler and Günter Zimmermann, "Studies in the Phonology and Morphology of Classical Nahuatl", IJAL 28:243-250 (1962).

14 That the o/u range represents only one phoneme is evidenced in the inability of the naive Nahuatl speaker to perceive or reproduce the distinction between [o] and [u] in Spanish minimal pairs involving those two sounds. Each of the following pairs of Spanish words is pronounced homophonously: oso 'bear', uso (n) 'use', mocho 'deformed', mucho 'much', lona 'canvas', luna 'moon'.