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PHONETIC ELEMENTS OF THE MOHAVE
LANGUAGE

BY

A. L. KROEBER

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INTRODUCTION

The present description of the sounds of the Mohave language, one of the members of the Yuman family in the southwestern United States, is based on an intermittent acquaintance of ten years, supplemented by experimental studies made in 1910. Certain suggestions, such as the orthography adopted for the h-sounds, are due to Mr. John P. Harrington, with whom the phonetics of the language have been discussed.

The ethnology of the Mohave has been under investigation by the writer at various times since 1900. No special study of the language was attempted, except so far as made necessary by ethnological inquiries; but the desire of recording proper and common names correctly, and repeated acquaintance with the

tongue, led to a determination of many of its phonetic features. When it was recognized as desirable, more recently, to extend to a wider range the phonetic methods first applied to American languages¹ by Dr. P. E. Goddard in his essay on the phonology of the Hupa language, the general familiarity acquired with Mohave made this tongue seem a satisfactory one for experimental determinations.

The Mohave employed for this purpose were Captain Jack Jones, designated hereafter as informant one, and Achora-hanyava, who will be known as informant two. The former speaks English, the latter Spanish, but as both are more than fifty years old, and Mohave is their habitual speech as well as mother-tongue, the results arrived at are unquestionably typical for this language. Palatal contacts were taken only of informant one, with a false palate of aluminum. After this had been marked with intersecting lines, it was photographed without reduction. The records taken were immediately drawn on prints previously made from this photograph of the blank palate. While such a free-hand method does not attain to the accuracy of a photograph made of each record, the corresponding lines on the palate and the print insure a very close approximation to an absolutely correct reproduction; and as no two palatograms of the same sound are exactly alike, it seemed better to compare several guided drawings of as many contacts of one sound, than to depend on the one or two photographs of palatal impressions which could be taken in the same period. The most correct method obviously is to secure a series of photographs of impressions and to select the most nearly normal or average for each sound; but such a course involves the expenditure of much time. The present informant has two of his teeth reduced to the roots; the second molar on the right and the last on the left side. These gaps appear as protuberances respectively on the left and right sides of the palatal diagrams, but do not seem to have interfered with normal utterance. The subject's palate, besides being asymmetrical, is rather high, so that the false palate, from the side on which the tongue touches it, is deep, and the view of its

¹ Present series of publications, v, 1-20, 1907.

sides, especially toward the rear, is considerably foreshortened.

The speech of informant two is rapid and his voice rather high-pitched. For this reason the kymograph tracings made by him are less clear, with the tambours used, than those obtained from his companion. His laryngeal tracings in particular show such small amplitude of vibration as to be difficult to reproduce. A number of the clearest tracings from the mouth of this informant are however appended for comparison.

The audible elements of the Mohave language are 28 in number, without counting long vowels and several doubled consonants, whose greater length may or may not be original and organic.

Vowels:

u o a e i

Consonants:

	Stops, Surd and Intermediate	Labialized Stops, Surd and Intermediate	Fricatives, Surd	Fricatives, Sonant	Affricative, Surd and Intermediate	Nasal Continuants, Sonant	Lateral Continuants, Sonant	Trilled Continuant, Sonant	Semi-vowels	Breaths
Labial	p	....	....	ɸ	....	m	....	....	w	....
Dental	....	....	θ	ð	....	....	....	....	....	....
Alveolar	t	....	s	....	ts	n	l	....	....	....
Prepalatal	tʰ	....	....	....	....	ny	ly	r	y	....
Postpalatal	k	kw	....	....	....	....	....	....	....	....
Velar	q	qw	....	....	....	....	....	....	....	....
Glottal	ʔ	....	....	....	....	....	....	....	....	h, ʔ

VOWELS

The vowels of Mohave are all characterized by slight lip movement, especially in the direction of rounding or retraction, resulting in an invariably open quality; and by containing more aspiration than the vowels of European languages. To at least some extent both of these habits are prevalent among all the Indians of California, and appear to recur more or less typically in many North American languages.

As regards lip position, a noticeable difference exists between those photographically recorded from the two subjects. Informant one (figs. 1-5) has accustomed himself to unusually careful enunciation for purposes of phonetic recording. He possesses

also unusual mobility and control of the muscles used in speech, as shown by a considerable mimic ability. The photographs of his lips therefore show extreme positions, such as would but rarely be attained in actual speech, even by himself. The lip positions of informant two (figs. 6-10), which differ much less from one another, accordingly reproduce much more accurately the normal exterior articulations of Mohave vowels; but those of informant one show to what extent the movements of the lips can be exaggerated, or it would be better to say, performed without abridgment, without appreciably affecting the characteristic qualities of the several vowels.

As regards aspiration, all final vowels, whether accented or unaccented, and many of those before consonants, are spoken with much breath. In the tracings, this breath usually increases in strength toward the end. This may in part be due to a gradual accumulation of expelled breath in the tube connecting the mouth and the tambour, but is certainly not the principal cause, since the mouthpiece used did not tightly enclose the lips, and was provided with perforations closed only lightly with cotton. Moreover practically every final vowel shows toward its end, if it is long enough, a distinct and often sharp rise, with which it concludes. During this rise, which of course means increased stress of breath, the voice-vibrations lose in amplitude, usually ceasing at the moment the breath attains its maximum force (figs. 64, 72). In vowels followed by a consonant, the curve is often similar. In this case the voice vibrations also cease at the crest of the breath explosion, so far as appears from the breath tracings; but simultaneous glottal tracings reveal that in most instances the vocal chords continue to vibrate until the needle indicating the breath movements has again fallen to normal level, when the glottal vibrations cease or change in character for the ensuing surd or sonant consonant (figs. 66, 67). In any event the breath rise is in the vowel, not after it; and where a tracing appears to show the opposite, it is only that the apparatus is not attuned to sufficient delicacy to indicate the diminishing vibrations of the vocal chords. That these should diminish is natural, since the structure of the glottis tends to make the amount of

breath and vocalization in inverse ratio. The most significant point is that the aspiration attains its maximum force while the voice-vibration, in other words the vowel, is still going on. The breath therefore is an integral part of the vowel, not an addition. The vowels of Mohave accordingly differ from those of Hupa, which are either unaspirated like those of English, or aspirated through the addition of a sustained but surd breath. Aspirated *a* in Hupa might therefore not improperly be written *ah* or *a'*; but to represent Mohave *a* by either of these symbols would be misleading.

Mr. Waterman has recently shown² that in Northern Paiute the vowels contain a similar strength of breath; and tracings made by him or the writer from Wintun, Salinan, and Luiseño informants, reveal about the same condition, so that the character of the Athabascan aspirated vowels would seem to be unusual in the Californian region. Papago, an Arizona tongue of the Pima group, however possesses vowels followed by a distinct surd breath.

Generally speaking, Mohave vowels contain as much breath as consonants, their tracings being exceeded in height only by those of the explosions of final stops. That the tracings present much variability in this regard is due in part to the use of different tambours, the rubber diaphragms of which vary in sensitiveness to vibrations of different pitch and in susceptibility to large movements such as are caused by the breath.

The tracings of vowels adjacent to voiced continuants, such as *w*, *y*, *r*, *l*, *ly*, show a less distinct rise, and the point of demarcation between vowel and consonant is usually not discernible in the record (figs. 81, 82, 91, 107, 112). This indicates that in combinations like *orro* or *elye* the amount of breath is fairly constant until the final acceleration, when the voice of the ultimate vowel begins to die away and its aspiration increases correspondingly.

There is no organic nasalization of vowels in Mohave, although tracings regularly show a transmission of vocalization through the nose as well as the mouth, probably in direct proportion to

² Present series, x, 13-44, 1911.

the stress of the vowel (figs. 47-53). This transmission may take place through the solid parts of palate and nose rather than directly through the naso-oral air-chamber.

u, ù

The back vowel shows little lip rounding (figs. 1, 6) and is open or broad in quality. For this reason it has been indicated when long by ù, the symbol ū being associated, in most modern European languages, with closeness as well as length. The false palate used shows practically no contact for this sound (fig. 14).

o, ò

The o sound, long or short, also is open and does not affect the palate. It will be seen that the lip position is not very different from that of u (figs. 2, 7), and in rapid or slovenly speech the two sounds are sometimes hard to distinguish. O is somewhat less common than u.

a, ā

A (figs. 3, 8) is produced with wider lip opening than other vowels except e, and, the tongue lying flat, the palate is not touched. Long a has been represented by ā, as its quality is that usually associated with this symbol. A is the most common of the vowels.

When a is unaccented and short, at the beginning and end of words and syllables, it is usually very much slurred, so as to lose much of its distinctive quality or to become entirely inaudible. This is perhaps sometimes accompanied by incomplete laying flat of the tongue, owing to the influence of the following or preceding sound making itself felt in the very brief interval that the vowel lasts. The resulting short colorless vowel has usually been heard and written as possessing more of an e-timbre than any other quality; but in every instance of slow and careful enunciation such neutral e sounds are recognizable as merely brief or weakly voiced renditions of ordinary a.

It is probable that every Mohave stem word, and every syntactical word except those closing in a few grammatical terminations like -k, -tc, and -m, ends in a vowel. Since many words have the accent on other than the ultimate syllable, abbreviated final -a is very common. As in rapid or even in ordinary speech

it is usually inaudible, especially after stops, the question arises whether this a is not slurred to the extent of being whispered or even unvoiced. This does not seem to be the case; for all successful kymograph tracings show glottal and often even breath vibrations for this final sound. Ama't-a, earth, may be heard as ama't- or even mat-, but in carefully made tracings always appears as ama't-a. It is true that informants are likely to speak with more than usual effort at clear enunciation in producing tracings, so that even uniformity of these visible records can hardly be taken as an absolute indication of the practice followed in normal speech; but it is a fact that this final a has always been heard either as a voiced vowel or not at all, never as a surd echo. Informants have also never criticised the rendition of the sound in question by a voiced a. This contrasts markedly with the practice of Papago, in which true surd final vowels occur. The difference extends to other Indian languages. In the Shoshonean group, for instance, Ute is said by Dr. Sapir³ to possess surd vowels. Northern Paiute,⁴ on the other hand, shows some tendency to slur final vowels, much as does Mohave, but without their attaining surdness. The same is true of Luiseño.

The situation in Mohave therefore resembles the case of English as regards many of its short unaccented vowels.

Although the slurred vowel in Mohave is always a, it remains, however, to be ascertained by comparison with related languages whether it always represents original a.

Unaccented initial or final a is weakened in composition; aha, water, but almost ha-'avu'lypo and ha'-kuvilya (fig. 113), place-names; aha't-a, domestic animal (figs. 90, 141), horse, as compared with (a)ha't-teoqa, dog (figs. 95, 140).

e, è

E, long è, is spoken with wider aperture of the lips than any other vowel including a, but with little retraction (figs. 4, 9). The tongue is raised until it reaches the gums in the region of the last two molars (fig. 13). E is a less common sound than i.

³ Science, n.s., xxxi, 350-352, 1910.

⁴ As observed from the informant reported on by Mr. Waterman in the present series, x, 13-44, 1911.

i, ì

The lip position for i and ì is narrower than for e, but only slightly more retracted (figs. 5, 10). The tongue is considerably more raised anteriorly (fig. 11). This is the most frequent vowel next to a.

LABIALS

P, v, m, and w are bilabial. There are no labio-dental sounds in Mohave.

p

The labial stop p is invariably surd during its occlusion. The vocal chords begin to vibrate, somewhat gradually, immediately after the commencement of the explosion of the sound. In some instances this vocalization is exactly simultaneous with the release for the explosion (compare the q in fig. 54), in other cases it is synchronous with the end of the puff as indicated by the highest point reached by the tracing needle (fig. 66); but these are apparently only unintentional variations from the norm of inception of sonancy, which falls in the middle of the explosion (fig. 67). The last part of this sound is therefore voiced and it is more exactly described as an intermediate than as a surd stop. It has usually been heard as intermediate between American English b and p, and was written b nearly as often as p until its nature began to be understood.

Essentially the same kind of stop has been found in various positions of articulation in Hupa, Kato, Paiute, Wintun, Salinan, Luiseño, and Papago.⁵ In Hupa and Kato entirely surd aspirated stops also occur, a circumstance which has led Dr. Goddard to represent the dental and palatal intermediates by the sonant symbols d and g. This should, however, be interpreted as nothing more than a matter of orthographic convenience. In Papago and Luiseño final stops are never intermediate but entirely surd and considerably aspirated. In these two idioms there is no question of two distinct classes of stops; the same stop is partly sonant, or surd and aspirated, according as it does or does not stand before a vowel. This is also the Mohave rule, which is however circumscribed by the fact that all stem words end in vowels,

⁵ Present series, x, 7-9, 1911.

and that *k* is the only stop which, through being a grammatical ending, occurs as the termination of words. *P* is therefore never final. It has also not been found before the few surd continuants, *θ*, *s*, and *h*. It does, however, precede other stops, such as the *-k* just spoken of; and in these cases it bears no trace of sonancy (fig. 56).

In the tracings the explosion of *p* is usually somewhat lower than that for *t*; it is, however, both higher and more sudden than that for *k*. The period of occlusion is normally longer than the period of explosion. With the sensitive tambour mostly used, the record of the occlusion is generally not a straight line, but a slight rise followed by a gentler decline and sometimes a second gradual rise before the needle suddenly rises at a sharp angle to mark the explosion (fig. 106). These membrane undulations during the occlusion probably mark nothing more than rebounds of the needle from the sharp decline at the conclusion of the preceding vowel. The first steep downward stroke of the needle at the beginning of the tracings of medial *p* might be interpreted as already part of the occlusion, if simultaneous tracings from the glottis (fig. 67) were not frequently voiced during this descent of the breath needle: indicating that the sound element represented by this stroke is still part of the vowel. The occlusion of initial *p* and other stops is usually a straight line (fig. 66).

It is in accord with what has already been said about the relative amount of breath in Mohave consonants and vowels that the tracing for *p*, obviously one of the most puffy and easily aspirated of all sounds, rarely surpasses the adjacent vowel curves very greatly in height and sometimes falls below them.

v

V presents no peculiarities beyond being invariably bilabial. In the tracings it is usually rather heavily voiced (figs. 77, 80, 96). In carefully articulated speech it is often reproduced by an ascending and descending curve between the end and beginning of the curves marking the preceding and following vowel (figs. 96, 142). At other times, however, *v* shows merely a sustentation of breath at the same level as in the adjacent vowels, or even a drop between them (figs. 113, 117).

m

M also presents no peculiarities. It is usually of the same length as stopped consonants or spirants, longer than short vowels, and shorter than long vowels. When before p, it is simultaneous with the occlusion of this sound, which is not of greater duration than ordinarily. In such cases the first part of the occlusion is voiced, the second half unvoiced (fig. 60). When m is initial, its sonancy often begins gradually, and at least sometimes does not set in until some time after the lips have been closed (figs. 54, 70). In final m the tracing often shows no explosion whatever, indicating that the lips are parted gradually or not at all (figs. 55, 65, 68).

A number of words such as a'mmo, mountain-sheep (figs. 49, 72), amma'ya, sky (fig. 50), hammulye', ashes (fig. 127), tinya'm-mot-e, not dark, contain an m with prolonged occlusion. This is somewhat less than twice the length of ordinary m. It is impossible to say whether this "doubled" m represents in all cases an assimilation of two consonants or is an organic constituent of the language distinct from m. On account of this uncertainty, which applies also to a similar lengthening of other continuants, mm has not been reckoned as a separate phonetic element of the language. A few doubtful tracings, as of manya, you (fig. 52), perhaps show long mm in initial position. Should they be confirmed, mm would of course have to be regarded as entirely distinct from m.

Like the other labials, m of course does not affect the roof of the mouth.

w

W is a rare sound, much less common than v, and has not yet been found at the beginning of any word. In careful enunciation it can readily be distinguished from v by the greater rounding of the lips. It does not appear to differ appreciably from the voiced w of English (figs. 88, 103, 135).

INTERDENTALS

θ, δ

The fricatives θ and δ, surd and sonant respectively, are

spoken with the tongue between the teeth or against the upper teeth. In some cases the lower part of the upper gums is also touched by the tongue, as shown by palatograms (figs. 16-18). The sounds are essentially the same as the two values of English th. The sonant, δ , is perhaps "doubled" in some words, as ta' δ sitea, corn (figs. 61, 92). Surd θ has not yet been found lengthened. Both sounds usually show in tracings as a rounded curve, rising and falling again (figs. 86, 98, 129). In certain other Yuman dialects Mohave θ is replaced by s.

DENTAL-ALVEOLARS

The dental or alveolar sounds t, s, n, l, tc, are not all formed at the same point, as the palatograms reveal.

t

T is usually audible as more truly dental than English t, and sometimes is clearly visible as interdental. Palatograms, however, show that in all cases the tongue is in contact also with the gums (fig. 23). The small untouched anterior area, which is found in all palatal impressions made of this sound, is due to a depression in the informant's palate which the tongue does not readily fill; but for this individuality, the t-contact would be even more posterior. As regards voice and breath, what has been said of p applies to t.

s

The surd fricative s is more anterior in articulation than t, the tongue position agreeing with the posterior one sometimes assumed for θ and δ : touching the upper teeth and lower part of the gums (fig. 19). In the tracings s shows like θ (fig. 65). In a number of Indian languages the sound has been described as between English s and sh, or somewhat different from both. To some extent this is true of Mohave s, but in its audible effect it approximates rather to s. Informant one's pronunciation of English s and sh shows that he articulates the former like his s sound, the latter more posteriorly and with troughing of the tongue (figs. 20, 21).

S is probably long or doubled in *issona'*, woodpecker, and appears to be of unusual length in most tracings of *sa'ma δ ik*, does

not know. In *as'a'sim*, nods repeatedly (fig. 65), a reduplicated form, a probable glottal stop following the first *s* gives the effect of length of the continuant.

n

The sound *n* also differs somewhat from *t* in place of articulation, the contact being on the gums (fig. 22), but following the teeth more regularly than for *t*. In all other respects *n* agrees with *m*, even to its absorption in the occlusion of stops, as in *mastamho'inte* (figs. 47, 83), and its lengthening in *hannava'* (fig. 80) and other words.

l

This lateral sonant continuant is formed by a contact similar to that of *n*, the breath escaping on the side, in the case of informant one, through the gap caused by the loss of his right molar (fig. 29). The anterior contact is forward of that in English *l*. This position has been observed also for Luiseño *l*, and in Hupa by Dr. Goddard. In tracings the beginning and end of intervocalic *l* can usually not be marked definitely; often the two adjacent vowels and the included *l* form one nearly straight line, either ascending or descending (figs. 82, 107). Near its inception, however, the curve of *l* sometimes shows a distinct dip, which is even more prominent in the related sound *ly*. Dr. Goddard has commented on the same feature in Hupa and Kato *l*, and it appears regularly in tracings of *l* in Yurok, Wintun, Paiute, Luiseño, and Papago. Dr. Goddard explains the momentary dip as probably due to a single lateral movement of the tongue.

L is one of the continuants that are lengthened, as in *ye'llaka*, goose (fig. 108).

te

The affricative *te* shows a contact against the roof of the mouth almost identical with that of *t* (fig. 24). Its tracings resemble those of stops, the duration of the release which contains the *c* (š) element not being appreciably longer than the explosion of *t* or *p* (figs. 77, 78, 92, 94). The effect of this sound is the same as that of English *ch*.

An apparent lengthened *te* occurs in *aha'tcoqa*, dog (figs.

95, 140), really aha't-tcoqa, from aha't-a, domestic animal.

In a few words, such as aha'nya-mi'tsqurqa, a species of frog (fig. 87), and a'tsqueuqa, a bird (fig. 137), probably the bittern, ts was consistently heard and written. This ts is likely to be only a varying apperception of tc, or possibly a modification of it by the following velar k.

ALVEOLAR-PREPALATALS

The alveolar-prepalatal sounds of Mohave are probably even less related to one another than the dental-alveolar class. They comprise t, ny, ly, r, and y.

t·

For lack of a convenient typographical symbol, this character has been employed to designate a t formed slightly farther back than the t discussed. With careful enunciation the tongue touches the palate only over a narrow band back of the gums above the front teeth. The gums proper, as well as the teeth, are entirely free. Along the sides of the mouth, however, the tongue is less elevated than for t (fig. 26). Towards the rear of the palate, therefore, t· is more alveolar and less palatal than t. When t· is less carefully pronounced, the tongue touches the gums as well as the fore-palate (fig. 25). In such cases the palatal contact for t· is very similar to that for t, but can nevertheless be distinguished from it by a greater width of untouched palate in the region of the first molars.

The purest contact for t· is very similar to that for r (fig. 27), which is no doubt the cause of an audible r tinge in the stop. Such words as amat-a, earth, and ahat-a, horse, were at first consistently written amarta and aharta. A back or palatal t distinct from front or dental t is found in a number of the native languages of California, including Luiseño, Yokuts, Salinan, Costanoan, Yuki, and perhaps Pomo and Miwok. In Yokuts and Salinan the r-tinge is also characteristically audible, but, in contrast to Mohave, after the t. In Yuki the r-affection is lacking, and the effect of the sound resembles that of tc.

T· has not been found initially in Mohave. As regards sonaney, aspiration, and length it is identical with t.

ny

A palatalized n, which is of course a simple sound, is as common as dental n. At the middle incisors, the tongue touches the palate but little farther back than for n. Farther to the rear, however, the tongue is more raised and in contact with a greater expanse of the roof of the mouth, until, in the region of the second molars, or the interstices between the first and second molars, the tongue touches the palate in a complete or nearly complete transverse band. From there back, the tongue becomes more and more depressed, until at the posterior end of the last molar it is in contact only with the gum. The palatograms reproduced in figures 31 to 33 show the degree of variability in the production of this sound.

Tracings of ny from the mouth sometimes evince vibrations (fig. 63), which must be referred to vocalization transmitted through the buccal opening on account of imperfect closure between tongue and palate. In some words, such as mā'nya (fig. 52), ny is short as compared with the vowels; in anyā' (fig. 48) and nyamaθā'm (fig. 51) it is long.

The double letter ny is of course orthographically incorrect for a simple sound. It has, however, been chosen as the only typographical facility available other than ñ, the employment of which seemed undesirable on account of the almost standardized use of this character to denote ng in American languages.

ly

Ly is a palatalized sonant l which is more common than the unpalatalized sound. It corresponds to surd l or surd tl of some other Yuman dialects. The palatalization is less thorough than for ny, particularly the complete contact across the palate at the second molars being absent. Some portion of the entire length of the roof of the mouth is however touched, as the palatogram (fig. 30) shows. If this contact were simultaneous for all parts, a complete closure would be formed, resulting in a stop. The sound is however a continuant, so that one part of the contact must be made and concluded before the remainder begins. Nevertheless the sound is not merely l plus y, for a superposition of palatograms for l and y (figs. 29 and 12) gives

a different contact. In kymograph tracings *ly* shows heavy voice vibrations (figs. 54, 91), and regularly presents the dip already mentioned as characteristic of *l* (figs. 113, 117).

r

A short trilled *r* is found in Mohave. The tip of the tongue is flicked a few times against the top of the gums (fig. 27). The contact is a little lower and more forward than for *t*. Figure 28 shows by contrast a palatogram of English *r* as spoken by the informant. In the tracings *r* not only appears as well voiced, but presents undulations corresponding to the movements of the tongue. In some cases the undulations begin in what seems clearly to be part of the preceding vowel (figs. 79, 111, 115, 142, 144), or continue into the following one (fig. 101). It may be that the tongue, anticipating the ensuing *r*, begins to "roll" slightly, though without touching the roof of the mouth, during the progress of the vowel.

R is one of the continuants found in lengthened form, written *rr*. For informant one, the number of tongue movements in *r* varies from one (figs. 87, 111) to four (figs. 56, 79, 85, 89), averaging two (figs. 75, 94); in *rr*, from two to seven, with an average of three or four (figs. 59, 101). Informant two, who habitually speaks faster than his companion, makes only one or two tongue movements for *r* (figs. 139, 142, 144), and two (fig. 136) or sometimes three or four (fig. 125) for *rr*.

R is a rare sound initially.

y

Y, which occurs both initially and medially, is formed with a somewhat greater contact of the tongue on the palate (fig. 12) than *i* (fig. 11). In tracings it is usually impossible to separate from the adjacent vowels (figs. 81, 132, 134). An apparent diphthong *ai* is resolved, in careful enunciation, into *aya*. Thus *amma'ya* (fig. 50), *se'lyea'ya*, usually heard as *amma'i*, *se'lyea'i*.

POSTPALATALS AND VELARS

k, *q*, *kw*, *qw*

The back consonants of Mohave are all stops, but are four in number. Organic palatal *k* can be distinguished from or-

ganic velar *k*, designated by *q*. Each of these is spoken both with the lips in normal position and with the lips rounded. Hence the labialized palatal *kw* and velar *qw*, which are simple sounds. Both in tracings and palatal position *kw* and *qw* are indistinguishable respectively from *k* and *q*.

In sonancy, breath, and length, all four of these sounds agree with the stops previously described. *K* is the only stop that has been found finally in words. In this position it is entirely surd, and with a more strongly aspirated and longer sustained explosion than otherwise (figs. 56, 82, 105). In this it agrees with final *tc*. The tracings for all the *k* sounds differ somewhat in shape from those of *p*, *t*, *t'*, and *tc*. In most instances the descent of the needle to mark the beginning of the occlusion is more gradual, the horizontal line indicating the period of total closure shorter, and the ascending line produced by the explosion less nearly vertical, than for the anterior stops. In extreme cases the tracing for *k* or *q* therefore has the shape of a capital *V* (figs. 67, 78, 113), as compared with the vertical, horizontal, and vertical strokes produced by a *p* or *t*. This difference indicates that the approach of the articulating parts is more gradual for *k* than for the anterior sounds. It is obvious that the lips and the tongue-end, being more mobile than the back of the tongue, make contact with more of an edge and more suddenly. When the rear of the tongue touches the back hard palate or the velum, it is one rounded surface that approaches another. The greater time consumed in making the closure complete and again removing it, seems to be at the expense of the closure itself: the total duration of *k* is the same as that of *p* and *t*.

Q is audibly distinct from *k* chiefly in being produced with greater muscular exertion. It frequently sounds forced or labored.

The contact of both *k* and *q* varies somewhat, and in many words positions can sometimes be obtained for *k* which are as posterior as some of the anterior contacts of *q*. In most instances, however, the average articulation of the two sounds is distinct on the false palate as well as audibly, the *k*-position of

only a few words, such as *qara'è'rva* (figs. 89, 142), being difficult to determine.

The organic difference between *k* and *q*, or *kw* and *qw*, is of course entirely independent of the varying positions assumed by the tongue, in Mohave as in other languages, as *k* precedes a front or a back vowel.

In *k* in its normal position, as before *a*, the tongue touches the palate from the second molar back. The false palate used was cut off squarely at the rear of the last molars. In about half of the impressions made, the contact extended entirely across the false palate, or nearly across it, in a narrow band along the hind edge (figs. 37, 38); in the other instances the contact did not show and was therefore more posterior (figs. 39, 40). The contact is apparently firmest between the middle of the tongue and the roof of the mouth; in several cases portions of the gum immediately adjacent to the last molar or two were touched but lightly or not at all. For *k* before *u* the position is practically identical, but probably slightly more posterior (figs. 35, 36). *K* before *i*, however, is much more anterior. It did not seem feasible to obtain reliable palatograms of this sound without the following *i*. The impressions taken therefore include both *k* and *i*, but as the *i*-contact proves to be much smaller than that for *ki*, the whole of the latter must be regarded as due to the *k* (fig. 34). It can be seen that the palate is completely covered by the tongue as far forward as the second molars; and even forward of this line the *k*-contact rises higher up from the teeth toward the median line of the palate than that of *i*.

In *q* and *qw* the middle of the false palate was never touched by the tongue. In many cases there was a small area of contact in the region of the hindmost teeth, but usually not adjacent to them (figs. 42, 43). In other instances, especially in the word *aqā'qa*, raven, whose onomatopoeic origin perhaps induces an extra effort at throaty articulation, the false palate was practically or entirely untouched (figs. 44, 45, 46). These results indicate that at least the principal contact in *q* and *qw* is really velar.

Kw is a common sound, qw hardly less so. Q is probably not as frequent as k, but is by no means rare.

The nasal continuant in k position does not occur in the language, although the Mohave pronounce it without difficulty and employ it frequently in the distorted forms which words assume in their songs.

BREATHS AND GLOTTAL STOPS

h and ʰ

There are two h sounds in Mohave, which probably correspond very nearly to the two indicated by the same symbols in Yana by Dr. Sapir.⁶ The sound ʰ, which has been established only as an initial, is faint, and usually escapes observation until some familiarity with the language has been acquired. It occurs most frequently as a prefix indicating the third person possessive or subjective in nouns and verbs. In tracings ʰ is often invisible (figs. 58, 67), at other times shows as a slight and short bulge in the upward rise preceding vowels (figs. 55, 94). The sound may be compared to the Cockney h.

H is medial as well as initial, and even final in syllables, as in *ahmaʰ*, *quail*, *ahtāʰ*, *cane*, *ahʰāʰ*, *cottonwood*. It ordinarily presents a more pronounced and longer rise and fall than ʰ in tracings, but its curve when initial is nevertheless quite modest (figs. 93, 99). It sounds stronger when it follows a vowel, but in tracings generally only carries on the final upward curve of the preceding vowel (figs. 109, 110, 119), except when it is succeeded by a consonant, which normally increases its vigor (figs. 76, 104, 118). After stopped consonants, as in *maʰthāk*, *north* (figs. 70, 97), it appears as a distinct sharp rise and fall immediately after the explosion of the stop. It has similar quality in *marhoʰ* (fig. 115), and *mastamhoʰinte* (figs. 47, 83). A number of tracings of the word *hamaʰkhava* (fig. 93), however, have a different character, the explosion of the k and the h being apparently combined into one expulsion of breath, which differs from the explosion of ordinary medial k in being higher, sharper, and entirely surd.

To the ear, h, especially when preceded by a vowel, has

⁶ Present series, ix, 5, 1910.

something of the quality of a fricative in k-position. Breath tracings also usually show distinct vibrations (figs. 76, 84, 90, 95, 110). As synchronous tracings from the larynx are however entirely smooth, it is clear that the sound is purely surd and that its vibrations are due to friction produced by constriction at some point above the glottis. The quality of the sound makes it probable that the constriction is in the region of the rear palate. Dr. Goddard has described the same phenomenon in connection with the h of Hupa and Kato,⁷ Mr. Waterman has determined it for Paiute,⁸ Dr. Sapir indicates it for Yana,⁹ and it extends also to other languages, such as Yuki.¹⁰ In all these tongues the sound has been recognized as essentially an h in spite of its approach to fricative character.

A sound often heard as hw, even xw, seems to be a combination of h with short unaccented o preceding another vowel: hoā'lya, hoā'mi.

Glottal stops have not been heard or determined at the beginning or end of words, but occur as organic constituents within words and between vowels that are brought into juxtaposition by the compounding of words or stems (figs. 66, 68, 78, 89, 124). In rapid speech they are likely to be slurred out of existence, especially by informant two (figs. 78, 100, 124, 142). They appear after a number of continuant consonants, as in aθ'ī', salt, ah'ā', cottonwood (figs. 55, 62, 65, 120), but are doubtful after stops (fig. 79). A glottal stop shows in a breath tracing as a low, nearly level line; it is the same in a record from the glottis.

STRESS AND PITCH ACCENT

Many Mohave words are to our ears definitely accented on the last syllable. Such are anyā', sun, haly'a', moon, aθ'ī', salt, avi', stone, ipa', man, kwaθidè', shaman, hamo'k, three, tcimpā'pk, four, nyamaθā'm, tomorrow, ahmo', mortar, melyeqe', throat. When the stress is on any syllable preceding the final, it is some-

⁷ Present series, v, 12, 1907; xi.

⁸ x, 24, 1911.

⁹ ix, 5, 1910.

¹⁰ x, 11, 1911.

times fairly well marked, as in *ka'veik*, south, *pā'ya*, all, *mā'nya*, you, *sa'maḍik*, does not know, *vī'ka*, seven, *ī'wa*, my mouth, *θenya'ā'ka*, woman; or more frequently is so evenly balanced that it seems to rest on two syllables. Thus *aha't-teoqa* or *ahat-teo'qa*, dog, *a'laik* or *ala'ik*, is bad, *a'lakwisa* or *ala'kwisa*, a tribal name, *ama't-a* or *a'mat-a*, earth, *amma'ya* or *a'mmaya*, sky, *a'mmo* or *ammo'*, mountain-sheep, *mī'hū* or *mīhū'*, your nose, *a'tsqueuqa* or *atsqe'uqa*, a bird, *ò'tùra* or *òtù'ra*, gambling poles, *ma't'āra* or *mat'ā'ra*, playground, *hama'khava* or *ha'mak-hava*, Mohave, *so'qwilya* or *soqwī'lya*, a hawk, *ḍokupī'ta* or *ḍo'kupīta*, owl, in each of which pairs the first form seems to the writer the more correct, though the other has also been heard.

Of more importance than stress in the accentuation is pitch. While the writer's ear is poorly trained for the observation of this quality, he finally received the impression that that syllable of a word which appeared to be most strongly stressed was spoken in a higher pitch than the others. Measurements of wave lengths made in a number of tracings that are of large enough size to render this procedure feasible, corroborated this subjective judgment. Thus it was ascertained that in *ò'tùra*, *'i'pūka*, *ta'ḍḍīta*, *vī'ka*, *a'mmo*, *ama't-a*, *mā'nya*, *mastamho'inte*, *orrò*, *ihne'*, the vowel indicated by the accent was from one to three or four full tones of the diatonic scale higher than the other vowels.

The average vibration rate per second for the raised syllable is twenty-five per cent, or a major third, above that of the remainder of the word, irrespective of the position of this syllable. The only exception was *vāra*, no, which was always heard stressed on the first syllable, but in most of the tracings available appears to have the second a higher-pitched. In words like *ama't-a*, *'i'puka*, *ta'ḍḍīta*, the final short or slurred *a* is normally considerably lower in tone than both preceding syllables.

The contrast in pitch is particularly striking in *a'ha*, water, *ah'ā'*, cottonwood; and *ā've*, rattlesnake, *avè'*, mouse. It must be observed, however, that in *ah'ā'* and *avè'* the higher-pitched vowel also sounds stressed; in *a'ha* and *ā've*, on the other hand,

the stress on the first syllable is usually apparent only when the words are compared with their counterparts. A'mmo, ò'tùra, ama't-a, and other words which were varyingly written while attention was being given only to force of utterance, are also uniformly spoken with higher pitch on the vowels marked. As a similar doubt as to stress rarely arose concerning words which subsequently proved to have the last syllable high-pitched, it seems probable that increased stress and higher tone coincide in words accented on the ultimate, but that when the accent falls elsewhere it consists only of a rise in pitch, which to the English ear has at first somewhat the appearance of more forcible utterance. Or the difference may be due to the fact that the English ear is less accustomed to a final rise and therefore notes it more readily. It is also possible that a sharply rising tone may have to be distinguished from a less noticeable high but level tone, or a circumflex one; but the tracings secured are scarcely sufficiently delicate in pitch indication to determine. At any rate it seems clear that heightened pitch rather than increased stress constitutes the normal accent in Mohave.

A similar condition appears to characterize the Yurok language of the opposite end of California. This is however the only tongue in the state for which pitch-accent has as yet been definitely determined. Dr. Goddard denies any considerable function of pitch in his careful analyses of Hupa and Kato.¹¹ Dr. Sapir does not indicate the quality in his writing of Yana,¹² and Mr. Waterman has failed to find it in Northern Paiute.¹³ The writer has observed pitch inflections in Papago, but as they consist only of a regular falling of tone in the course of all words, they scarcely constitute an accent. For the other languages of the area observations are however still too imperfect to be worth much, so that the status of Mohave may prove to be by no means exceptional.

¹¹ v, 18, 1907; xi.

¹² ix, 1-235, 1910.

¹³ x, 13-44, 1911.

PITCH VALUES OF VOWELS OF MOHAVE WORDS

The number of vibrations per centimeter of tracing, corresponding to about one-fifth of a second duration, was found to be as follows in one or more tracings of the subjoined words. Many records were obtained in a low-pitched voice, to which the tambours used were more sensitive.

a'ha: a', 50; a, 33.

ah'ā': a, 32, 38, 26; ā', 40, 41, 37.

ā've: ā', 33, 35; e, 29, 29.

āvè': a, 32, 31; è', 38, 40.

vì'ka: ì', 37; a, 23.

orrò': o, 30, 31; ò', 41, 44.

ò'tùra: ò', 30, 31; ù, 27, 24.

a'mmo: a', 34, 43, 41; mm, 36, 43, 41; o, 29, 33, 33.

ama't:a: a, 33, 32; m, 35, 39; a', 46, 46; a, 29, 30.

ta'òditca: a', 32; i, 29; a, 23.

'i'puka: i', 30; u, 27; a, 23.

mastamho'intc: a, 34; a, 38; o'i, 40.

nyamaθā'm: a, 31; a, 31; ā', 38.

ihne': i, 31, 34, 31; e', 31, 37, 34.

mā'nya: ā', 45, 50, 52; a, 45, 39, 45.

vā'ra: ā', 37, 25, 34; a, 37, 27, 41.

EXPLANATION OF PLATE 6

Lip-positions for vowels.

Informant one:

Fig. 1.—u in ỳhù, my nose.

Fig. 2.—o in ỳòò', my tooth.

Fig. 3.—a in ah'ā', cottonwood.

Fig. 4.—e in āvè', mouse.

Fig. 5.—i in aθ'ì', salt.

Informant two:

Fig. 6.—u in ỳhù, my nose.

Fig. 7.—o in ỳòò', my tooth.

Fig. 8.—a in ah'ā', cottonwood.

Fig. 9.—e in āvè', mouse.

Fig. 10.—i in aθ'ì', salt.



EXPLANATION OF PLATE 7

Palatograms from informant one.

Fig. 11.—i in avì', mountain.

Fig. 12.—y in ayā', mesquite bean.

Fig. 13.—e in ävè', mouse.

Fig. 14.—u, part of iyù'm, seeing.

Fig. 15.—w in wa, part of avì'-waθa, the name of a place.

Fig. 16.—θ in θa, part of θara'pk, five.

Fig. 17.—θ in aθ, part of aθ'ì', salt.

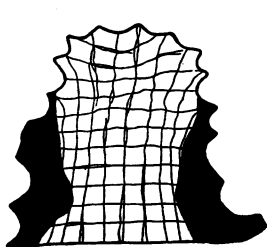
Fig. 18.—ð in að.

Fig. 19.—s in aspā', eagle.

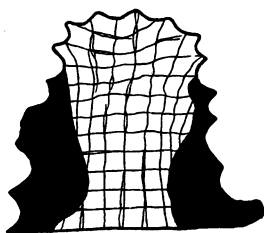
Fig. 20.—English s in so.

Fig. 21.—English sh in show.

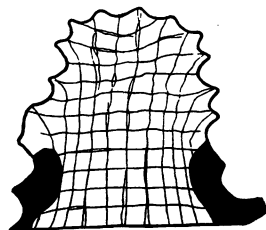
Fig. 22.—n in na, part of na'maθa, raccoon.



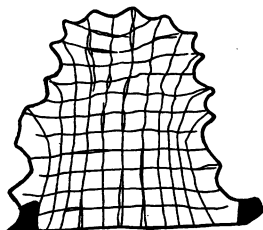
11 i



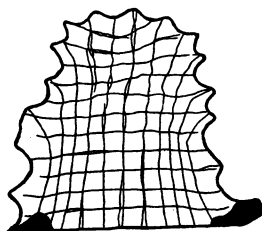
12 y



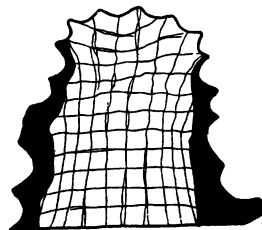
13 e



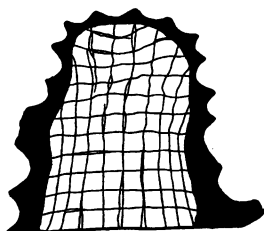
14 u



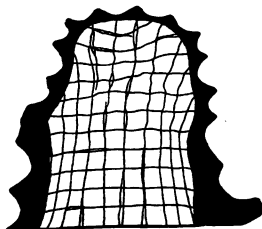
15 w



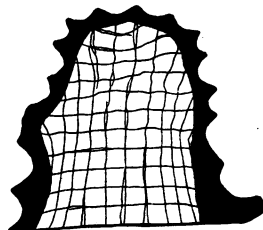
16 θ



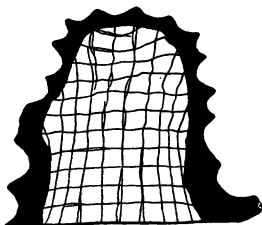
17 θ



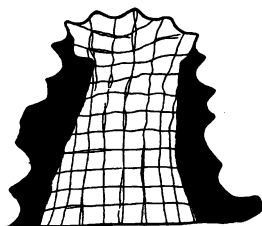
18 ð



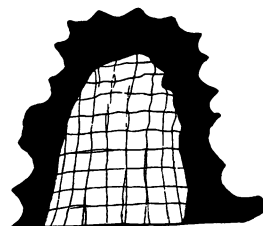
19 s



20 Eng s



21 Eng sh



22 n

EXPLANATION OF PLATE 8

Palatograms from informant one.

Fig. 23.—t in ahtā', cane.

Fig. 24.—tc in hatca', Pleiades.

Figs. 25, 26.—t. in ama't.a, earth.

Fig. 27.—r in arrā', interjection of astonishment.

Fig. 28.—English r in row.

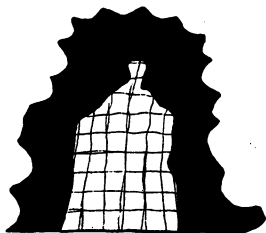
Fig. 29.—l in lap, part of lapalā'pa, flat.

Fig. 30.—ly in haly'a', moon.

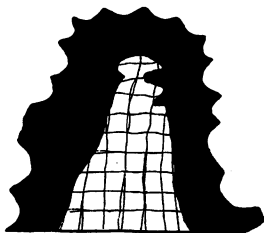
Figs. 31, 32.—ny in anyā', sun.

Fig. 33.—ny in mā'nya, you.

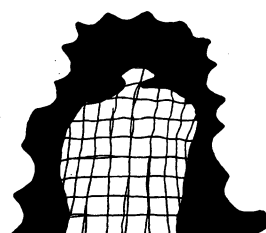
Fig. 34.—ki, part of ki'ðik, come here!



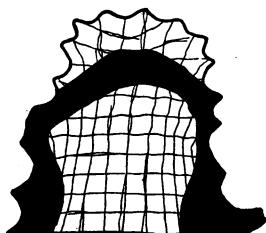
23 t



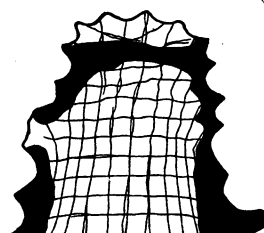
24 tc



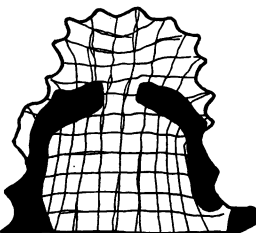
25 t



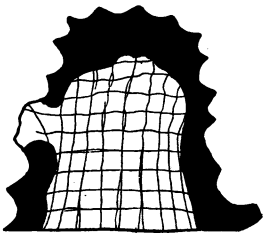
26 t



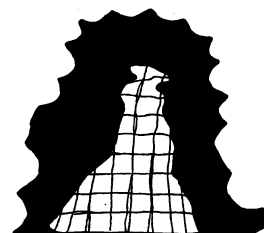
27 r



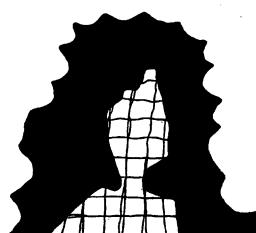
28 Eng. r



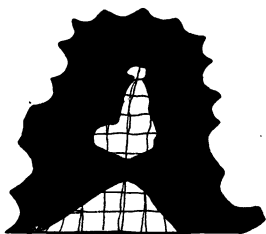
29 l



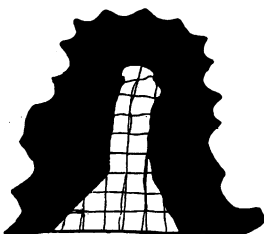
30 ly



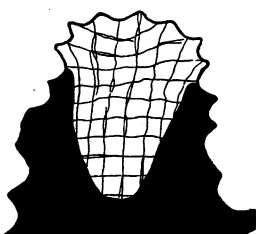
31 ny



32 ny



33 ny



34 ki

EXPLANATION OF PLATE 9

Palatograms from informant one.

Figs. 35, 36.—k before u in kupo', carrying frame.

Fig. 37.—k in ka, part of ka'navak, tell.

Figs. 38, 39.—kw in kwa, part of kwaθidè', medicine-man.

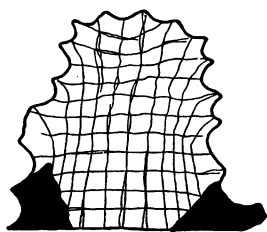
Fig. 40.—k in pāpk, part of teimpā'pk, four.

Figs. 41, 42.—q, possibly k, in qa, part of qara'è'rva, name of a place.

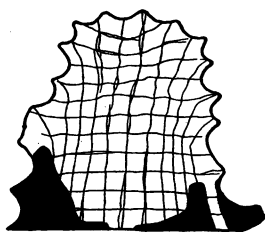
Figs. 43, 44.—qw and q in aqwā'qa, deer.

Fig. 45.—qw in qwa, part of qwalyinyo', tule.

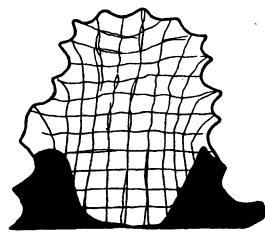
Fig. 46.—q in aqā'qa, raven.



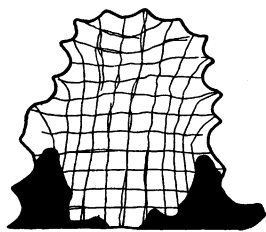
35 ku



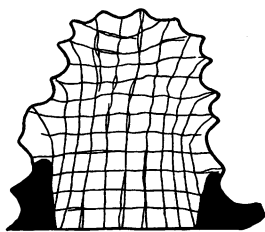
36 ku



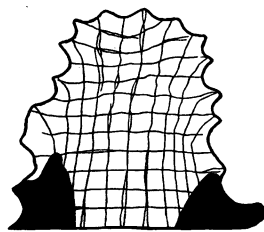
37 ka



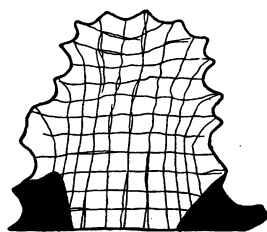
38 kwa



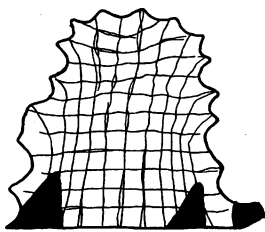
39 kwa



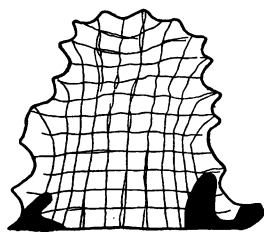
40 -k



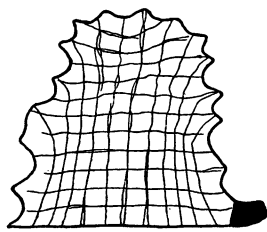
41 qa



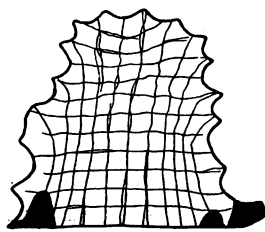
42 qa



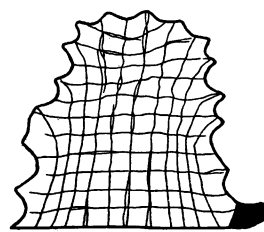
43 qwa



44 qwa



45 qwa



46 qa

EXPLANATION OF PLATE 10

Tracings from the nose and mouth of informant one; nose above.

Fig. 47.—mastamho'inte, syntactical form of mastamho', an important mythological character. Cf. fig. 83.

Fig. 48.—anyā', sun.

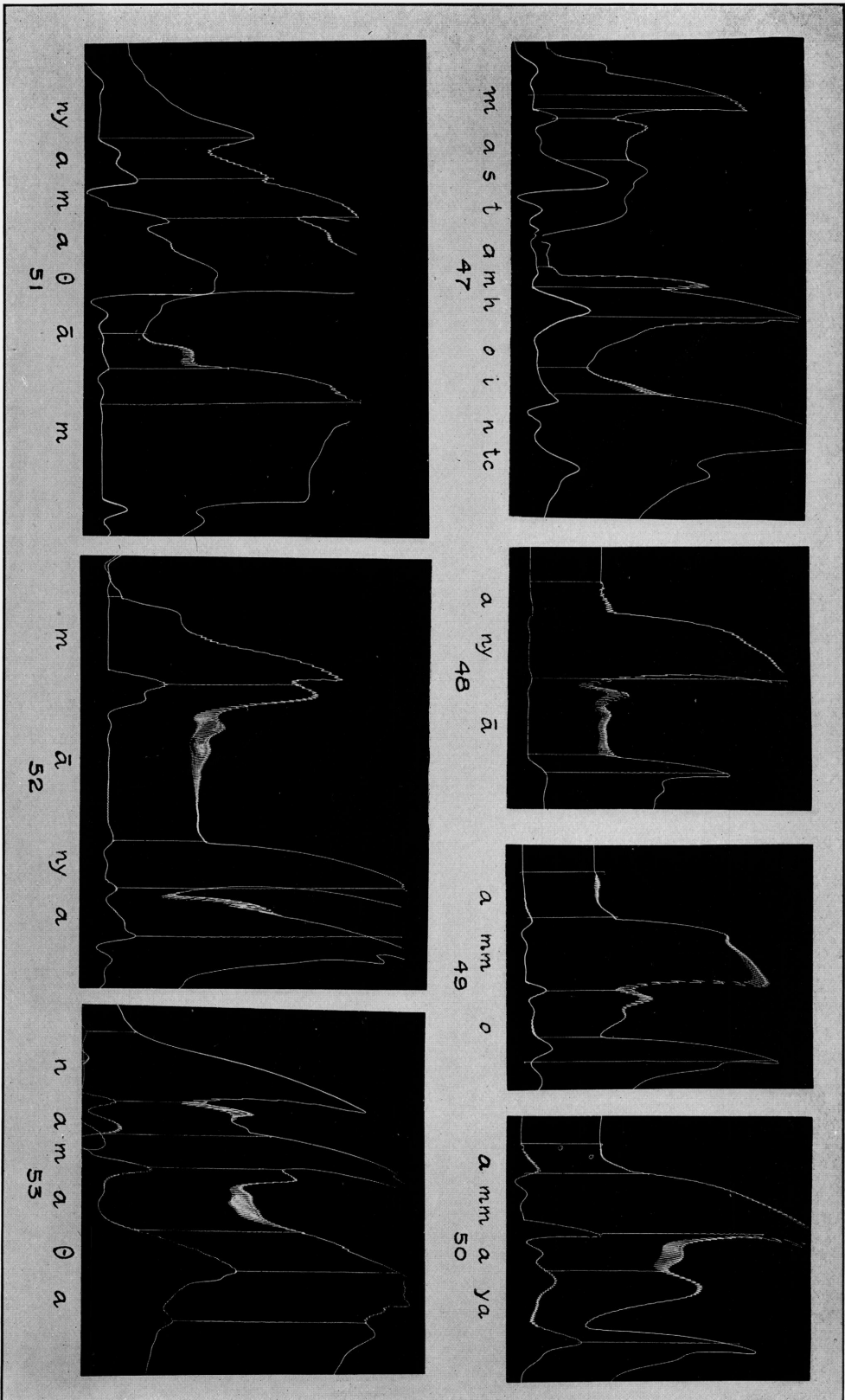
Fig. 49.—a'mmo, mountain-sheep. Cf. fig. 72.

Fig. 50.—amma'ya, sky.

Fig. 51.—nyamaθā'm, tomorrow. Cf. fig. 86.

Fig. 52.—mā'nya, you.

Fig. 53.—na'maθa, raccoon.



TRACINGS OF MOHAVE WORDS.

EXPLANATION OF PLATE 11

Tracings from the mouth and glottis of informant one; glottis below.

Fig. 54.—melyeqe', throat. Cf. fig. 91.

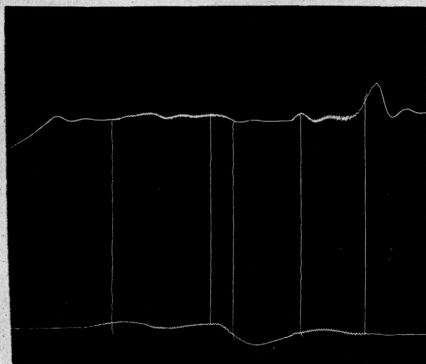
Fig. 55.—'iv'a'um, standing. Cf. fig. 100.

Fig. 56.—θara'pk, five.

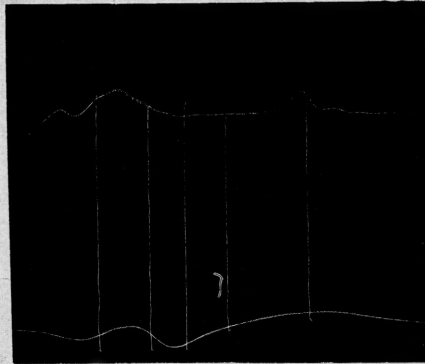
Fig. 57.—ama'ta, earth. Cf. fig. 122.

Fig. 58.—'i'puik, dead.

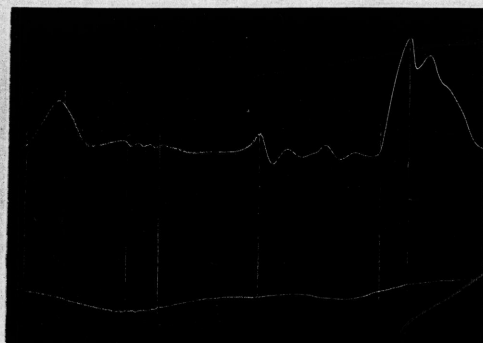
Fig. 59.—orrò', the nighthawk. Cf. figs. 101, 133.



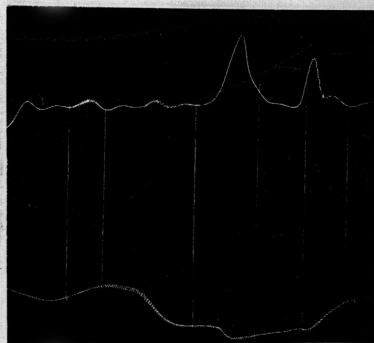
m e l y e q e
54



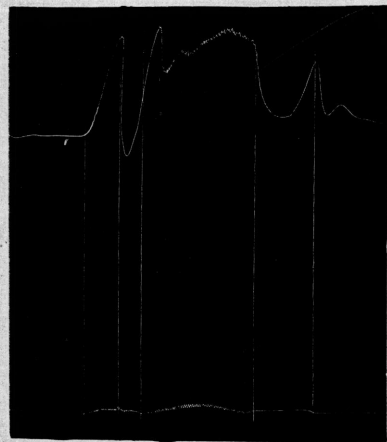
' i v ' a ' u m
55



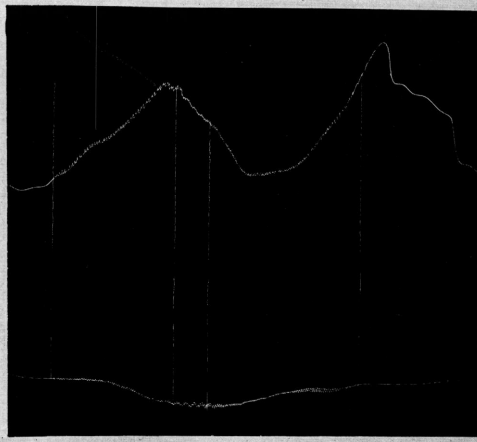
θ a r a p k
56



a m a t a
57



' i p u i k
58

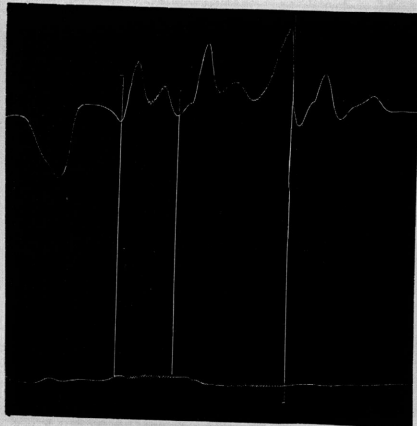


o r r ò
59

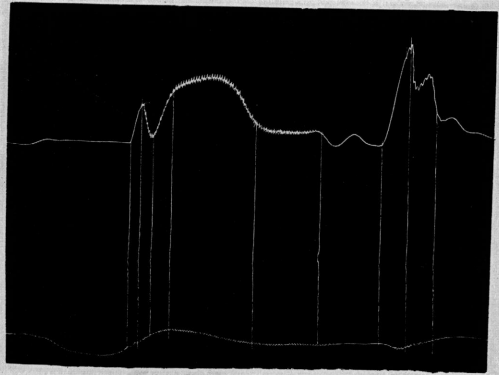
EXPLANATION OF PLATE 12

Tracings from the mouth and glottis of informant one; glottis below, except in fig. 65.

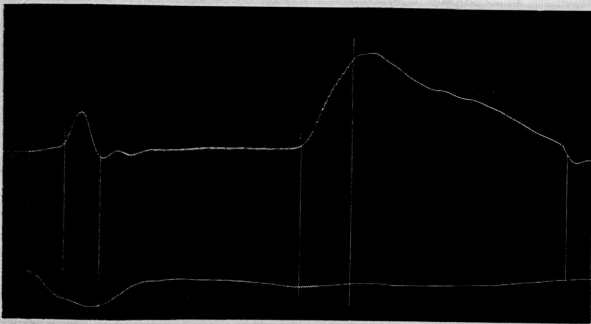
- Fig. 60.—tcimpā'pk, four.
 Fig. 61.—ta'ððitea, corn. Cf. fig. 92.
 Fig. 62.—aθ', salt.
 Fig. 63.—inye'pa, I.
 Fig. 64.—vì'ka, seven.
 Fig. 65.—as'a'sim, nodding repeatedly.



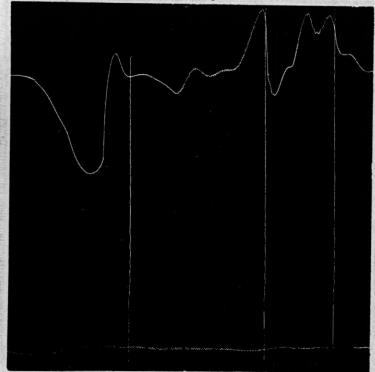
tcimpā'pk
60



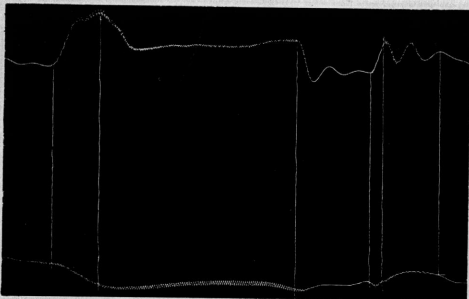
ta'ððitea
61



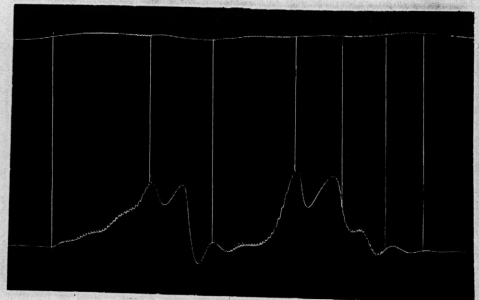
aθ'
62



inye'pa
63



vì'ka
64



as'a'sim
65

EXPLANATION OF PLATE 13

Tracings from the mouth and glottis of informant one.

Fig. 66.—pi'ipa', somebody. Glottal tracing above. Cf. fig. 124.

Fig. 67.—'i'puka, its end or beginning. Glottal tracing above.

Fig. 68.—ka'ŋm, give! Glottal tracing above.

Fig. 69.—a'htot-a, grape-vine. Glottal tracing above.

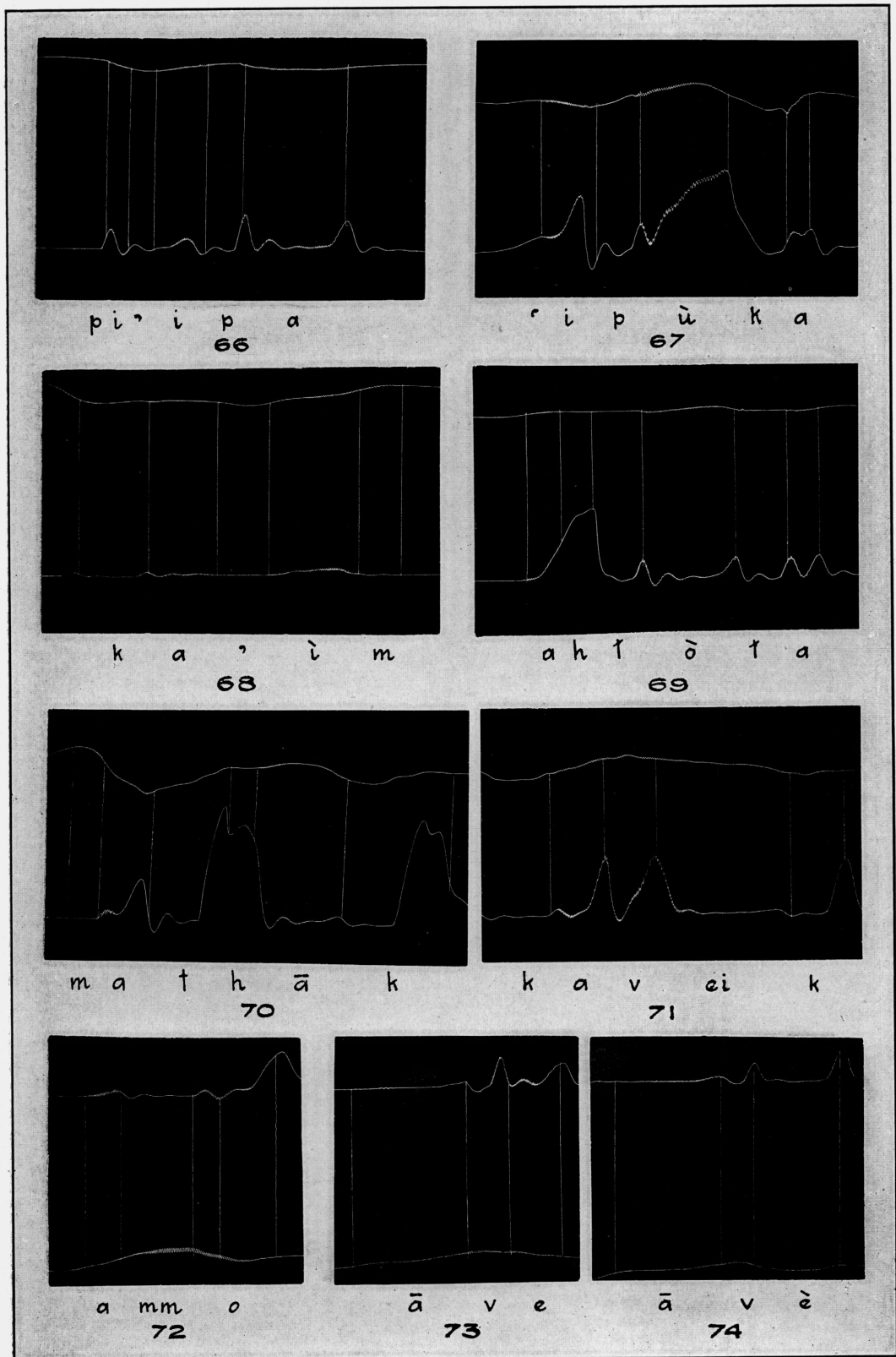
Fig. 70.—ma'thāk, wind, north. Glottal tracing above. Cf. fig. 97.

Fig. 71.—ka'veik, south. Glottal tracing above. Cf. fig. 105.

Fig. 72.—a'mmo, mountain-sheep. Glottal tracing below.

Fig. 73.—ā've, rattlesnake. Glottal tracing below.

Fig. 74.—āvē', mouse. Glottal tracing below.



EXPLANATION OF PLATE 14

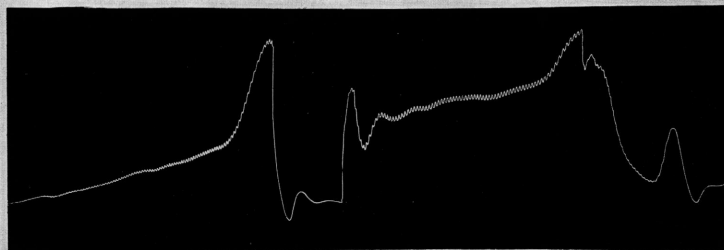
Tracings from the mouth of informant one.

Fig. 75.—ò'tùra, gambling poles. Cf. fig. 121.

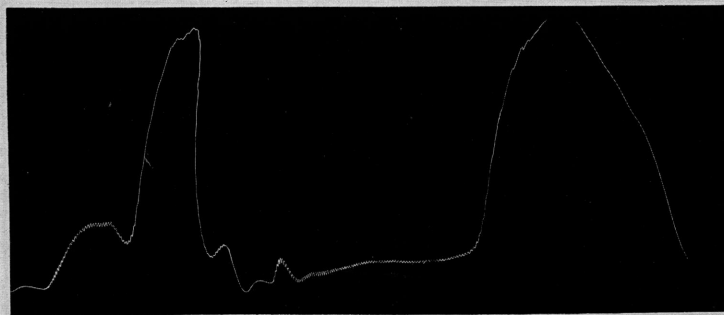
Fig. 76.—ihne', drift-wood.

Fig. 77.—vā'ptite, nothing. An a that has not been heard appears between the p and t. Cf. fig. 143.

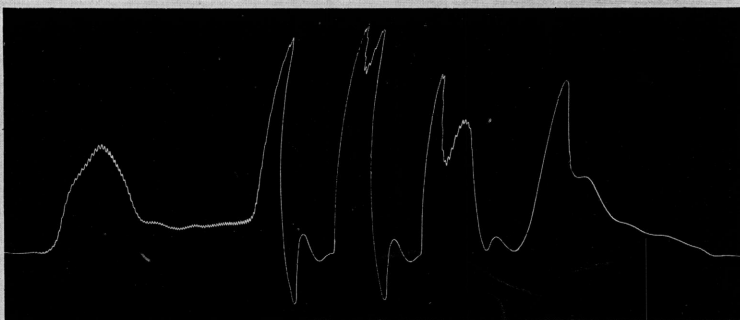
Fig. 78.—kwora 'ā'koè'vite, elder brother, from kwora 'ā'ka, old man, and o'è'vite. The glottal stop in the latter word, and that which should separate the two elements of the compound, do not show in the tracing and have probably been slurred out.



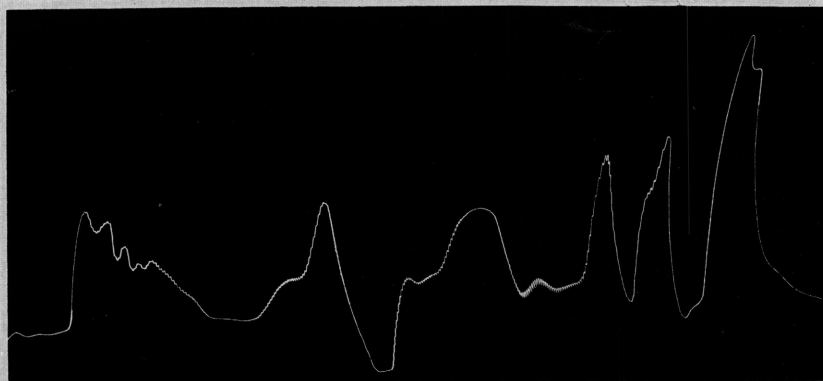
ò t ù r a
75



i h n è
76



v ā p [a] t i tc
77



kwora ' ā k [a] o ['] e v i tc
78

EXPLANATION OF PLATE 15

Tracings from the mouth of informant one.

Fig. 79.—ma't'āra, play-ground, field.

Fig. 80.—hannava', an insect.

Fig. 81.—ayā', mesquite bean. Cf. fig. 134.

Fig. 82.—a'laik, bad.

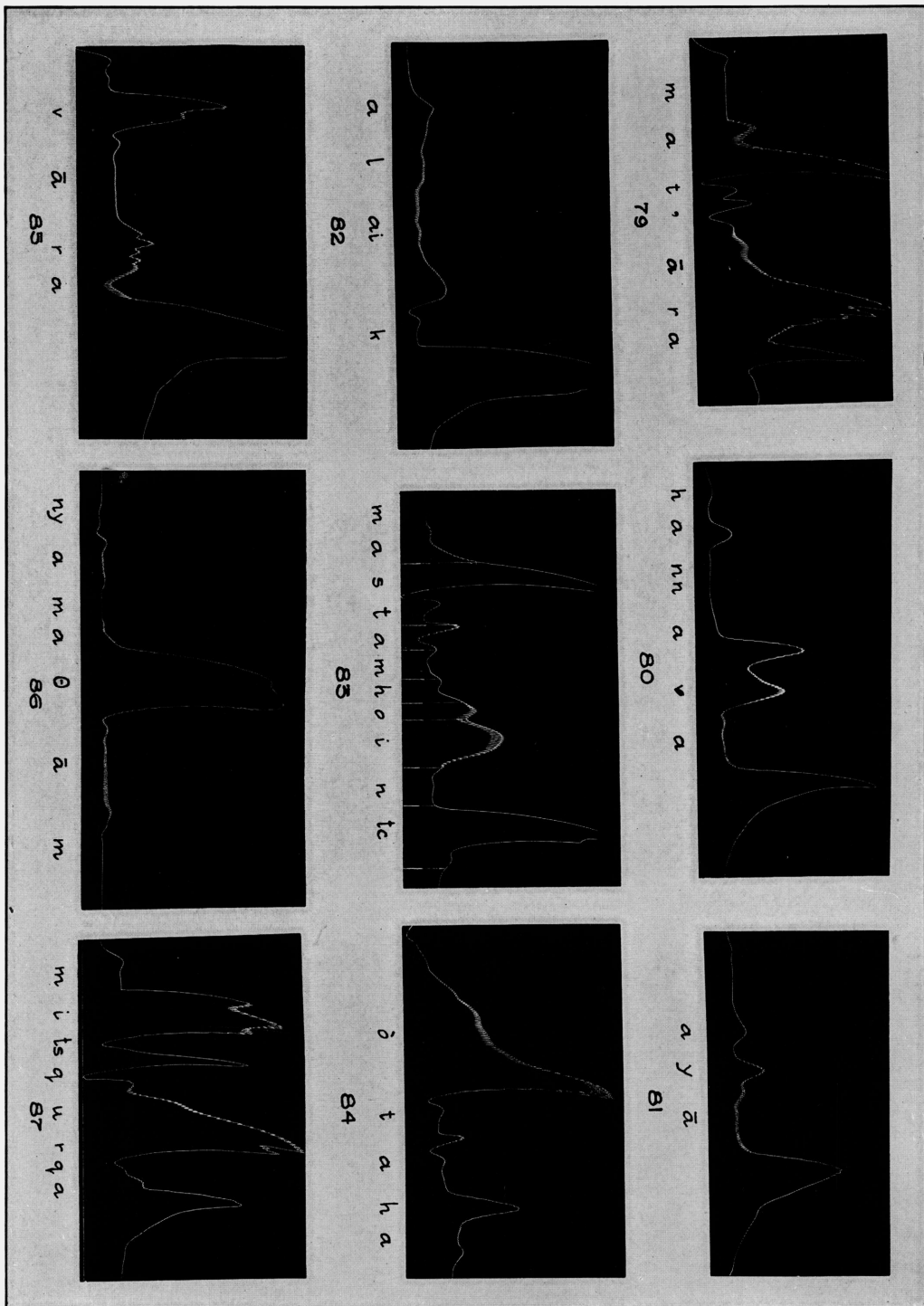
Fig. 83.—mastamho'inte, a mythological character. Cf. fig. 47.

Fig. 84.—ōta'ha, dice.

Fig. 85.—vā'ra, no. Cf. fig. 139.

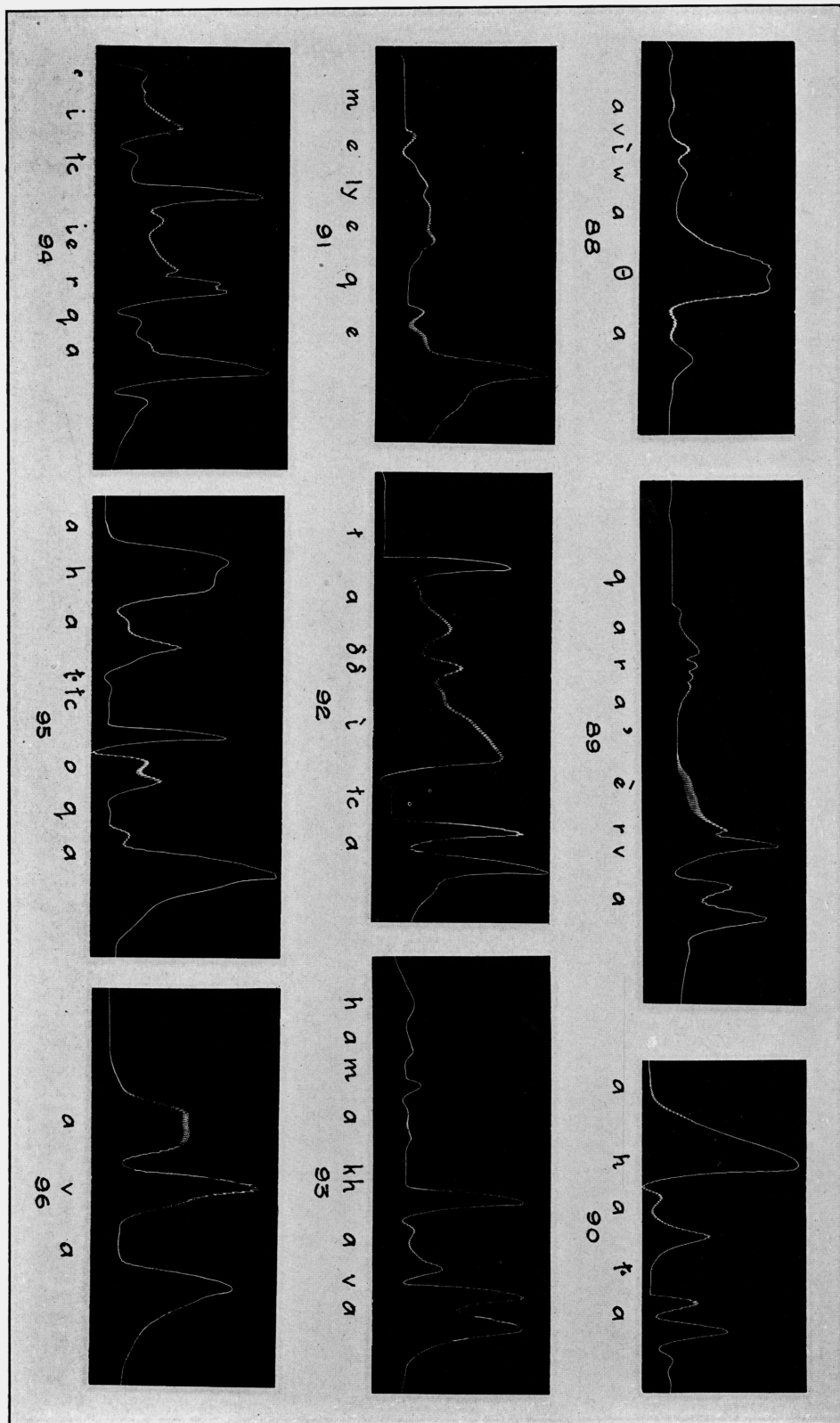
Fig. 86.—nyamaōā'm, tomorrow. Cf. fig. 51.

Fig. 87.—mi'tsqurqa, part of aha'nya-mi'tsqurqa, a certain kind of frog. Ts perhaps equals tc.



Tracings from the mouth of informant one.

- Fig. 88.—avi'watha, name of a place.
- Fig. 89.—qara'è'rva, name of a place. The initial may be k. Cf. fig. 142.
- Fig. 90.—aha't-a, domestic animal, now horse. Cf. fig. 141.
- Fig. 91.—melye'q, throat. Cf. fig. 54.
- Fig. 92.—ta'ððitca, corn. Cf. fig. 61.
- Fig. 93.—hama'khava, Mohave.
- Fig. 94.—'itcie'rqa, its excrement.
- Fig. 95.—aha't:teoqa, dog. From aha't-a (fig. 90). Cf. fig. 140.
- Fig. 96.—ava', house.



EXPLANATION OF PLATE 17

Tracings from the mouth of informant one.

Fig. 97.—ma'thāk, wind, north. Cf. fig. 70.

Fig. 98.—ìðo'kuvaì'ra, name of a place. A glottal stop has usually been heard between a and ì.

Fig. 99.—hamo'k, three.

Fig. 100.—'iv'a'um, standing. Cf. fig. 55.

Fig. 101.—orrò', the nighthawk. Cf. figs. 59, 133.

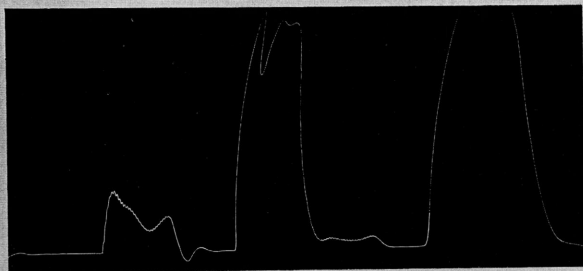
Fig. 102.—ko're, now, well, then, come. Cf. fig. 144.

Fig. 103.—ì'wa, my heart. Cf. fig. 135.

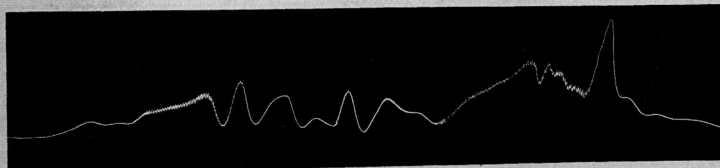
Fig. 104.—ahtā', cane.

Fig. 105.—ka'veik, south. Cf. fig. 71.

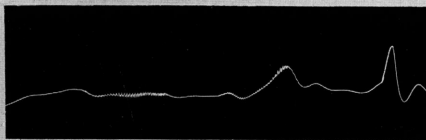
Fig. 106.—ðokupì'ta, owl.



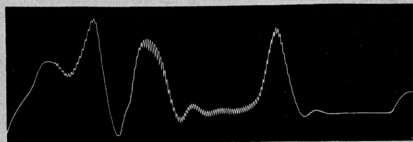
m a t h ā k
97



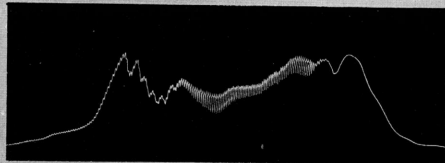
ì ð o k u v a ì r a
98



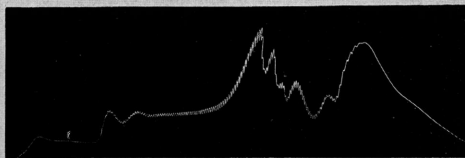
h a m o k
99



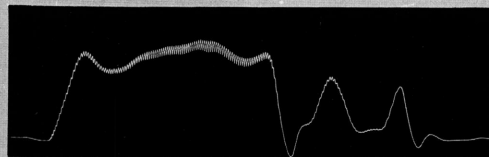
' i v ['] a u m
100



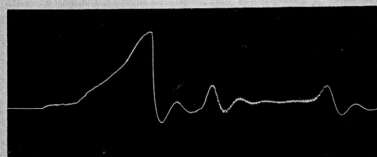
o r r ò
101



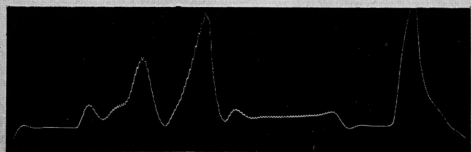
k o r e
102



ì ' w a
103



a h t ā
104



k a v e i k
105



ð o k u p ì t a
106

EXPLANATION OF PLATE 18.

Tracings from the mouth of informant one.

Fig. 107.—lù'lim, fly slowly.

Fig. 108.—ye'llaka, wild goose.

Fig. 109.—ì'hù, my nose.

Fig. 110.—'ì'hù, his nose. Cf. fig. 119.

Fig. 111.—meremè'rem, straight.

Fig. 112.—arrā', interjection of astonishment. Cf. fig. 136.

Fig. 113.—aha'kuvì'lya, name of a place.

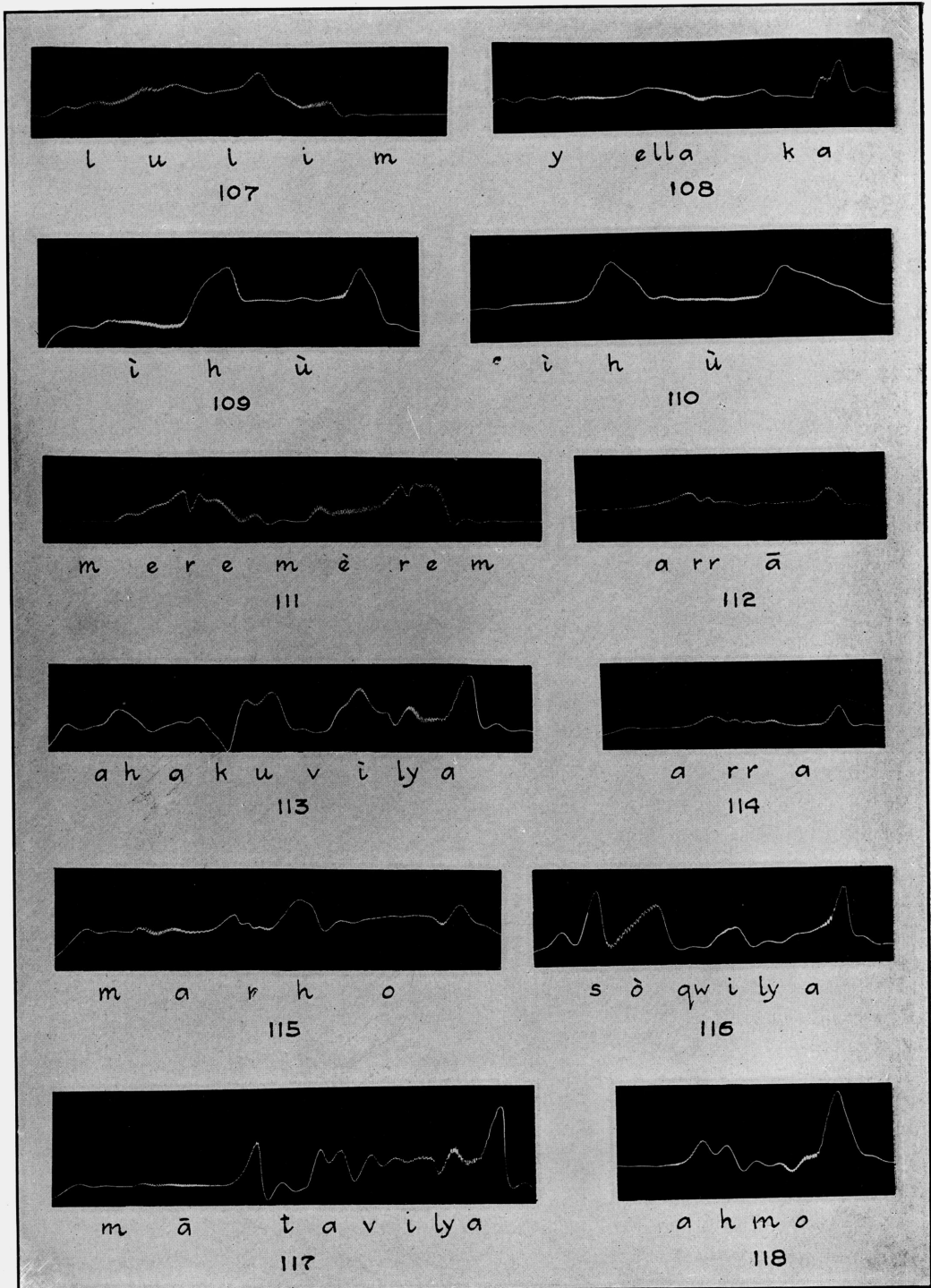
Fig. 114.—arra', interjection of surprised fear.

Fig. 115.—marho', fox.

Fig. 116.—sò'qwilya, a species of hawk.

Fig. 117.—mā'tavilya, a mythical character.

Fig. 118.—ahmo', mortar.



EXPLANATION OF PLATE 19

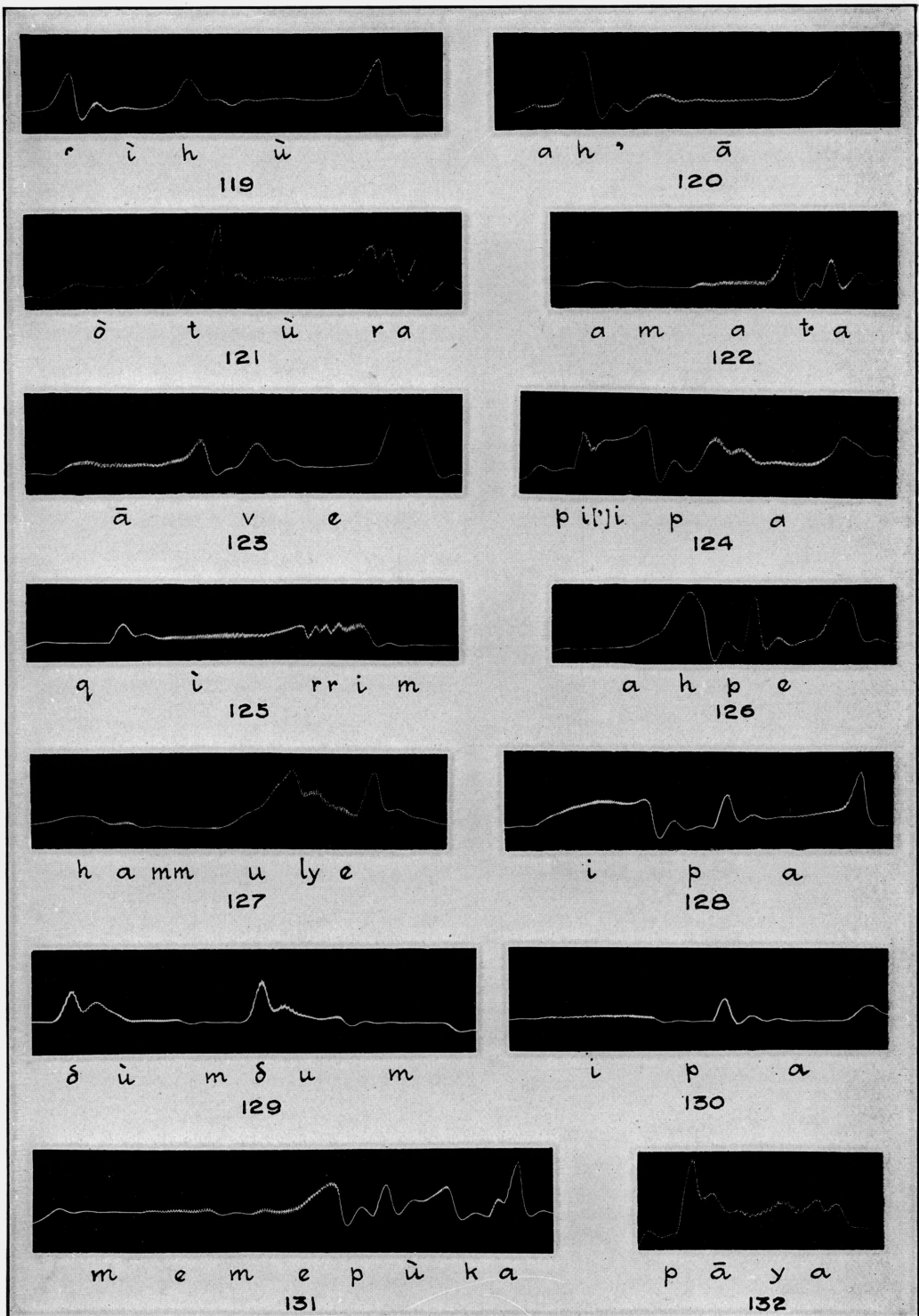
Tracings from the mouth of informants two and one.

Informant two:

- Fig. 119.—'i'hù, his nose. Cf. fig. 110.
- Fig. 120.—ah'ā, cottonwood.
- Fig. 121.—ò'tùra, gambling poles. Cf. fig. 75.
- Fig. 122.—ama'ta, earth. Cf. fig. 57.
- Fig. 123.—ā've, rattlesnake. Cf. fig. 73.
- Fig. 124.—pi'ipa', somebody. The glottal stop seems to have been slurred out. Cf. fig. 66.

Informant one:

- Fig. 125.—qì'rrim, fly fast.
- Fig. 126.—ahpe', metate.
- Fig. 127.—hammulye', ashes.
- Fig. 128.—ipa', man.
- Fig. 129.—δù'mδum, but.
- Fig. 130.—ipa', arrow.
- Fig. 131.—memepù'ka, knee. Probably from i'me, my leg.
- Fig. 132.—pā'ya, all.



EXPLANATION OF PLATE 20

Tracings from the mouth of informant two.

Fig. 133.—orrò', the nighthawk. Cf. figs. 59, 101.

Fig. 134.—ayā', mesquite bean. Cf. fig. 81.

Fig. 135.—i'wa, my heart. Cf. fig. 103.

Fig. 136.—arrā', interjection of astonishment. Cf. fig. 112.

Fig. 137.—a'tsqueuqa, a bird, probably the bittern.

Fig. 138.—alyha', hermaphrodite.

Fig. 139.—vā'ra, no. Cf. fig. 85.

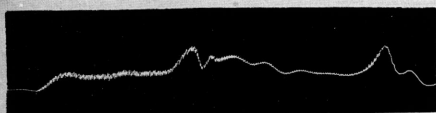
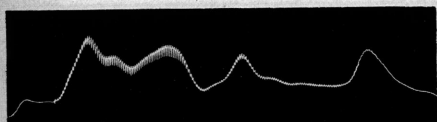
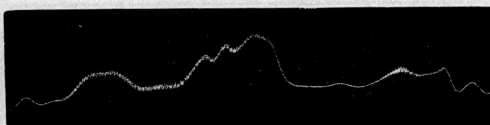
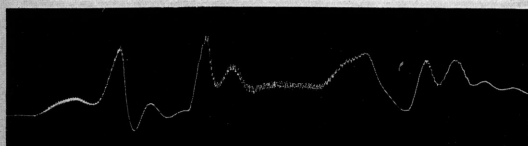
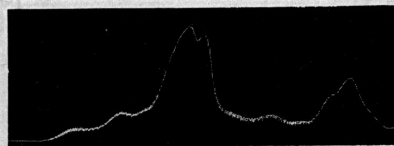
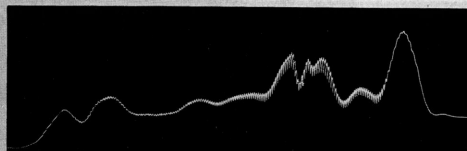
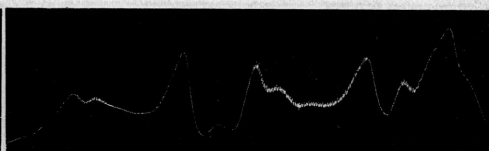
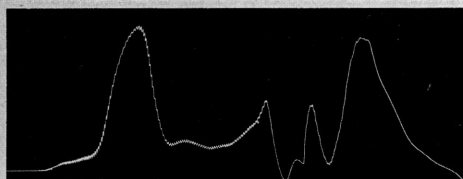
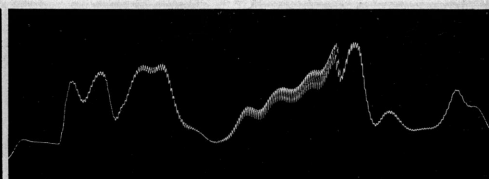
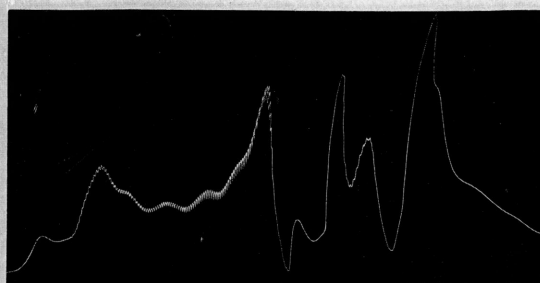
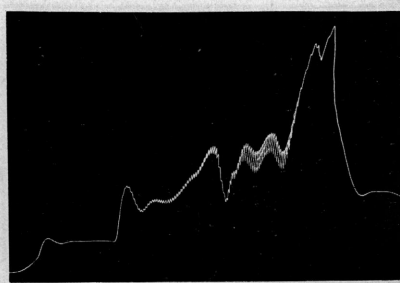
Fig. 140.—aha't.tcoqa, dog. The initial a seems to have been slurred out of existence. Cf. fig. 95.

Fig. 141.—aha't.a, domestic animal, horse. Cf. fig. 90.

Fig. 142.—qara'è'rva, name of a place. The glottal stop is slurred over. Cf. fig. 89.

Fig. 143.—vā'ptite, nothing. The word seems derived from vā'ra, no (figs. 85, 139). The undulations of the tracing of ā suggest a following r, which however does not appear in the tracings and has not been heard. Cf. fig. 77.

Fig. 144.—ko're, now, well, then, come. Cf. fig. 102.

o rr ò
133a y ā
134i w a
135a rr ā
136a ts q eu q a
137a ly h a
138v ā r a
139[a]h a t t c o q a
140a h a t a
141q a r a ['] è r v a
142v ā p t i t e
143k o r e
144

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