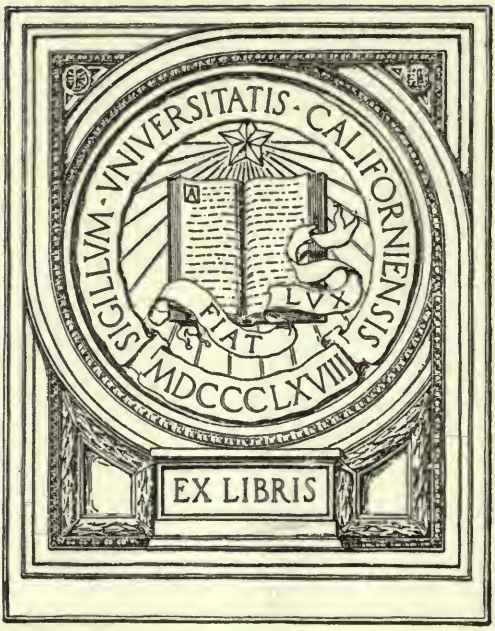

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Vol. 5 No. 1

THE PHONOLOGY OF THE HUPA LANGUAGE

PART I.—THE INDIVIDUAL SOUNDS

BY
PLINY EARLE GODDARD

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VOLUME 5

WITH 26 PLATES

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VOL. 5 NO. 1

THE PHONOLOGY OF THE HUPA LANGUAGE.

PART I.—THE INDIVIDUAL SOUNDS.

BY

PLINY EARLE GODDARD.

INTRODUCTION.

Since there is great danger, almost a certainty, that the American languages will become extinct in a few generations, it is extremely important that they should be so recorded that a comparative study may be made of their relation to each other and to the other languages of the world.

There are two serious obstacles to be overcome. First, it is extremely difficult for a man of mature years to acquire a new language with any degree of perfection. Months or years of constant association with the native speakers are required for even a fair degree of success. It is not easy to separate the individual sounds from the sound masses, to distinguish closely related sounds, and to ignore distinctions which the speaker has always observed, but which are not observed in the language attempted. The lack of accuracy in this regard is only too evident when vocabularies of the same dialect recorded by different individuals are compared. It is still more apparent when the recorders are of different nationalities.

The second task met with is to find a means of conveying to others these sounds so laboriously acquired. This difficulty becomes more apparent to the would-be recorder as his discrimination of the sounds of the language becomes more exact. At first

it seems sufficient to say that they are equivalent to the corresponding sounds of English or German. Gradually the consciousness arises that not one of the sounds is exactly equivalent to any sounds that he knows in other languages, most probably he will find a sound or two utterly different.

This difficulty of sound-representation may be met in two ways. First, a careful description may be made of the physiological processes involved in their production; and, second, the physical characteristics of the sounds themselves may be pointed out. By means of the information thus given, one who has never heard the sounds may gain some idea of their character and relation to each other and may even produce them with a degree of accuracy.

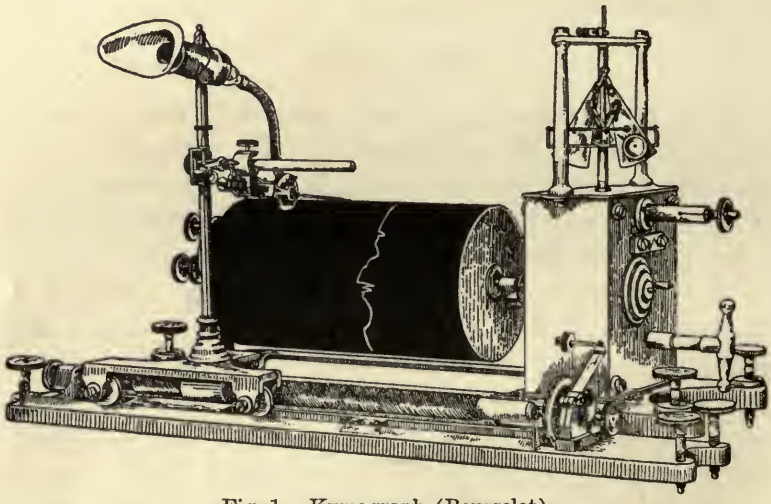

Fig. 1.—Kymograph (Rousselot).

Much of the information necessary concerning the physiological positions and movements may be obtained by directly observing the native speakers. The camera is a considerable aid in preserving such data for purposes of comparison and in representing them to the student. Photographs of the lip positions for the vowels may be easily and quickly made with a sufficiently good lens and light. The tongue positions for most of the consonants may be fixed by means of palatograms, the making of which

requires little time and trouble when once a false palate has been obtained for the native subject. Other physiological data may be secured and preserved by means of records on a kymograph according to the methods of Rousselot[1] (Fig. 1). Especially the exact time and degree of the movements of the organs in their relation to each other may be recorded in this manner.

The physical characteristics of the language may be preserved by means of the improved phonographs of the several makes. Such records are, however, practically valueless unless they are accompanied by carefully written texts. Otherwise there is no means of associating the proper meaning with the sounds.

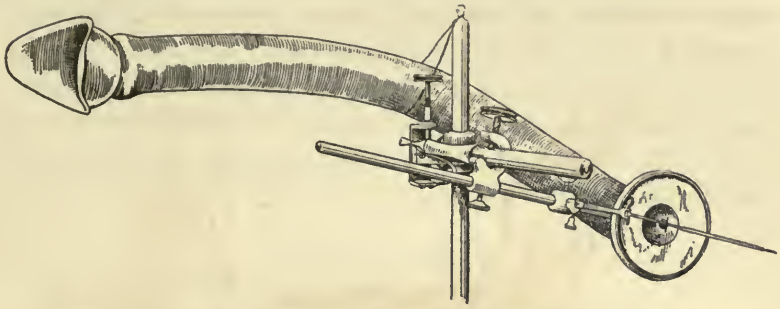

Fig. 2.—Vowel Tracer (Goddard).

An analysis of the physical character of the vowel sounds of a language would allow a statement of them in terms of Fourier's theorem both for comparison and record. This can be accomplished by transcribing and enlarging the records made on the phonograph according to the method of Bevier[2] or Hermann,[3] or the records on the gramophone according to the method of Scripture.[4] By means of the kymograph and a vowel recorder consisting of a disk of glass or rubber and a reed pen (Fig. 2),

[1] For a more extended discussion consult an article by the author: Mechanical Aids to the Study and Recording of Language, Am. Anthropologist, Vol. VII, No. 4, pp. 613-619, 1905.

[2] Bevier, The Acoustic Analysis of the Vowels from the Phonograph Record, Physiological Review, Vol. X, 193 (1900); Vol. XIV, 171 (1902).

[3] Hermann, Phonophotographische Untersuchungen, I, Arch. f. d. Ges. Physiol., 1889.

[4] Scripture, Researches in Experimental Phonetics, Stud. Yale Psychological Laboratory, 1899.

records for the eye may be made on smoked paper. These may be studied for the length and pitch of the vowels and when enlarged by photography may be analyzed for their physical characters. Such an analysis of the vowels of Hupa has been attempted, but has not yet been carried to completion.

The physical characters of the consonants, in many particulars, may be easily determined and represented by means of the kymograph and a Marey tambor according to the methods of Rousselot. The fact of sonancy and its limits, especially, is easily determined in this manner.

By means of the several methods mentioned above an attempt has been made in the following paper to represent the Hupa language as spoken by one individual, Julius Marshall. This has been done in part to obtain a permanent record of this one Athapascan dialect, but more especially for the sake of comparison with similar records of related dialects which it is hoped may be soon made and presented.

CLASSIFICATION.

The individual or elementary sounds of a language are abstractions except as here and there a syllable consists of a single sound. While it is true that they have a slightly different value produced by the phonetic setting of each separate syllable, the change is so slight that it becomes very practical to represent and describe these abstractions as if they really existed, and afterward indicate, where it seems necessary, the changes wrought upon them by the sounds which go before or follow after. There are in Hupa thirty-three individual sounds, of which nine are vowels, two are semi-vowels, one is a liquid, five are nasals, eight are spirants, and eight are stops. Of the vowels, a unites with ī and ū to form the diphthongs ai and au, and ō with ī to form oi. It is difficult to be sure whether the sound which has sometimes been represented by ē and sometimes by ei is a simple vowel or a diphthong. Of the consonants, t unites with the spirants l, s, and c to form affricatives, and d in like manner with z and j. The prepalatal stops, k and g, when aspirated upon their release,

1.—a, wa-, *through.*

2.—a, adenne, *he said.*

3.—e, es, *fish-trap.*

4.—ō, ōle, *become ye.*

5.—i, ille, *become thou.*

6.—ō, yō, *that.*

7.—ī, kīye, *again.*

8.—ē, ēdin, *without.*

9.—*w*, taikyūw, *sweathouse.*

10.—ū, tillū, *dive out.*

1

2

3

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8

9

10

PROFILE VIEW OF THE SAME

are followed by a glide resembling y and of sufficient strength to attract considerable attention.

Besides these sounds there are two belonging to the glottis, a stop and a spirant. As far as is known these directly precede or follow a vowel. They have little or no sound in themselves, but make themselves apparent by the character which they impart to the vowel with which they are employed, or by the silence which they enforce. They have been viewed as modes of vowel utterance rather than independent "sounds"; although they must be recognized as parts of the language essential to its intelligibility.

DESCRIPTION.

VOWELS.

The vowels of Hupa, as a whole, are characterized by almost a minimum of lip and jaw movement. The mouth aperture is often so small that one wonders that the sound of the voice is not entirely smothered. Something of this closeness is apparent in the photographs shown in Pls. 1 and 2. This laxness of lip motion is no doubt compensated for by additional tongue activity.

a.

The vowel a with about the quality of a in father (Pl. 1, Figs. 1, 2; and Pl. 2, Figs. 1, 2) shows no greater and sometimes less opening than e. This is especially noticeable when the vowel is initial. When it follows w in the syllable wa, it has its greatest opening, exceeding that for any other vowel. After working for some time with the language, it was found necessary to distinguish between two varieties of this sound. At first the difference was supposed to be due to duration and later it was attributed to pitch. First by means of the eye in examining tracings and later by the ear, it became evident that the principal, if not the only difference, was due to the aspiration in one and the lack of it in the other. This aspiration, while it continues after the vowel ceases, especially makes itself apparent in the latter part of the vowel to which it gives a "breathy" character. This seems also to be true of the vowel when it is followed by any spirant. When the vowel is followed by a stop, glottal or buccal, it has a hard,

compact sound. The former is heard in yī-da-tciñ, "from the north," and in the second person plural of the present of verbs like na-a, and the second occurs in yī-da-tcin, "from the east," and in the third person singular of the present, na-a.

û

Closely related to a, not only in its manner of formation, but also in its alternation with it under certain morphological and phonetical circumstances, is the vowel û. It seems to the ear to be not quite so narrow as u in but, yet less wide than the preceding sound. It occurs when a syllable becomes closed by the presence of an n as in yûn-tū*w*, "you pick it up," while a appears in ya-tū*w*, "he is picking it up." It also alternates with a in the root of this word as it appears in the perfect tenses. The present definite is ya-win-tûñ, while the past definite is ya-win-tan. The past has a stress accent on the ultima, while the present has the accent on the penult.

e.

The vowel e is quite open as regards the mouth movement. This is apparent from Pl. 1, Fig. 3, and Pl. 2, Fig. 3, especially if it be compared with ē. It is in no sense a "short" vowel since it is normally as long as a or ō, nor is it confined to closed syllables. To the ear it appears to be less open than the English e in met, but this may be due in part to its occurrence finally in the syllable. It is found in Hupa where most of the other Athapascan dialects have ī.

ē

A close sound, resembling e in they, is of occasional occurrence in Hupa. A vanish is sometimes present, but it is never very noticeable. This sound sometimes results from e when it is followed by y as te-sē-yai, "I went," but te-se-lat, "I floated." It occurs in other circumstances where nothing seems to influence it toward closeness. By an examination of Pls. 1 and 2, it will be seen that this vowel is uttered with an even greater approximation of the lips than ī.

i.

The vowel i is decidedly open in its formation (Pl. 1, Fig. 5, and Pl. 2, Fig. 5). It differs little, if at all, from the corresponding sound in English, and, as in English, it occurs only in closed syllables. It seems to bear something of the same phonetic and morphological relation to e that û does to a. It often appears where it seems to have no etymological reason for its existence, but where it is required to preserve the syllable. In the other Athapascan dialects n, l, ʟ, or s, as the case may be, fills the syllable without the aid of a vowel. It never has the full length given the other vowels and is at times exceedingly brief.

ī.

Of rather infrequent occurrence is the vowel ī. In most of the cases in which it is found, its phonetic setting favors it. It is found in kī-ye, "again," where it is followed by y and in the names of the cardinal points where it is preceded by y as in yī-de. This word, however, is as often pronounced yit-de. It is found in mī, "weather spirits," where no such explanation will hold. Otherwise the result is what would be expected in case all ī's had passed into e except where prevented by the phonetic setting. As has been said above, there is reason to believe that this has happened.

ō.

The o-sound is generally of rather close quality, as in English so or note. The lips are but slightly protruded, as will be seen from Pls. 1 and 2. This vowel is the characteristic of the second person plural under nearly all circumstances and, in that office, ends in a definite aspiration. As in the case of a, mentioned above, this aspiration imparts a peculiar quality to the whole vowel, but is more pronounced in its latter part. The sonancy seems to fade out of it while the breath continues.

o.

Under some phonetic circumstances a similar vowel appears somewhat obscured and perhaps slightly more open in its char-

acter. This is apt to be the case before n, t, and l. For example, in xon-ta it is much like that in English on, but noticeably closer. It does not seem probable that this vowel was originally distinct from the preceding.

ū.

The vowel ū is spoken with the lips closely approximated and well protruded. It frequently stands for other vowels where they would be followed by w. This is especially true in the case of weak syllables. In this regard there is a parallel between it and ī when followed by y. Morphologically it appears paired with e in certain roots, but it does not seem possible that there is a corresponding phonetic relation between them.

SEMI-VOWELS.

y.

The sound represented by y seems to differ very little if at all from the corresponding sound in English. On referring to Pl. 3 it appears that the place of the narrowing of the mouth passage and the amount of the narrowing agrees very closely with that for English. No difference is perceptible to the ear.

w.

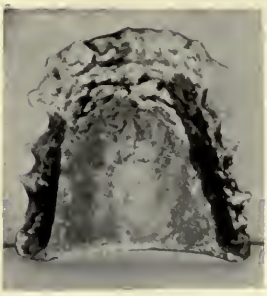
The semi-vowel w stands for a sound practically identical with that of English. It is probable that in Hupa the lips are not so much protruded as in English. This sound seems to correspond to a velar or palatal sonant stop in some of the other Athapascan dialects.

CONSONANTS.

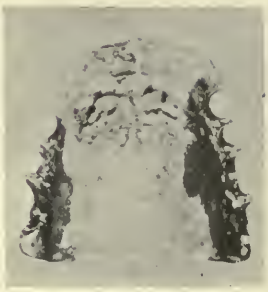
CONTINUANTS.

Liquid.

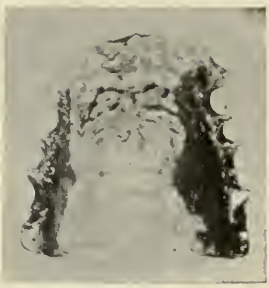
The Hupa has but one liquid, the lateral trill, l. Some of the northern languages have been recorded with an r of rather uncertain nature. The Tolowa has a trilled sound resembling r, which occurs after t and some other sounds, but which never stands alone as the initial or final sound of a syllable. The Hupa



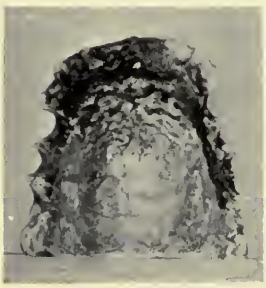
1.—y, ya, *lice.*



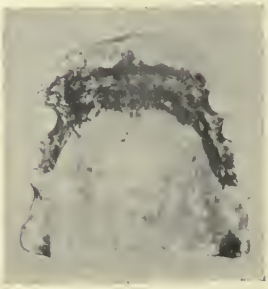
2.—y, yeū, *distant.*



3.—y, you (Eng.).



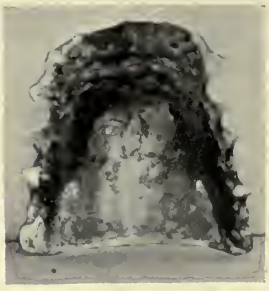
4.—l, la, *seaweed.*



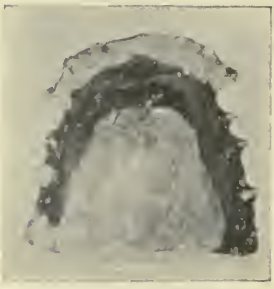
5.—l, tcenilla, *he took out.*

6.—l, low (Eng. author).

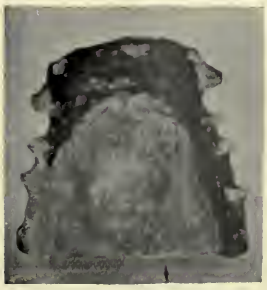
7.—L, La, *one.*



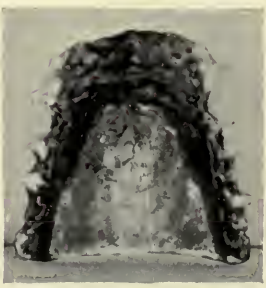
8.—L, Le-, together.



9.—L, miL, *with it.*



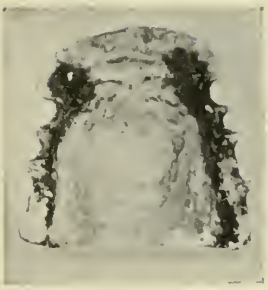
10.—L, Lōk, *salmon.*



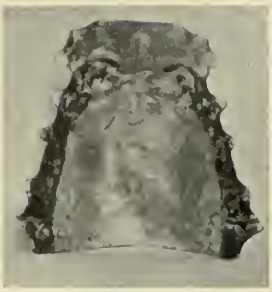
11.—L, Lō, *grass.*

12.—L, Lō, *grass.*

PALATOGRAMS.

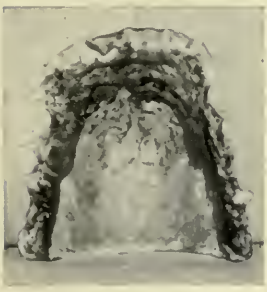


1.—s, xaïsyai, *he came up.*

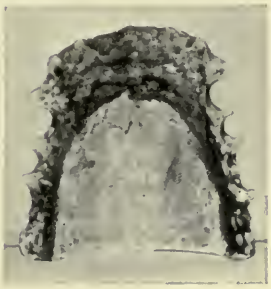


2.—s, so (Eng. author).

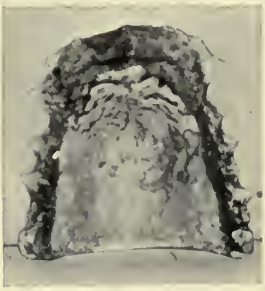
3.—dj, dje, *pitch.*



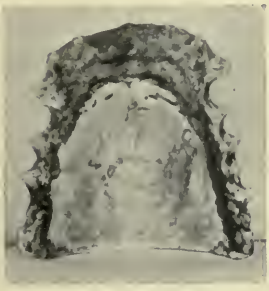
4.—tc, tce-, *out.*



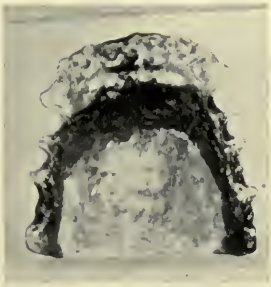
5.—d, dau, *no.*



6.—t, te-, *in water.*

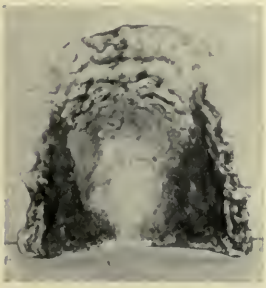


7.—*t*, te, *blanket.*

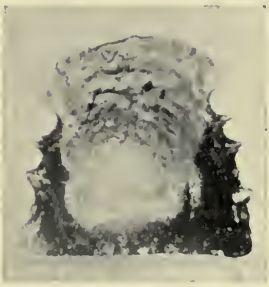


8.—d, doe (Eng.).

9.—n, nō-, *come to rest.*



10.—ky, kya, *dress.*



11.—k, kīye, *again.*

12.—k, key (Eng.).

PALATOGRAMS.

have no sound approaching r, although their neighbors, the Yurok, have a very pronounced one.

The tip of the tongue, in pronouncing l in Hupa, rests upon the gums just above the teeth or upon the teeth themselves—a position well forward of that employed in English. A passageway for the escape of the breath is left on each side of the mouth near the second molars. This agrees exactly with the English positions of escape. Compare Figs. 4, 5, and 6 of Pl. 3.

The sound of the Hupa l is noticeably different from that in English. It might perhaps be described as less bell-like and more nearly approaching a spirant. The Hupa find certain English combinations with l difficult. They pronounce ellus for eels, and millik for milk. Closely connected with l both phonetically and morphologically are the spirants ʟ and L.

Nasals.

m.

The sound represented by m calls for no comment. Its position is both evident and fixed. It has a full nasal quality with no tendency toward a mixed quality approaching b. Several of the Athapascan dialects in many words have b in the place of Hupa m. Since Hupa entirely lacks b, m may actually have assumed its place.

n.

The tongue position for n is well forward of that for the English sound. The point of the tongue centers itself near the juncture of the front teeth and the gums. This position is the same as that occupied by d and t. The period of total nasality is quite short or sometimes entirely lacking. The velum seems to fall and immediately rise again, and the point of the tongue to recede from the contact as soon almost as it is completed. See Pl. 4, Figs. 8 and 9, and Pl. 5, Fig. 1.

ñ.

The nasal formed in the post-palatal position is very common in Hupa as the final sound in a syllable, and is even found in

some cases in the initial position where it is the result of a w assimilated to a preceding ñ. It seems quite generally to impart a nasal quality to the preceding vowel, but it does continue after the vowel, as a pure nasal. It seems to the ear to occupy less time than does English ng and lacks the ringing quality. See Pl. 5, Figs. 3, 5, and 7.

n.

A peculiar n was discovered while working over, with a Hupa helper, texts already recorded. Its exact nature eluded the ear completely and since it was of rare occurrence it was not noted in the Hupa Texts. Its true nature was disclosed by the use of the Rousselot apparatus. By examining Pl. 5, Fig. 4, it will be seen, (1) that the vowel preceding it is nasalized, (2) that a period of silence both as regards the nasal and the buccal passages ensues, (3) that an explosion of surd breath through the nasal passage follows. It appears from Pl. 5, Figs. 4 and 8, that the tongue does not assume the position for n until after the stop, which is thus shown to be glottal. The sound may be described as a surd dental nasal occurring after a glottal stop.

The ear perceives a short exploded sound with a prominent nasal resonance.

ñ

When a more careful study was made, it was found that a similar surd nasal in the palatal position occurs (Pl. 5, Fig. 6). This appears in the same morphological relation to *n* that ñ does to n.

SPIRANTS.

w, h*w*.

Closely related to w is the surd spirant *w*. When initial in Hupa it sounds very much like wh in English. Besides the puckering of the lips shown in Pl. 2, Fig. 9, and the raising of the back of the tongue toward the palate, there is perhaps a narrowing either at the palate or the glottis which gives the suggestion of h. When final, the sound is very elusive until the ear becomes accustomed to the language. The breath seems to escape very freely

and with less of the rubbing which characterizes spirants and gradually to die away. When it follows vowels other than ō and ū it is introduced by a glide related to ū. The tracings shown in Pl. 7, Figs. 3, 4, and 12, present the sound as a straight line at a high level above the base, indicating little or no variation in the force of the air column. It is hard at times to distinguish this sound from x, and under unusual adjustment the irregularities of the x tracing appear. This indicates that the narrowing is at the rear of the palate and that the uvula sometimes vibrates in consequence.

It is strange but undeniable that this sound corresponds to c (sh) or s in nearly all, or all, of the other Athapascan languages. The transition is hard to conceive unless a palatal sound is assumed as the base of both sounds, for which assumption there seems to be no other ground.

L.

Many American languages have one or more spirant sounds more or less closely associated with l. These are very difficult to hear, speak, or describe until one is thoroughly familiar with the language which contains them. Often they are described and written as tl, because l following t in English is often a surd if not a surd spirant. They are often mentioned as unilateral which may be one, but is not the only, important feature. To some ears the sound suggests k or kl.[5]

That the sound represented by L is sometimes unilateral appears from a study of the palatograms in Pl. 4. When l is uttered in either English or Hupa a passageway appears on each side, but for L such a passageway appears only on the left side of the palate, the right side of the mouth. By an examination of Pl. 6 it will be seen that l is plainly sonant, for it has minute regular waves which result from the vibration of the vocal chords. These are always lacking in tracings of L, proving beyond all doubt that it is surd. The tracings for the surd are seen to reach a greater height than do those for the sonant. This is generally the case

[5] Compare the name for the Indians at the South Fork of the Trinity, Kelta from Leldiñ. Contributions to North American Ethnology, Vol. 3, p. 89.

with surds, and is probably due to the fact that the closure of the glottis for sonants considerably restricts the flow of breath. This would seem to be partly counteracted by a greater narrowing of the mouth passage, giving to the surd the quality peculiar to spirants. Both the surd and sonant show a sharp single depression which is probably due to a single movement of the side or sides of the tongue.

That these two sounds are related morphologically appears in the nouns and verbs of Hupa.[6]

h.

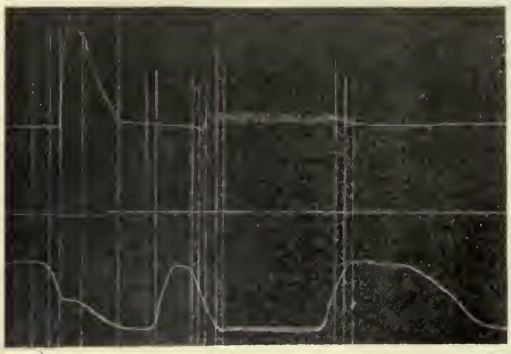
The sound represented by h in Hupa seems to be somewhat stronger but of less duration than the related sound in English. It seems to be made through a quite narrow opening of the glottis. To some ears it has appeared as a palatal spirant. It is true that Navaho has a palatal spirant in the corresponding position in certain words, but the Navaho sound is quite unlike the Hupa sound, appearing as the surd of y, but with the character of a spirant.

The tracings of syllables beginning with h show only a slight but definite rise of the line before the beginning of the vowel. In one case, between vowels, the h appeared with regular waves of a low frequency. See Pl. 8, Figs. 1 and 2.

x.

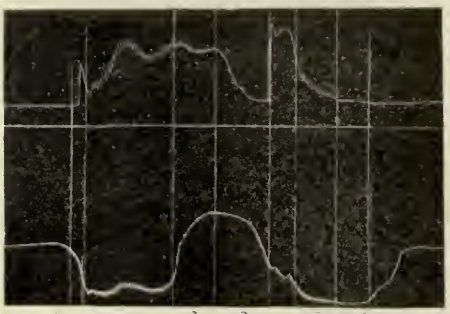
The letter x has been employed for a sound which has nothing corresponding to it in English. It is a post-palatal surd spirant which is accompanied by a number of flappings of the uvula. These make themselves prominent in the tracings of this sound (Pl. 7). They are of too low a frequency to give a musical note, but do impart a strange roughness to the sound. When final the sound is not very unlike the German sound represented by ch after back vowels as in *dach*. When initial the sound appears to be more harsh. At first the initial sound was often confused with h, into which it seemed to grade. At other times it appeared much harsher than h. Soon it was found that distinction of

[6] Morphology of the Hupa Language, Vol. 3 of this series, pp. 24, 288.



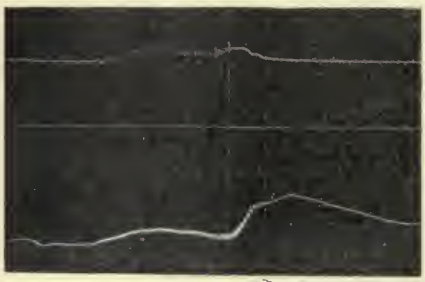
t a n a n

1.—tanan, *water.*



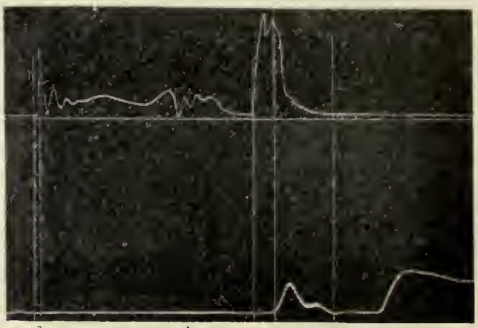
d a w ɪ l ɬ o (gl.stp) n

2.—dawiltōn, *you jumped.*



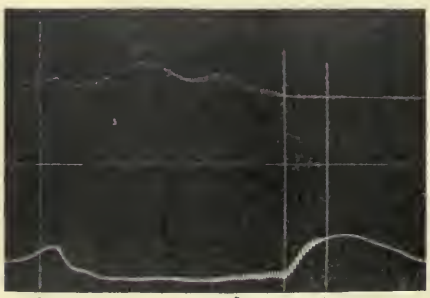
a ñ

3.—añ, *yes.*



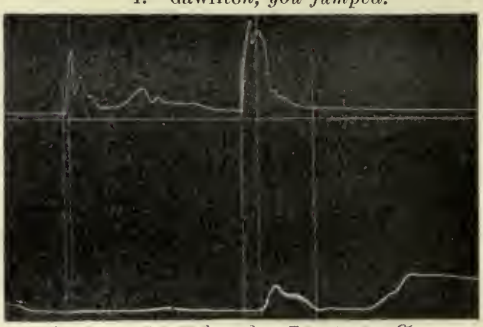
d a w ɪ l ɬ ō (gl.stp) n

4.—dawiltōn, *you jumped.*



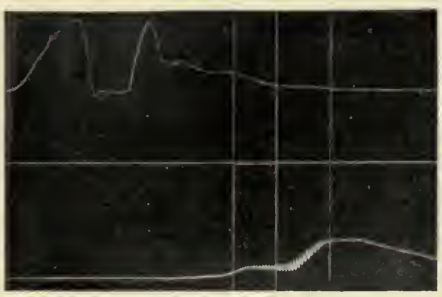
h e i yû ñ

5.—heiy̆ûñ, *yes.*



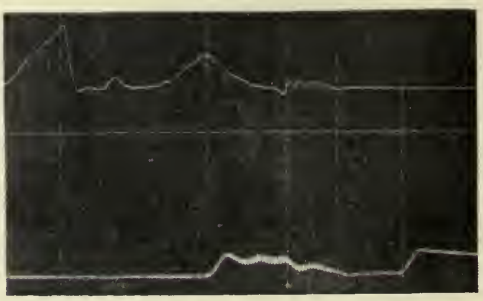
d a ï l ɬ ō (gl.stp) ñ

6.—daïltōñ, *it jumps.*



x oi ĸ yūwû ñ

7.—xoikyūwûñ, *he sleeps.*

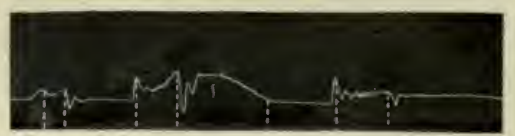


yī ĸ yūwɪ ñ ya (gl.stp) n

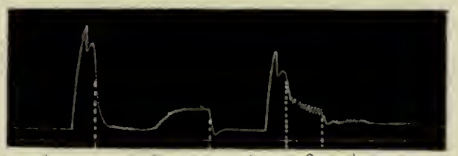
8.—yīkyūwiñyan, *it ate.*

Figs. 1 and 2, upper tracing from the mouth; lower tracing shows movement of tongue point. Figs. 3-8, upper tracing from the mouth; lower tracing from one nostril.

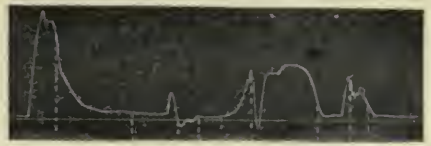
1.—kyūwīyûl, *food.*



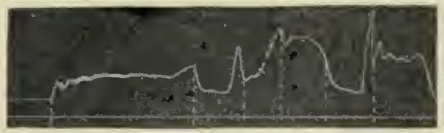
2.—miLdakiLdiLdil, *sifting basket.*



3.—teōtûl, *you (pl.) used to step.*



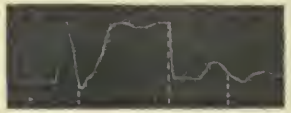
4.—takimmiLdiñ, *acorn soup place.*



5.—nayateōLdō, *let them dodge* (neuter).

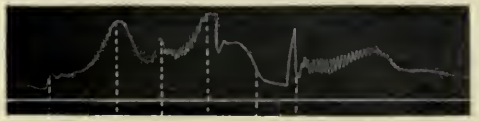
6.—yittōtûL, *let it step.*

7.—iLwaLx, *you shook a stick.*



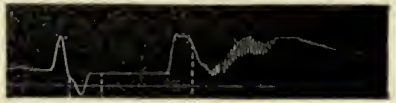
8.—kyūwLō, *I make baskets.*

9.—yittetaL, *it stepped.*



10.—nasōLdō, *you (pl.) dodged.*

11.—kyōLō, *you (pl.) make baskets.*



12.—kinLō, *you make baskets.*

TRACINGS FROM THE MOUTH.

meaning went with the difference in sound in several cases. Ultimately the two sounds were distinguished by ear without difficulty.

The making of this sound can be easily observed directly if the mouth is opened toward a good light. The mouth passage near the attachment of the uvula to the soft palate is made quite small. The uvula has its free end turned toward the mouth by the force of the passing air in the current of which it is seen to vibrate. The tracings reproduced in Pl. 7 resemble quite closely tracings of velar r in German and French. The Hupa sound presents nothing of that character to the ear. In the velar r the tongue is v-shaped in cross-section, while for the Hupa sound it is flat. Besides, one is sonant and the other surd.

s.

The tongue point spirant, s, appears to be formed in the same locality that the corresponding English sound is, namely, close to the roots of the teeth. It seems probable that the opening is more nearly round in Hupa than in English. A slight difference of quality is noticeable. The Hupa ear does not tolerate any approach to c (sh) when this sound occurs before y, as in tcittes-yai.

Tracings of this sound are shown in Pl. 7, Figs. 7, 8, 9, and 10, and palatograms in Pl. 4, Figs. 1 and 2.

z.

The sonant corresponding to the sound given above does not occur in Hupa except after d, with which it forms an affricative.

c and j.

The palatal spirants c (sh) and j (zh) do not occur in Hupa except after t and d respectively, with which they form affricatives.

STOPS.

The labial stops are entirely lacking in Hupa. Many other Athapascan dialects have b, but none of them as far as is known has p. The dialects which like Hupa lack b have m in corresponding words.

d.

The only frequently occurring voiced stop is d. It is a true dental being formed with the tongue on the teeth (Pl. 4, Fig. 5), not on the alveolar ridge as is the case in English. It is at first almost always mistaken for t, but later it is readily distinguished as a sonant. See Pls. 6, 7, and 8.

t.

The corresponding surd has the same position as d. It is rather strongly aspirated, in this particular closely resembling initial t in English.

t.

Hupa has another t formed in the same tongue position, but having quite a different quality. It appears to lie between d and t, and is at first distinguished from them with great difficulty. It differs from d in that there is a definite period of time after the breaking of the contact before sonancy begins. It differs from t in that it lacks the aspiration. In fact the breath seems to be drawn in rather than forced out. This does not appear to be done from the lungs but from the mouth, either by the sudden withdrawing of the tongue enlarging the buccal cavity, or more probably by a closure of the glottis. It appears in the tracings with a sharp top while t has a flat top, or a second rise before it has fallen far. Compare Pls. 6, 7, and 8.

k_1, ky.

The front vowels, e, ē, i, ī, when preceded by a palatal stop have that stop in the pre-palatal position agreeing very closely with the position of k or c in English under the same circumstances. Compare Figs. 10, 11, and 12 of Pl. 4. A palatal stop having the same position occurs before the back vowels. In that case a definite glide is heard which may with propriety be written y. The fact seems to be that the palatal stop in this position is always aspirated (Pl. 7, Fig. 12, and Pl. 8, Fig. 7), and an aspiration through this position approximates y.

g, gy.

In a few cases a corresponding sonant stop is heard. Some Hupa ears are satisfied with either the surd or sonant in these few words in which others would insist on the sonant.

k_2.

The post-palatals occupy the region between the posterior portion of the hard palate and the uvula, with differing positions according to the vowel with which they are employed. They are not aspirated and for that reason more closely approach the sonants than do English surds. It does not seem practicable to separate these positions which clearly grade into one another.

k_3.

Post-palatals, corresponding to those last given in position, but differing from them in the manner of their formation, are found. Instead of the simple explosion a harsh, cracking noise is heard. This seems to be produced by the manner of withdrawing the tongue or by suction back of the point of closure. In Fig. 12, Pl. 8, a few peculiar vibrations are to be observed which represent the physical effect of this peculiar release of the tongue from its contact. It appears from Figs. 10 and 14, Pl. 8, that the air column is directed inward for an instant, since the tracing point is drawn suddenly downward, sometimes even below the line which is traced during silence when the pen is at rest.

q.

A few syllables have a sound which is plainly formed by the contact of the tongue with posterior portion of the velum. To make this contact it is not necessary to raise the tongue particularly, but to retract it bodily. The resulting sound is soft because of the yielding surface with which the contact is made. It is particularly difficult in this case to distinguish between surd and sonant. Some speakers say qō and some gō for worm, and all seem to be satisfied with either sound, provided they are both alike made near the uvula.

AFFRICATIVES.

Stops followed closely by spirants result often in sounds which are not simple, since the tongue occupies two positions consecutively, nor are they exact combinations of simple sounds since because of their close union each is modified by the other. They seem not to have resulted from the juxtaposition of the component consonants, but are either original or derived from simple sounds.

dz.

This combination is of infrequent occurrence and presents no difficulty.

ts.

A tracing of this combination is shown in Pl. 7, Fig. 11. As compared with initial s in Fig. 7 of the same plate, it will be noticed that the tracing point rises more nearly vertically.

There were many cases in which it was very difficult to determine whether s or ts should be written. All doubtful cases were referred to the native ear for classification. There is still a doubt whether all speakers agree in the employment of these sounds in certain words. In other words this doubt does not exist but ts is heard uniformly, spoken with force.

dj.

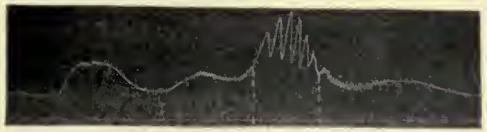
A palatogram of this compound is shown in Pl. 3, Fig. 3. That the tongue takes the position of d as regards its point will be seen by comparing Figs. 3 and 7 of this plate, but the anterior portion of the tongue is contracted sidewise beginning at the premolars as may be observed from the narrowing of the white portion of the palatogram at that point.

The sound of this affricative is not perceptibly different to the ear from the soft g of English.

tc.

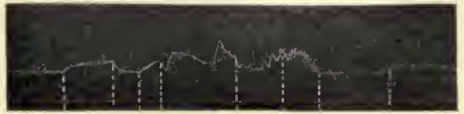
The occurrence of this combination both as initial and final is frequent in Hupa syllables. A palatogram of it shown in Pl. 3, Fig. 4, is practically identical with that of dj. A tracing is shown in Pl. 6, Fig. 5.

It impresses the ear much as ch in chip does in English.



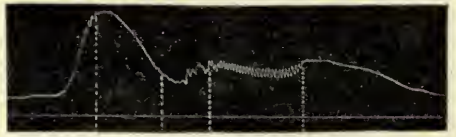
y ō ō x aɪ

1.—yōōxai, *let it buy.*



m e n ɪ ɪ x e (gl stp)

2.—meniLxe, *you finished it.*



e ō (asp) x au w

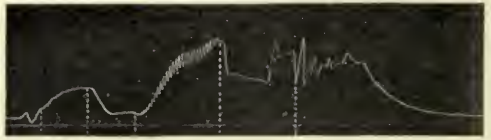
3.—eōxauw, *you (pl.) used to catch.*

e iū w x au. w

4.—eiūwxauw, *I used to catch.*

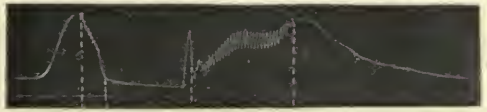
wō (asp) xû n ɬ e

5.—wōxûnte, *you (pl.) will catch.*



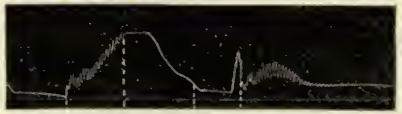
ɬc ɪ L wu L x

6.—teiLwaLx, *he shook a stick.*



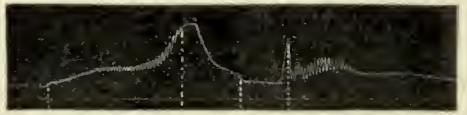
s ɪ n d au x

7.—sindaux, *you stayed.*



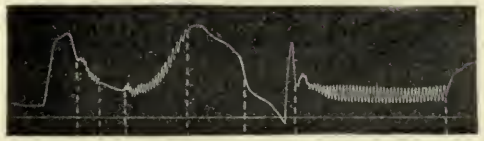
n a s d ō

8.—nasdō, *it dodged.*



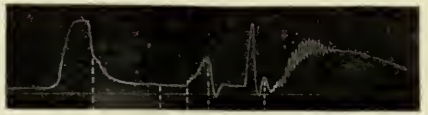
n aya s d ō

9.—nayasdō, *they dodged* (neuter).



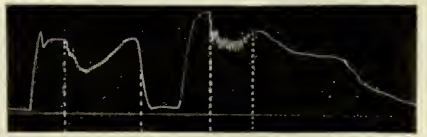
k₁ ɪ n e s t a n(?)

10.—kinnestan, *tan oak.*



ɬs e m ɪ ʔ a

11.—tsemitta, *rock its pocket.*

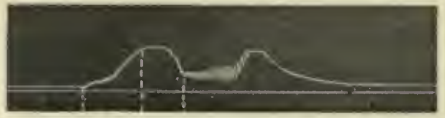


ɬ aɪ k₁ yū w

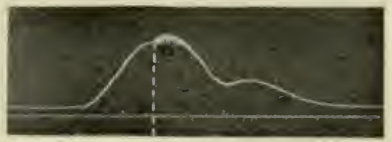
12.—taikyūw, *sweathouse.*

TRACINGS FROM THE MOUTH.

1.—haiyō, *that one.*



2.—nehe, *we.*

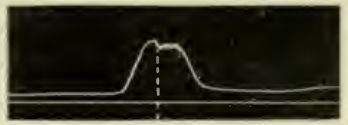


3.—hwa, *sun.*

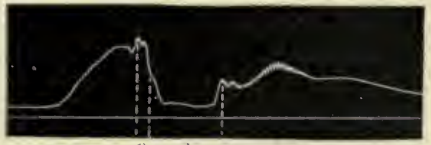
4.—tcwitc, *wood.*

5.—dau, *no.*

6.—te, *blanket.*

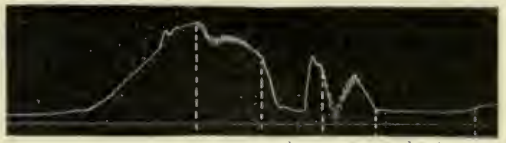


7.—kya, *woman's dress.*



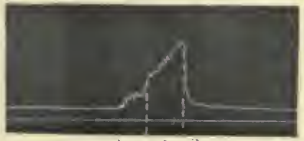
8.—lûkkai, *white.*

9.—lûkkau, *fat.*



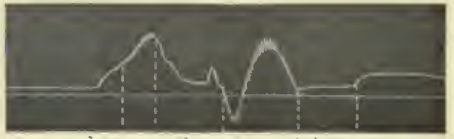
10.—xeakai, *cradle.*

11.—qō, *worm*



12.—kût, *already.*

13.—kût, *root.*



14.—kekai, *its thigh.*

TRACINGS FROM THE MOUTH.

tcw.

This combination, which is not infrequent, is undoubtedly related phonetically to the preceding not as a combination of that sound and w but as some modification of it. It would seem to be the form which tc takes when aspirated. That the aspiration has a w-like sound seems strange, but it must be remembered that the second component of tc (sh) has become a surd w in Hupa. Fig. 4 of Pl. 8 shows a tracing having a flat top which is quite different from the sharp summit in the tracing of tc referred to above. As far as is known other Athapascan languages have corresponding words with one sound (tc) where Hupa distinguishes tc and tcw.

tL.

A sound which has been represented by L in the Hupa Texts and otherwheres seems to be a combination of t and the spirant L. That there is a complete contact appears from a study of the palatograms shown in Figs. 11 and 12 of Pl. 3. Tracings reproduced in Pl. 6, Figs. 8, 9, 11, and 12, show less elevated spirants than is the case with L, indicating less pressure of the air column, undoubtedly due to increased resistance in the air passage.

When this combination is preceded by a weak syllable such as a possessive prefix, t completes the weak syllable. In the case of the simple spirant L the t is not heard. For example *hwit*-Lō-we, "my herb" was consistently written before the relation of the sounds represented by L and L was understood.

CONCLUSION.

After considerable time and effort had been expended in the attempt to grasp the Hupa sounds the conclusion was forced upon the hearer that certain distinctions readily heard by the native ears were being entirely ignored. It is always possible to refer the question of the identity or non-identity of the sound of two syllables of different meaning or function to an intelligent native for decision. Sometimes the differences in sound seemed to be connected with the vowel and sometimes with the consonant.

When the vowel was in question it became evident that it was not the color which might be due to a slight change in the size and shape of the resonance cavities, nor greater or less duration in the actual time of speaking, nor any change in the pitch of the vowel either as a whole or in parts that distinguished it from its "double." Considerable latitude in vowel quality, probably more than among educated speakers of English, is tolerated. The duration and pitch of the syllables in question were tested by means of tracings with negative results.

In syllables ending in a vowel, however, three degrees of aspiration were to be seen. The second person dual and plural of verbs showed marked aspiration which was detected afterward by ear with considerable degree of certainty.[7] Certain syllables were evidently terminated by a glottal stop with a resulting lack of aspiration, while many others had a gentle aspiration. In the case of the glottal stop the aspiration sometimes is only deferred, being plainly heard after the stop. It seems certain that the native ear is much more acute as regards these final elements than is that of the writer. The character of the latter portion of the vowel is considerably affected by the different terminations. The aspirated vowels lose their color ending in breath while those followed by a glottal stop maintain their natural quality to their close.

In a similar way it was made certain that the difference in sound between *te* "blanket" and te a prefix meaning "in the water" was not due to the position of the tongue in forming their initial sounds but to the character of the interval between the release of the dental and the beginning of the vowel. In the case of te, the prefix, about as much aspiration takes place as in English, while after *t* in *te* "blanket" there is a peculiar lack of aspiration. This must be due to the arresting of the air column either by the closure of the glottis or by some peculiarity of the release of the tongue from its position. Similar differences exist between the palatal stops. The k most resembling English does not seem to be particularly aspirated but the release of its mate results in a

[7] The Morphology of the Hupa Language, p. 98.

decided clucking sound which seems also to be due to suction posterior to the point of contact. The t written *t* and the k marked k_3 are undoubtedly the representatives of the sounds which in many American languages have been called "exploded," a most undesirable term.

It is evident also that the continuant consonants fall into two classes. The difference between the affricatives and simple spirants seems to be of a related nature. The impulse towards firmness of contact which seems to characterize *t* and k_3 in the case of L and s results in tL (written L) and in ts.

The conclusions seem justified that all classes of Hupa sounds are capable of at least two distinct modes of utterance, totally disassociated from the positions of the vocal organs, or sonancy; and that the native ear readily distinguishes these closely related sounds and makes use of the differences to multiply the possible number of syllables.

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