

hinweist, dass die Aussprache nicht losgelöst von der Bedeutung der seelischen Situation zu denken ist.

## V

Der Sprachgeschichte ergibt sich die Möglichkeit eines ganz neuen Einblickes in die Hochsprache als etwas Werdendem, in den Wandel der Sprache als etwas durchaus nicht kausal Bestimmtem, in das Wesen der Sprache als etwas durchaus nicht Mechanistischem sondern als etwas Seelischem. Über diese Wege hinaus führt der Weg zur Deutung. Die Emphase vor allem zeigt Varianten, z. B. langes *a* zu langem offenen *o*. Sollte die Aufgewühltheit der englischen Kultur in der Übergangszeit vom Altenglischen zum Mittelenglischen sich bis hier hinein in die Sprache charakterisieren wollen? Der Weg zur Deutung der Lautgeschichte, der sie aus ihrer Enge herausführt, als der Geschichte der Schicksale eines Volkes will sich hier öffnen. Seine Schwierigkeit wird niemals verkannt werden.

## VI

Neue Forderungen erheben sich für die Phonetik, die schwierig zu erfüllen sind, die aber der Phonetik ein ähnliches Schicksal wie das der Sprachmeister des 17. Jahrhunderts ersparen sollen, und die die Phonetik mitten in das wirkliche Leben der Sprache stellen wollen.

Ist die Variante—um nur einen bestimmten Fall zum Beispiel zu machen—sowohl sprachgeschichtlich als auch psychologisch als bedeutungsvoll erkannt, so darf sie in der Phonetik nicht verleugnet werden. Das Ziel ist die elastische Phonetik. Versuche können wir schon bei SWEET, KLINGHARDT, ARMSTRONG-WARD und auch in der neuen Auflage von DANIEL JONES' Lehrbuch feststellen. Der Zusammenhang von Tonbewegung und Lautgebung blieb indessen unbeachtet. Der Weg zu einer elastischen Phonetik steht durch die Sprachwissenschaft, Sprachbeobachtung nunmehr offen. Die Normform des lebensfremden Lexikons genügt nicht mehr. Die Phonetik hat es nicht mehr allein mit der korrekten Beschreibung und Darstellung von Lauten und Worten zu tun, sondern sie hat auf die besondere Bedeutung des Sprachkörpers im Satz Rücksicht zu nehmen; die Texte sollen nicht ein Mosaik von Vokabeln des Lexikons sein, sondern sollen wirklich innerlich zusammenhängende Sprache geben.

Die wirklich grossen schöpferischen Zeiten kennzeichnen sich nach sprachgeschichtlicher Erkenntnis immer dadurch, dass sie bis in den Lautbestand der Sprache wirkend eindringen. Die Experimentalphonetik in Verbindung mit der Sprachwissenschaft kann heute nachweisen, dass die Sprache der Gegenwart diese innere Aufgewühltheit zeigt. Die Phonetik als Pädagogin muss davon verantwortungsbewusst ihrerseits Kunde geben.

Der Aufgabenkreis sowohl für die Sprachwissenschaft, als für die Phonetik ist weiter und tiefer geworden. Die Grenzen lassen sich bei dieser Auffassung von der Sprache nicht mehr ziehen. Auch die Phonetik soll nicht nur dem Gestaltenden, Ordnenen, ohne das eine Kultursprache nicht existieren kann, Rechnung tragen, sondern von dem Schöpferischen in der Sprache, wie es sich sinnvoll (ohne rational

zu sein) äussert, einen Eindruck geben. Die Normsprache ist universalistisch, lässt keinen Einblick in die nationale Besonderheit einer Sprache tun. Gerade diese Auskunft gab aber bisher keine Phonetik, es ist aber das Lebensunmittelbarste in der Sprache. Hier muss die Phonetik Wege finden zu einer lebensnahen Pädagogik.

## VII

Die Frage nach dem Verhältniss von Sprachwissenschaft und Phonetik ist, wie wir zeigen konnten, zuerst eine weltanschauliche. Weil die Sprachwissenschaft das zu oft vergass, wurde sie lebensfremd und fand keinen Weg zur Phonetik. Weil die Phonetik dies bisher kaum beachtet hat, fehlten ihr recht eigentlich die Fragestellungen und Ziele. Keine Pädagogik ist aber ohne diese weltanschauliche innere Auseinandersetzung zu denken. Wie könnte es die Phonetik sein, wenn sie nicht nur richtende Lehrmeisterin, sondern auch Spracherzieherin sein will!

28. Prof. A. TANAKADATE (Tokyo): *A study of Japanese phonemes by means of tone films.*<sup>1</sup>

Among the various appliances for recording the spoken sound, the tone film is perhaps the most advanced.<sup>2</sup> Its general use in phonetic laboratories, however, is rendered difficult by the high cost of installation. Its great advantage lies in the facility with which requisite artificial modifications can be introduced into any desired portion of the record and reproduced for verification. The fringes in the film cannot be used directly for the harmonic analysis, unless they are transformed into curves by the microphotometric method as in the case of spectrographs.

The Institute of Physical and Chemical Research in Tōkyō has been endeavouring for the last few years to perfect such an instrument, and has been applying it to the study of the Japanese phonemes. Mr TAGUTI and his collaborators have succeeded in so constructing the instrument that the two kinds of record (fringes for the acoustical analysis, and the corresponding curves for the visual analysis) are recorded simultaneously on the same film side by side. Applying this to Japanese sounds they have obtained results which are quite new, at least to us; and some of their results might apply to other languages as well.<sup>3</sup>

My excuse for communicating the results of this investigation is the interest I took in the matter in 1885 when the question of Romanizing the national writing was first discussed publicly. The

<sup>1</sup> Compiled from reports and papers by RYŪSABURŌ TAGUTI, written in Japanese.

<sup>2</sup> SCRIPTURE published the same view in *J.A.S.A.*, January 1935.

<sup>3</sup> *Bull. Inst. Ph. Ch. Res.* (Rikwagaku Kenkyūzyo Ihō), vol. XII, no. 8, August 1933, describes the construction of the film recorder which is patented by the Institute. Vol. XIII, no. 12, December 1934, gives a study on the accuracy of the recorder and the reproducer with their applications to testing instruments of precision. Vol. XIV, no. 4, April 1935, deals with sound waves and hearing. They are all in Japanese with short abstracts in English. Short preliminary papers appeared in the journal "Kwagaku" (Science) by the joint authors TAGUTI and OOSIBA.



views I expressed in two papers published in that year were found later to be essentially the same as those laid down in the theory of phonemes. These views have now been physically confirmed, as I had hoped just fifty years ago that they might be.

*Phonetic Characteristics of Consonants and Vowels in Japanese*

The record of any single syllable of the Japanese sound elements, e.g. that represented by the Kana *く* (*ku*) or *け* (*ke*) presents three characteristic portions. The beginning corresponds to the consonant *k*; the end corresponds to the vowel *u*; and there is an intermediate portion between the two where the amplitude of the oscillations is reduced to an insignificant amount (see Fig. 1). This middle portion does not play any important part in the formation of sound quality, or the Japanese phoneme. Cutting away this part or lengthening it artificially does not change the reproduced quality of the sound or sound value.

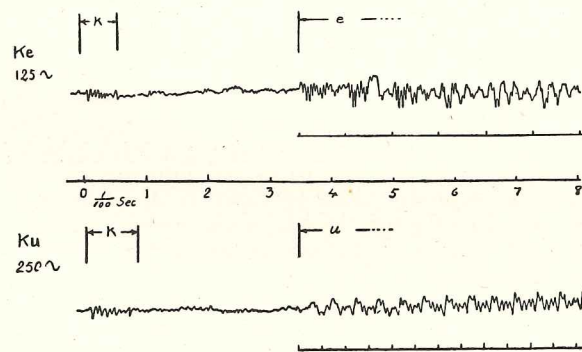


Fig. 1

The same holds when the consonant is followed by any other vowel. But when the *k*-part and *u*-part of the curve are separated by more than 0.3 sec. the *k*-sound becomes no longer perceptible, and the *u*-sound only is heard, that is to say, the meaning of the prefix *con-* of the term consonant holds only within that time limit (0.3 sec.) in the Japanese ear. It becomes non-sonant, if it is not followed by a vowel within that limit of time. Sounds emitted by materials in nature present a similar effect to the ear. A triangle struck with the ordinary hammer is heard differently by the ear when the hammer is covered with felt, although the graphs in the two cases are scarcely distinguishable to the eye, except in the small interval, ca.  $\frac{1}{100}$  sec., at the very beginning, corresponding to a consonant in human articulation. *When run backwards, the sounds of the two triangles sound the same*, showing that the real difference is in the very short initial part. The result was rather surprising. For this reason various speakers and hearers were tried, but the result was found to be generally true among normal Japanese. This being so, there can be no final consonant in Japanese proper (the final *n* being

taken as a pseudo-vowel). Consequently, when the *ku*-film is run backward we hear only the *u*-part.

When *ku* and *ke* are spoken in succession and recorded, the film gives *kuke* as it should; run in reversed direction, however, it gives out *eku* as is to be expected from the above result. But the *k* which is connected with *e* in the original is now heard in connexion with the *u* of the other syllable *ku*. Thus, the independent existence of consonants and vowels is physico-phonetically proved. The film records of sound elements can be cut out and joined so as to speak any word wanted. The spelling system so created will conform with the system now widely known as the "Japanese system": one letter, one phoneme. Indeed, one of the short poems in the classical collection was written in the Japanese system and recited backward to the film, and it gave a correct recitation when run in reversed direction, e.g. *Ezakutama* came out to be *Amatukaze* and similarly

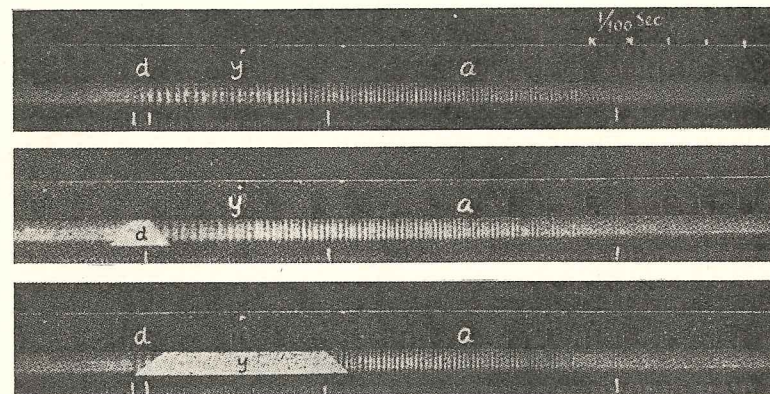


Fig. 2

for other words. The Hepburn system can never be expected to accomplish this result.

True, there are variants in Japanese phonemes as in other languages, but the records show essential common elements which are prominent in each case, e.g. either in *si* or *ti*. The sound heard in *ja* of *Japan* consists of three parts, (i) a very short beginning corresponding to *d*, followed (ii) by a longer portion for *y* and (iii) the last and longest portion corresponding to *a*. Now, if any one or two of these portions be cancelled by artificial blackening, the rest gives out the remaining phonemes. When the film is run with the *d* blackened, the film says *ya*, if the middle *y* part is blackened, it says *da*, and so on, each part corresponding to one letter standing for one Japanese phoneme.<sup>1</sup> This suggests the possibility of con-

<sup>1</sup> It was the result of this experiment in scientific connexion with other facts, which brought the scientific sub-committee of the Government Committee for standardizing Roman orthography to acknowledge unanimously the consistency of the Japanese system. (Official Communiqué.)



structing an automatic typewriter which will write in response to any speech normally delivered.

#### *Latent Sound*

To explain the fact that an imperceptible consonant becomes perceptible when a vowel comes next to it, we must acknowledge the existence of the vibration of that consonant-sound either in the air or in the organ of hearing. In ignorance of the precise mechanism, we will call it *latent sound* which becomes sensible under certain circumstances.<sup>1</sup> I might recall an analogy in the sensitive flame used in acoustic experiments. A tuning fork of an inaudibly high pitch, when presented to a slowly burning gas flame, has no effect on the flame; but, when the speed of the flame reaches a certain value, the flame exhibits a vigorous flickering in response to the tuning fork. The mechanism of hearing must be left to the psycho-physiologist. But our tone-film experiments bring out the following facts.

#### *Wave Numbering and Hearing*

The organs of hearing and speaking constitute a coupled system of motion in a dynamical sense. Hearing cannot attain its full effect at the instant when the air wave reaches the ear. In order to investigate how many waves are necessary to constitute sound sensation, Mr TAGUTI made a series of carefully drawn sine waves of one, two, three... more than ten waves as in Fig. 3, and made a film of them. He then tried to hear the sounds produced from each of them in succession. With only one wave, no sound could be observed though attentively listened to by different observers. With two waves a very weak but distinct sound is heard. As the number is increased one by one, the loudness goes on increasing up to ten, when the exciting effect seems to have become saturated, so to speak. Here we are concerned with loudness, pitch and duration of the effect produced. With a number of waves less than ten, loudness cannot be distinguished from duration; the addition of successive waves simply increases the impression, while the pitch can be judged even with only two waves. The experiment was repeated with the form of waves copied from that of *o*. In this case, one wave produced a slight sound whose character was indefinite. There is some doubt whether this comes from the *o*-film or is due to the resonance of the trumpet of the instrument, although such disturbing causes

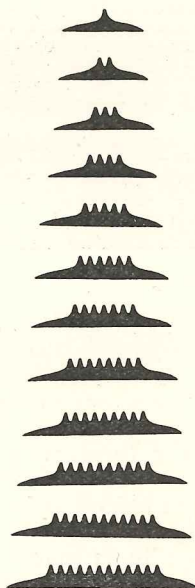


Fig. 3

<sup>1</sup> The final consonant in French, which is not heard as a final sound, but becomes audible when the "liaison" is made, may perhaps be a representative of latent sound.

were eliminated with the greatest care.<sup>1</sup> After two waves, the result was the same as in the other case.

This result, combined with that arrived at in regard to the time limit of the residual or after-effect of a consonant, gives an idea of the circumstances of perception and its fading when a sound-wave of a given intensity is conveyed to the ear. In Fig. 4<sup>2</sup> the curve in full line shows an impressed sound of constant intensity continuing for a ten-wave duration, that in dotted line shows the growth and fading of the sensation produced thereby.

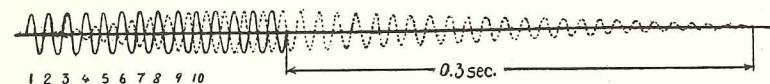


Fig. 4

In closing this communication, may I be allowed to add my pleasant recollection of the lecture delivered in 1878 at the University of Tôkyô by the late Sir ALFRED EWING, who pronounced two Japanese words in reversed spelling into a primitive phonograph with tin foil. When the record was run backwards, *Atara Oamah* came out as *Hamao Arata*, the name of one of the directors of the University at the time. It was this fact that impressed me with the rational ground for writing the language with the Roman characters. And it was the reprint of the work on the harmonic analysis of vowels, by Prof. JENKIN and his assistant EWING (*Trans. Roy. Soc.*), that induced me to take the groups of Japanese sounds as arranged in the classical schedule as the basis of the Japanese orthography, when I wrote the two papers mentioned above. At the time when that classical schedule was composed, writers were perfectly aware of the difference between the three nasal variants *m*, *n*, *ng*, and they used three different symbols (see *Kokuzimondai no Kenkyû* by KIKUZAWA, p. 186). But the normal Japanese has no need to distinguish these, and they are all included under one sound-group *n*. Indeed, the simplified group of 50 sounds may be looked upon as a phonemic grouping of sounds of which (as Prof. SINMURA remarked on the occasion of the tenth centenary celebration of Kûkai or Kôbô-Daisi) the Japanese may be proud in having noted the principle of "phonology" at so early a date.

*Addenda:* The recording instrument for phonetic researches must be very carefully examined as to the parasitic sound produced by the instrument and the regularity of running. Eccentricity of the sprocket wheels of a few microns is enough to distort the sound.

<sup>1</sup> It is to be observed that a single wave of *o* consists of several overlapping sine curves, from the point of view of harmonic analysis, and it appears to justify the importance of the harmonic series, not as a mathematical artifice, but as a physical essential in a vibrating system, as specially pointed out by LORD RAYLEIGH in his *Theory of Sound*.

<sup>2</sup> The start and decay of the motion of the unbeaten side of a drum membrane show a similar feature. See OBATA and TESIMA, "On experimental studies on the sound and vibration of a drum" (*J.A.S.A.* vol. VI, p. 271).



The films on sale may be compared to clocks on sale before the introduction of astronomical clocks, scrutinized for the investigation of longitude variations.

#### CONTINUATION OF GENERAL SESSION

*Chairman:* Mr J. R. FIRTH.

29. Dr GUY S. LOWMAN (Providence, U.S.A.): *The treatment of au in Virginia.*

Virginia is a South Atlantic State with an area of 42,000 square miles, situated between 36° 30' and 39° 30' North latitude and 75° 15' and 83° 40' West longitude. The southern boundary extends for 440 miles, and the maximum length from north to south is 200 miles. There are three chief geographical areas, a coastal plain or tidewater region, about 75 miles in width, a vast Piedmont plateau, and the section west of the Blue Ridge mountains, which extend from north-east to south-west.

The population is 2,500,000, of which 67.6 per cent. is rural. One-fourth are Negroes.

The first permanent English settlement in America was made at Jamestown in 1607. Within sixty years, practically all the readily accessible lands of the Tidewater had been occupied by settlers pushing north-westward up the four great estuaries, the James, the York, the Rappahannock, and the Potomac. The Piedmont was settled almost entirely, except in the south-west, by later expansion from Tidewater.

Tidewater Virginia never had a frontier in the same sense that later sections did. Gentlemen (in the seventeenth-century meaning of the word) and their servants sailed directly to their homes, bringing the necessary comforts of life with them. Until about 1690 labour was chiefly done by white bondservants, of the farm labourer class in England, who were sold for four to seven years' labour, before gaining their freedom. After 1690 Negro slaves were the chief labourers.

A well-marked class system, English in origin, survives in Tidewater Virginia. The distinction is between those who owned slaves prior to the Civil War, and the poor whites who had to do their own work.

I shall disregard Negro speech, because I have not studied it thoroughly. Negro speech in Virginia differs in stress, intonation and rhythm, but not markedly in phonetic characteristics, with the exception of a few elderly or isolated individuals.

In 1727, a few years before the Virginians had reached the mountains, northern settlers, chiefly from Pennsylvania, began pushing into the section west of the Blue Ridge.

The intrusive settlers were of German, Scotch-Irish and English Quaker stock for the most part. In the course of two centuries, they have been partially Virginianized.

In recording Virginian speech for the Linguistic Atlas of the United States and Canada, it became evident that the observation of the treatment of *au* is one of the most important means of distinguishing the Virginia dialects, one from another, and from the dialects of neighbouring states.

Seven different types of treatment of the *au* diphthong have been discovered. The boundary lines between the areas in which they occur can be surprisingly well defined. It should be remembered, however, that there really are no distinct speech boundaries, and that their apparent presence is due to the fact that the communities investigated were at least fifteen or twenty miles apart.

Type I. The most widespread, and generally considered the Virginian type. It is characteristic of the entire Piedmont section north of the James, and runs in a narrow strip south through Buckingham to Halifax County. In Tidewater it is characteristic of the Northern Neck peninsula, between the Rappahannock and the Potomac, of the section between the upper Rappahannock and the upper James, of the Norfolk-Newport News area in the extreme south-east, and of the eastern shore of the Chesapeake Bay.

There are two principal members of the phoneme. The diphthong *˘əu* stands before voiceless sounds as in *house—h˘əus*, *out—˘əut*, *south—s˘əuθ*. The diphthong *æu* or *æ·u* stands before voiced sounds and finally, as in *houses—hæuziz*, *crowd—kræud*, *cow—kæu*.

The symbol *ə* is employed in the diphthong *˘əu* to indicate a very short sound. A fronting arrow is used to indicate a sound slightly further forward than central. In rapid speech the fronting would not be heard.

Type II. The Petersburg type is found in all that territory south of the James, which is east of Farmville and Clarksville, except in the Norfolk area. It is found in the old counties, James City and Charles City, and in the Peninsula between the York and the Rappahannock, around and below Tappahannock.

*˘əu* is the principal member of the phoneme in all positions, as in *house—h˘əus*, *houses—h˘əuziz*, *crowd—kr˘əud*, *cow—k˘əu*.

A subsidiary member *ˆæu* stands before *n* and *l* as in *down—dˆæun*, *owl—ˆæul*.

In the Rappahannock area the first element of the principal member is not fronted but is somewhat lowered, and the second element is practically cardinal. The principal member stands before *l* as in *˘əu·l*, and the subsidiary member stands after as well as before *n* as in *now—næuˆ*, *down—dæuˆn*.

Type III has been found only in the speech of a single individual in western Prince Edward County not far from the boundary line of types I and II. It appears not to be characteristic of the region. The informant's speech appears at first to be type I. She says *thousand—θæuzn* and *cows—kæuz*, but in addition to saying *house—h˘əus* she regularly says *houses—h˘əuziz*. Although in the speech of her neighbours, *˘əu* and *æu* presumably are simply widely divergent members of the same phoneme, now in her speech the two sounds may either one of them stand before *z* in the capacity of distinguishing