raison de la nature spéciale du verbe "être", une accentuation spéciale de "suis" dans la même phrase me paraît absolument factice.

C'en est assez, je pense, Mesdames et Messieurs, pour vous permettre de mesurer la portée de l'expérience faite il y a cinq ans à Bonn, et dont le résultat vient de nous être communiqué. Je juge que le point de départ a été mauvais, l'accentuation phonétique des mots dits "vides" n'étant pas conforme au génie de notre langue. Le diseur (qui a peut-être éprouvé un certain embarras: mais je n'ai pas de confidence de lui sur ce point) a obéi à un ordre reçu, et il s'y est conformé au petit bonheur. Le résultat a été ce que vous savez, et ce qui n'a pas manqué de surprendre ceux, tous les premiers, qui avaient provoqué l'expérience: dans les limites que j'ai tracées il n'est pas, je crois, à retenir.

51. Mr Stephen Jones (London): *Observations on a case of "double-voice"*.

Recently, I have had occasion to investigate certain pharyngeals which occur in Palestinian Hebrew and Somali. I refer to the sounds ʕain (ʕ) and ħa or ħet (ħ). And the thing that struck me was their acoustic likeness to a case of "diplophony" or "double-voice" which was examined in the phonetics laboratory at University College some years ago.

It is this case and its bearing on the function of the "laryngopharynx" in speech that I would like to discuss for a few minutes.

(Here slide 1 was shown.)

This slide shows the subject making kymograph tracings of double-voice. He could produce the ordinary laryngeal tone and another tone simultaneously. The superimposed tone could be switched on and off at will. The quality of the normal singing voice was a pleasing tenor. When, however, the second note was added, the general effect became harsh and disagreeable.

(Here slide 2 of Fig. 1 was shown.)

Fig. 1 shows a few kymograms of the double-voice. The lower tracing in (1) and the upper in (2) were produced by single voice. They are simple sine curves and show conclusively that the waveform in the double-voice curves is not due to vowel quality or nodal vagaries in the tracing point.

The tracings in (1) were taken from the outside of the larynx. The note was small *f*, 170 ~. The curves of double-voice (i.e. the upper ones) show that the longer waves contain one ripple. This represents precisely what was heard, viz. small *f* and the octave below, i.e. big *F*, 85 ~.

No. 2 gives a mouth tracing sung on *a'*, 430 ~. The lower curves have four ripples—a double octave *A*, 108 ~. This was clearly heard.

No. 3 is the larynx tracing of a vowel sung on *g*, 192 ~. Here the lower note was a clear *G*, 96 ~, the octave below. The double-voice curve, as one sees, has one ripple.

Nos. 4 and 6 give double-voice recorded from the outside of the larynx. The glottal note was *g'*, 382 ~. Although no. 4 was sung

about a quarter tone flat, the twelfth below, a flat *C*, boomed out strong and clear; in no. 6 there was some uncertainty. The double octave *G*, however, seemed to predominate.

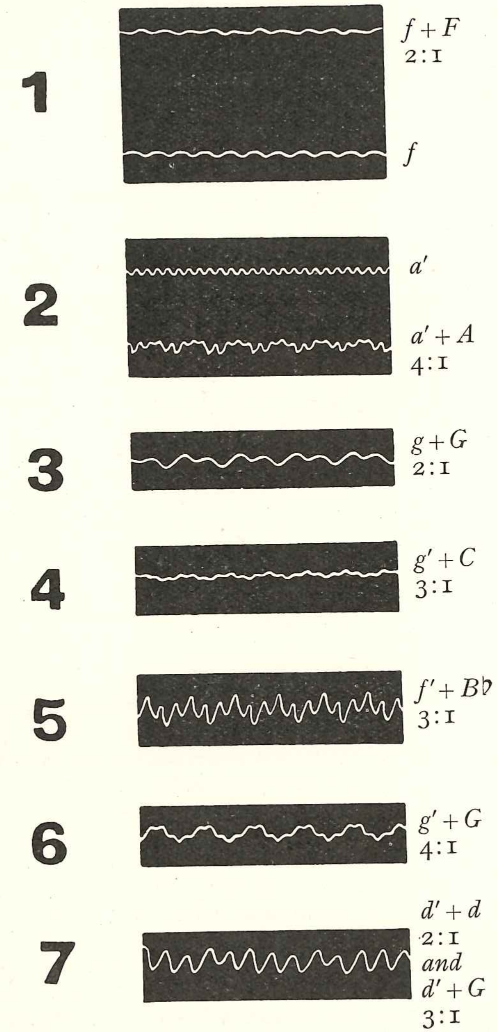

Fig. 1

No. 5 is a mouth tracing. The subject sang an *f'*, 342 ~. Here the twelfth below, *B*♭, 113 ~, was clearly heard. It is also recorded in the curve.

Tracing no. 7, taken from the mouth, is interesting. It shows fluctuations between the twelfth, *G*, 96 ~, and the octave *d*, 143 ~, for the lower note. The greater part of the tracing (three feet long), however, shows a steady twelfth below the glottal note, d', 287 $\sim$.

Sir Richard Paget investigated the same case and describes it in his book, *Human Speech*. He states there that the interval between the two tones was constant. It was always a twelfth, i.e. 17 semitones.

As you have seen, our results differ from his considerably. You can judge for yourselves from the tracings. This is a striking example of the value of the use of a simple recording instrument like the kymograph in phonetic investigation. Without the record, you probably would not take my word, and you would indeed be quite right.

Grützner reports that Donders could sing two notes simultaneously with the interval of a twelfth or an octave, while Merkel could only manage an octave.

The following is a convenient empirical formula for the results obtained:

$$n+\frac{n}{m},$$

where n is the frequency of the glottal note in hertz or c.p.s. and m has the values 2, 3, 4. More values for m are evidently possible.

It is obvious, of course, that n is only the fundamental. The expression for the glottal note complex would be given by some such expression as:

$$\sum_{1}^{\infty} n\,♂,$$

$$\sum_{1}^{\infty} 2n\,♀.$$

If you believe that the glottal note is a harmonic series, then n must be an integer. If not, n may have fractional values, but this does not concern us at present.

In every case the superimposed tone was a sub-harmonic of the laryngeal tone. This simple fact seems to imply a causal relation between the two and that the glottal tone is very probably the controlling factor.

Several investigators have attempted to locate this vicarious larynx which produces the second tone. Mr Negus, who examined me while I was producing double-voice, states that the note is produced by the constriction of the sphincteric band at the level of the ventricular bands, the rôle of which is somewhat passive and dancing attendance, as it were, on the active vocal cords. You will see an account of it in Mr Negus's book, *The Mechanism of the Larynx*. Prof. Flatau, I know, has examined the phenomenon. We should very much like to have his opinion.

It is obviously not produced in the epiglottis, although the tracing of a voiced epiglottis trill bears a great resemblance to tracings of double-voice, as you will see from the following slide.

(Here slide 3 was shown, illustrating trills of the tongue tip, uvula and epiglottis, breathed and voiced.)

Other tracings show similarity, viz. those of creaky voice or knarrstimme, and those of the ʕ in Palestinian Hebrew, Arabic and Somali.

(Here slides 4 and 5 were shown, slide 4 illustrating creaky voice and ʕ, and slide 5 showing X-ray photographs giving the appearance of the laryngo-pharynx in normal quiet breathing, pronouncing ɑ, ħ and ʕ.)

To conclude, I do not think, from observation of the more or less involuntary movements of the ventricular bands and surrounding soft tissue, that one is justified (except of course in the case of pharyngeals) in forming theories on their function in ordinary speech (i.e. distinction between whispered p—whatever that might mean—and whispered b). Someone has put it in this way—trouser legs flap, and sometimes flap vigorously when one walks or runs, but that garment has no physiological function in locomotion.

52. Dr C. B. Miller (Berlin-Buch): *Accent: classes and variations.*

In seeking an explanation of accent, we find two theories which have received considerable attention from phoneticians. The first one supported by Rousselot, that accent is the result of greater pressure by the organs of breathing, and the second, developed by Forchhammer, that a closer approximation of the vocal cords utilizes the breath in a more efficient manner, and that the result is a tone of greater strength. The first assigns the cause to the organs of breath, the second to the organs of phonation. Van Ginneken's opinion that the first theory is true for consonants and the second for vowels has in common with both theories the consideration of the relationship between the size of the physiological occurrence on the one side, and the resulting phenomenon on the other. Both assume a direct proportionality between muscle energy and accent, and neither has been thoroughly examined. For this purpose, among other methods, experiments with action currents would be required.

Jespersen says that the total energy is psychically indigenous to the speaker, and that the accent is often emphasized by motions of the head and arms. He says (the translation is my own): "The listener places himself sympathetically in the position of the speaker, as he can only understand what is said if he reproduce quietly the same articulation (weak innervation). In this manner he judges the syllable according to the amount of energy expended upon it, which does not always need to coincide with the objective physical intensity."

Both the theory that the listener places himself sympathetically in the position of the speaker and the procedure with action currents present difficulties. It was felt that more satisfactory results would be possible if a method were followed which would give and be based upon obtainable and measurable values. We have therefore recorded independently of each other the subjective impression of the accent, i.e. primary, secondary and unaccented vowels, and the physical intensity (molecular oscillation), and examined the relation between