FILM FROM A PHONETICS LABORATORY OF THE 1920s

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ABSTRACT

Silent 35mm movie footage has been discovered at UCL showing in detail the operation of a kymograph and of a sensitive flame. The experimenter who appears in the clips is almost certainly Stephen Jones, superintendent of the phonetics lab from its foundation in 1914. This paper documents the discovery and restoration of the film and analyses the content in relation to published work of the early department.

Keywords: experimental phonetics, kymograph, sensitive flame

1. THE FILM AND ITS CONTENTS

1.1. Discovery and location

In April 2008 the Department of Phonetics [1] at University College moved out of the premises it had occupied continuously since 1922. Although much material from the early days of the department had already been archived (chiefly the Daniel Jones papers[2]), further items came to light in the final clearing of storage areas. Among the last to be discovered were two 35mm film cans at the back of an understairs cupboard. The location is approximately 60 metres from a part of UCL comprehensively destroyed by bombing in September 1940.

1.2. Restoration

The cans were found to contain 3 unspooled lengths of 35mm nitrate film dated provisionally to the 1920s. Calculations suggested that the largest was about 540 ft (165 m) in length, while the other two were each about 140 ft (43 m). There was no documentation, but one of the cans was marked "FLAME DIPPING".

The films were in good condition chemically, but were tightly wound on small diameter cores and could not safely be uncoiled. Restoration was undertaken at PresTech Laboratories [3] in London under the direction of João S. de Oliveira. After several weeks of conditioning to permit the film to be unwound, a print was made onto modern 35 mm stock, and a digital transfer made from the new print.[4]

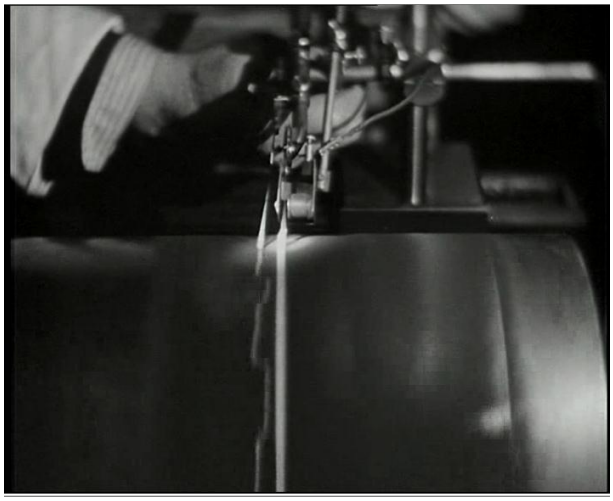
The longer film (about 5 min 20 sec) illustrates a variety of topics apparently related to the general theme of communication: calligraphy in various scripts (including phonetic transcription in the IPA), sign language, and greetings rituals. It contains professional-looking explanatory intertitles and some attempts at humour, suggesting that it may be a portion of a scripted documentary film. Its origin and precise connection with UCL are at present unknown.

The remainder of the present paper concerns the pair of shorter lengths, which, as had been conjectured, turned out to be negative and positive of the same footage. The digitized version of this runs for about 1 min 20 seconds. Possession of both the negative and the print strongly implies that this shorter film originated at UCL.

1.3. Content

The film shows the operation of two pieces of apparatus. The first section shows a large horizontal kymograph of the type known to have been in use at UCL [1].

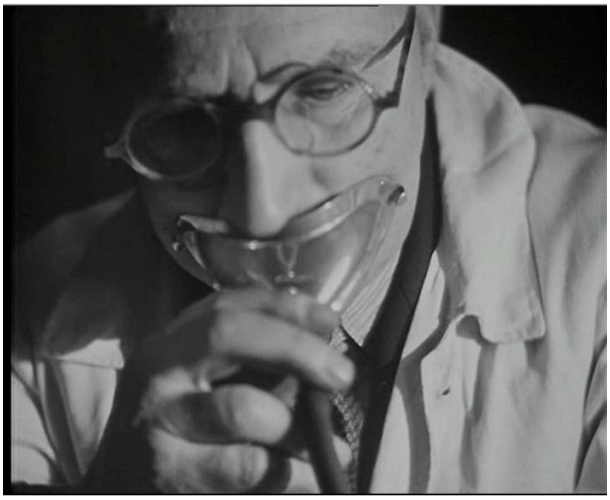
Figure 1: The kymograph in operation. The operator's arm gives an idea of the large size of the drum.



We see the revolving drum in close-up, as a timing track from an electrically maintained tuning

fork is laid down towards the right hand edge, and one other pen executes relatively large irregular movements. After a dissolve[5] at around 0:20 to a slightly different viewpoint, the drum is seen in slower rotation revealing the added annotation "P-O-T-A-T-O". A cut introduces the final short sequence, showing a white-coated experimenter speaking into a kymograph mouthpiece pressed to his face. He resembles Stephen Jones as seen in available photographs [1].

Figure 2: The experimenter (probably Stephen Jones) speaking into the mouthpiece.



The second section shows the operation of a sensitive flame. A young man (so far unidentified) is shown in what is evidently a phonetics classroom or laboratory, since a chart with diagrams of mouth positions can be seen in the background. He is watching a tall luminous gas flame. As he speaks, the flame dips at intervals to around half its original height and appears turbulent. In a second shot, he is facing away from the flame, probably to demonstrate that the disturbance is not due to his breath striking the flame. We do not know what he is saying, but the dipping seems to coincide with visibly energetic articulations where he has a narrow jaw aperture and widely spread lips—perhaps instances of [s]. There is some indication of more than usual respiratory effort being used to reinforce these fricatives. The film concludes with a close-up and fade-out on the luminous flame itself.

2. THE UCL DEPARTMENT AND LABORATORY

A comprehensive history of the UCL department is given in [1]. Although Alexander Melville Bell taught at UCL in the years 1865-1870, there was then a hiatus of 30 years, and the modern department can trace its origin to 1903 when E. R. Edwards (1871-1948) began lecturing on the phonetics of French. Daniel Jones (1881-1967) joined UCL in 1907 and began a career that would eventually make him the most significant British phonetician of the first half of the twentieth century. He was to become Britain's first Professor of Phonetics in 1921.

By 1914, Daniel Jones was able to add a small phonetics laboratory to the department he was gradually building up. As (part-time) assistant he appointed Stephen Jones (1871?-1941)[6], a science graduate then working as a schoolmaster, and in 1921 the position became a full one, with the title Superintendent of the phonetics laboratory. The lab they created emulated contemporary continental models, especially that at the Kolonialinstitut[7] in Hamburg, under the direction of Giulio Panconcelli-Calzia (1878-1966), which they visited in 1914. Stephen Jones remained in his role until his retirement in 1937.

2.1. Daniel Jones and experimental phonetics

Though Daniel Jones was primarily an auditory phonetician, he displayed some enthusiasm for experimental phonetics in the earlier phase of his career. While he seems to have done no original quantitative work, he published several lucid and well-illustrated surveys of available instruments, sometimes based on talks he had delivered. In these, kymography plays a large part, and it must be significant that the specific example *potato* is used [4].

Daniel Jones's concern seems to be not with instruments used as today as sources of empirical data, but rather as a means of *dramatically demonstrating* an effect for the observer (generally a student) to grasp. On a general shift in the functions of instruments in the history of science, see [3].

2.2. The work of Stephen Jones

Stephen Jones was plainly an accomplished all-round phonetician, as well as an experimentalist, and his most substantial publication [5] is in fact a descriptive phonetic account of Welsh, of which he was a native speaker.

Stephen Jones did not conduct any extensive programme of experimental research. A full bibliography of his work has yet to be compiled, but his publications on experimental phonetics are

all relatively brief, the most notable being [8]. A series of book reviews, notes, and conference reports indicate that even to the end of his career he kept up to date with developments. But nearly all of the work carried out in what remained a modest basement laboratory was done in support of linguistic phonetic observations initiated by others.

3. THE DEVICES SHOWN IN THE FILM

3.1. Stephen Jones and the kymograph

Stephen Jones of course played no fundamental part in the development of the kymograph, which was already more than 50 years old when the UCL lab was founded. But the large horizontal kymograph seen in the present film is of a very different design from those shown in [11], for example, which are all relatively small, and have the drum axis vertical. In fact it appears that the horizontal pattern is probably Stephen Jones's own design.

For much of the twentieth century, the firm of C. F. Palmer was a prominent supplier and manufacturer of laboratory equipment, with premises in Brixton, London. A very short note in *Le Maître Phonétique* by Stephen Jones [7] is an announcement that "a 12-page catalogue of apparatus for students of phonetics and for phonetic research has recently been issued by C. F. PALMER, Ltd…" He mentions that a noteworthy feature of the catalogue is two pages devoted to "a description of the kymograph and instructions on how to use it."

Examination of the catalogue [10] shows that in fact Stephen Jones was himself the likely author of the pages referred to, as well as designer of the kymographs which the firm sold for phonetic research:

> The Horizontal Kymograph illustrated here is the outcome of some years of experience and was made under the direction of Mr. STEPHEN JONES, of the Phonetics Laboratory, University College London.

All in all, it seems very likely that the kymograph shown in the film is the prototype built by C. F. Palmer to Stephen Jones's design and afterwards put into production and sold around the world.

3.2. The sensitive flame

The dramatic sensitivity to sound exhibited by fluid jets under certain circumstances was described in detail by Tyndall [12]. It is necessary to distinguish the *sensitive* flame from the *manometric* flame, with which it is sometimes confused. A sensitive flame is a big flame, close to instability, that dramatically dips in response to a particular sound (for instance, [s] but not other fricatives), as in the present film. By contrast, the small manometric flame is a pressure indicator with almost no inertia capable of following sound pressure variations. Viewed with a rotating mirror that sweeps it across the field of view, the varying height of the flame produces a (distorted) approximation to the speech waveform. The device was entirely superseded by modern oscillographs.

One of Stephen Jones's papers [6] describes the use of a sensitive flame as an intensity-measuring device in determining the inherent sonority of different vowels. He appears to have obtained reasonable results, despite the uneven frequency response typical of such flames.

Figure 3: Dipping of the sensitive flame, probably in response to a sibilant. The two images shown are 7 frames apart on the film (about 350 ms).

In fact it was precisely the frequency selectivity of sensitive flames that made them of potential interest to phoneticians. As late as 1938, Fry [2] was investigating their possible application as a visual feedback device in speech training for the deaf, and his paper acknowledges the loan of several jets from Stephen Jones. The foregoing is sufficient to establish that Stephen Jones would have had a suitable jet, and relevant know-how, enabling him to set up the demonstration shown in the film.

4. POSSIBLE PURPOSE OF THE FILM

The purpose for which the film was made can only be guessed at, but there are some relevant considerations which point fairly clearly in a certain direction. First, since the 35 mm movie projector was never a routine piece of classroom equipment, the film must presumably have been intended for projection in fairly large and well-equipped venue; this suggests a special occasion,

rather than regular teaching. Secondly, the way in which the two sequences are photographed suggests that the main purpose was not to *instruct*, but rather to *impress*. There is no establishing long shot of the kymograph, no close up of practical details such as preparing the paper by smoking, or assembling the tambours, or measuring the results. The lighting is dramatic, and the machine fills the frame. The white-coated experimenter is shown in closely-cropped close-up, and never reveals the face behind the mask. Similarly, in the sensitive flame sequence, the setting is dark, and the flame photographed so that the mundane gas burner from which it must be emerging is out of frame at the bottom.

In a period of intense work during the years 1914-1919, continuing to an extent into the early 1920s, Daniel Jones was occupied by an eventually fruitless scheme to establish an Institute of Phonetics in London on a very large scale [1]. The Institute reached an advanced stage of planning, and architect's drawings exist. Daniel Jones's efforts came to be increasingly focused on attempts to raise the vast sum of money required, and in search of sponsors, he (uncharacteristically) encouraged sensational newspaper articles, some of which portray the kymograph as a device which will transform the analysis and teaching of pronunciation [9]. We can suggest, therefore, that the present film might have been made to accompany a fund-raising presentation to a non-scientific audience.

Whatever its original purpose may have been, we are fortunate that the short film shows us two long-obsolete devices from the history of phonetics not as lifeless objects in a museum, but in action and responding to speech.

5. REFERENCES

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[12] Tyndall, J. 1867. *Sound: A Course of Eight Lectures Delivered at the Royal Institution of Great Britain.* London: Longman, Green, and Co.

[1] From 1971 it had been the Department of Phonetics and Linguistics. In 2008 it was renamed "Speech, Hearing and Phonetic Sciences."

[2] *http://www.ucl.ac.uk/library/special-coll/djones.shtml*

[3] *http://www.prestech.biz/*

[4] The film is available at *http://youtu.be/cXp7jfgRNVA*

[5] Probably achieved in camera by the well-known technique of rewinding the film a short distance and double-exposing the overlapped portion

[6] The two Joneses were unrelated. There is currently very little biographical information about Stephen Jones, and the exact year of his birth remains to be confirmed.

[7] In 1919 the Institute became part of the newly founded University of Hamburg.