

2.2 Basic palatography

Video cameras are helpful for recording movements of the lips and changes in jaw position, but they are of little help in telling us what part of the tongue is involved in an articulation and where the articulation is made on the roof of the mouth. The best way of recording this kind of data in the field (or in a simple laboratory set up) is by means of palatography, a nineteenth century technique that has now been developed so that it is capable of providing a great deal of information on tongue gestures.

Fieldwork palatography involves painting the tongue with a black substance, asking the speaker to say a word containing the articulation to be studied, and then observing where the black substance has been transferred onto the roof of the mouth. By putting a mirror into the mouth you can see (and photograph) the whole of the upper surface as illustrated in figure 2.5.

Excerpt from: Ladefoged, P., *Phonetic Data Analysis: An introduction to phonetic fieldwork and instrumental techniques*, www.jladefoged.com.

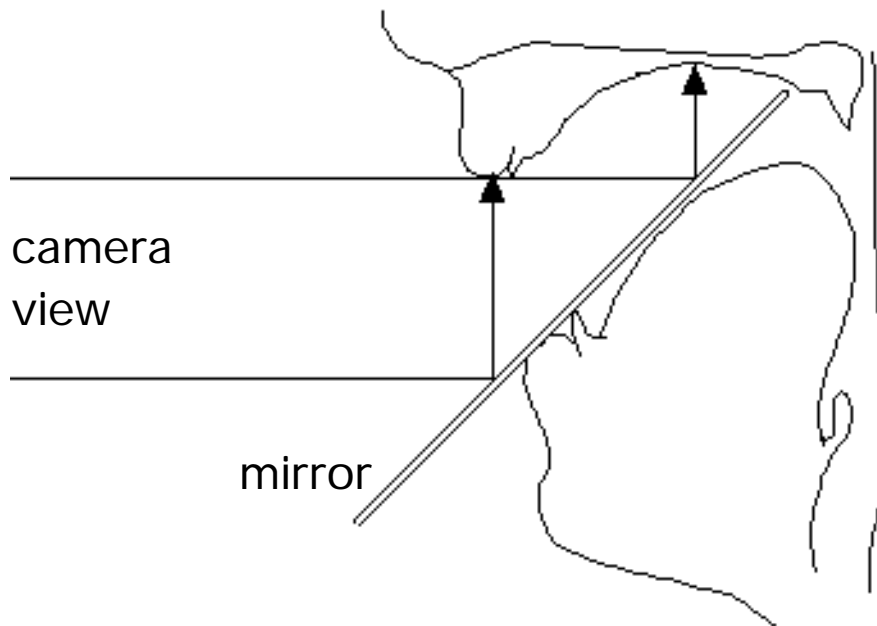


Figure 2.5. A system for photographing the roof of the mouth.

Figure 2.6 shows a photograph using this system, taken by Victoria Anderson as part of her fieldwork on Arrernte, an aboriginal language of Australia. The speaker's upper teeth are at the top of the picture. Below them, reflected in the mirror, is a view of the roof of the mouth, with the inside of the upper teeth being at the bottom of the picture. The speaker had had his tongue painted before saying a word containing an alveolar stop. The marking medium has been transferred to an area all the way around the molar teeth and across the alveolar ridge behind the upper front teeth (one of which is missing). This palatogram does not provide any information on the movements of the tongue, but we can see where in the mouth the stop was made.

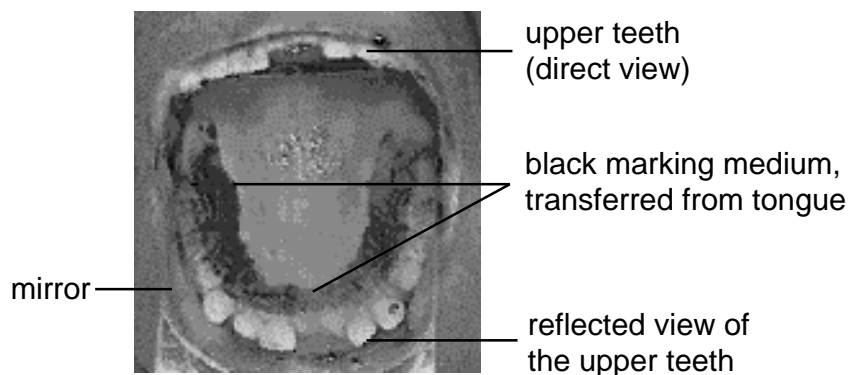


Figure 2.6. Palatogram of an Arrernte t. (Photograph by Victoria Anderson.)

The best marking medium is a mixture of equal parts olive oil and powdered charcoal. Powdered charcoal is completely tasteless and available from a pharmacist (it is used in medicines for flatulence). Any edible cooking oil will do. Paint the mixture on the part of the tongue that is likely to be used in the articulation, using a thick paint brush. Remember that you don't know exactly what part of the tongue will be used in a particular articulation, and it is better to cover more than less. Be sure to go far enough back. You may have to paint not only the tip of the tongue but also the underside of the tip if there is any chance of a retroflex articulation being used.

Part of the joy of palatography is that it is possible to improvise and get some data without being too elaborate. At a party I once met a speaker of Basque who said that he distinguished a dental ʃ from an alveolar s , a distinction I wanted to observe. I borrowed a small hand mirror, and made some charcoal by burning a piece of toast and scraping the black parts onto a flat surface. I ground them into a fine powder using a beer bottle as a rolling pin. There was some olive oil in the kitchen to mix with the powder, and a cotton swab served as a paintbrush. Lacking a camera, I looked into his mouth and sketched what I could see. An interesting evening's work; and the beer was good, too.

Tell the speaker to relax and not swallow after the tongue has been painted. You want a natural pronunciation of the word, which most speakers can achieve once they have found that the mixture in their mouth is not unpleasant. Turn on the video camera so that you are recording everything, ask for the word to be spoken, put a mirror in the mouth and photograph the contact areas. You will need to shine a light into the mouth so that it can be photographed without any shadows. It is best to have a proper light attached to the camera, but even a flashlight is better than nothing. After each word has been photographed and the camera switched off, the mouth should be rinsed with water mixed with a little lemon juice so as to clean the upper surface. Then you can repeat the sequence with the next word:— paint, relax, start video recording, speaker says the word, head back, mirror in the mouth, photograph.

Practice putting the mirror into the speaker's mouth before you do any painting of the tongue. Get the speaker to open the mouth as widely as possible. Then slip the mirror in so that its edge is behind the upper back teeth. Most speakers tilt their heads forwards at this moment and do not open their mouths widely enough. You want the head tilted back, the mouth wide open and the jaw pulled back. Then you can place the mirror at an angle of 45° to the plane of the upper teeth, so that the camera sees a view equivalent to looking straight up at the roof of the mouth, as shown in figure 2.5. The mirror should be about 5 cm wide and 15 cm long. A local glass works can cut and bevel the edges of a mirror of this sort.

Making palatographic investigations requires a great deal of sensitivity to local customs. In many parts of Asia it is not appropriate for a man to place his hand on the top of a young woman's head. When putting a mirror into someone's mouth, make sure that you ask permission to steady the head with your other hand before beginning. It is always helpful to keep a polite distance away from the speaker. With a video camera and a zoom lens it is possible to take a picture of just the mirror in the mouth

from a meter or so away, which speakers may find easier than having the photographer too close.

As with any instrumental procedure, you should demonstrate the whole procedure on yourself first. You can paint your own tongue quite easily, using a mirror. You can then relax, say a word, put the mirror into your mouth and let the speaker see the roof of your mouth. Make it clear that you have your own paintbrush, and that you have a separate paintbrush and a cleaned mirror for each speaker. I use a number of different color paintbrushes, cheap ones made for children rather than artists. I also pour a little of the oil and charcoal mixture into a saucer for each speaker so that they see that each paintbrush is dipped into a separate container. You must be careful with the black oil and charcoal mixture. It stains clothes easily, so it is best to put a towel or old shirt around the speaker. You should also make sure that the speaker sees that the mirrors have been thoroughly cleaned and stored in a sterilizing solution.

Indians are very quick to notice if something that has been in one person's mouth is then dipped into a common pot. An Indian friend once told me how horrified he was the first time he went to dinner in an American household. His host was making soup. Every now and then she would taste it to see if it needed more seasoning — and then put the spoon, which had been in her mouth, back into the pot. Despite his admiration for her, my Indian friend found it difficult to eat dinner.

The words used in a palatographic investigation have to be carefully chosen. Palatography records the contacts that have been made in the whole word. When investigating the difference between English *s* and *ʃ*, it is no good looking at words like *sin* and *shin*. The contact for the *n* at the end of the word will obscure the contacts in the *s* and *ʃ*. A more suitable pair would be *sip* and *ship*. You need to search for words that have only the consonants you are interested in, or in which the only other consonants are bilabials or glottal stops. Sometimes this is not possible and you have to use a word containing a velar consonant. This may not be too bad if you are investigating dental consonants, but it probably will affect the tongue position. Also remember that vowel and consonant articulations interact. Don't compare words like *she* and *saw*, as the high front vowel of *see* will cause noticeable raising of the sides of the tongue in comparison with *saw*. As we noted in the first chapter, always try to investigate minimal pairs, like *she* and *sea*, or *Shaw* and *saw*.

We usually want to know not only what part of the roof of the mouth is involved in the investigation, but also what part of the tongue has been used. We can get this information by reversing the process. Paint the roof of the mouth. Get the speaker to relax with the mouth slightly open (so that you can see that the tongue is not touching the roof of the mouth), start the video camera, ask the speaker to say the word and then open the mouth and let the tongue lie in a neutral position on the lower lip (this requires a little practice). After the photograph has been taken, the speaker should thoroughly cleanse the tongue, perhaps using water with a little lemon juice in it, and wipe it with a paper towel or a cloth. It is much more difficult to clean the tongue than the roof of the mouth.

Photographs of the tongue made in this way are called linguograms. They are never likely to be as comparable as photographs of the roof of the mouth. It is difficult to place the tongue in exactly the same position after every utterance. But you can usually see whether it is the blade of the tongue that has been used for a laminal articulation or the tip (or even the underside of the tip) for an apical (or a retroflex) articulation. If you are investigating a potential retroflex articulation, the tip of the tongue will have to be raised before being photographed.

Figure 2.7 shows the palatogram of figure 2.6, this time with its associated linguogram. Below it there is another palatogram and linguogram of the same speaker, also made by Victoria Anderson. On both palatograms an arbitrary grid has been drawn, based on the teeth and other anatomical landmarks, so that it is possible to compare one palatogram with another. It is clear that the affricate tʃ in the lower palatogram involved an articulatory contact that was much further back than the t in the upper palatogram. It is also possible to see that the sides of the tongue made contact higher in the palate in the lower palatogram. Both these points can be measured with reference to the imposed grid. But meaningful measurements of the contacts on the tongue cannot be made because the shape of the tongue is not constant. The upper linguogram shows that it is the tip of the tongue that is used in making the alveolar stop. In the lower picture, it is apparent that the blade of the tongue is used for the palatoalveolar affricate, and the tip of the tongue is completely free of any of the black marking medium. But, because the shapes of the tongue in the two photographs are not the same, no measurements can be made. Pictures of the tongue can be compared only qualitatively, noting, for example, that one articulation involves the tip of the tongue and the other the posterior part of the blade.

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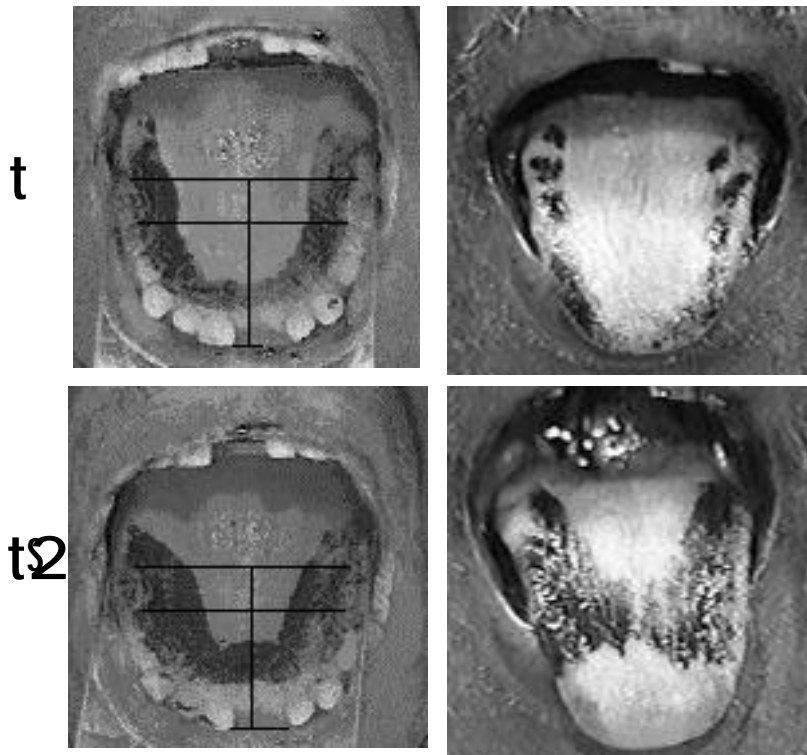


Figure 2.7. Palatograms and linguograms of an Arrernte speaker.
(Photographs by Victoria Anderson.)

Palatography is a fairly slow process. It can take an hour or more to photograph half a dozen words — two pictures for each word, one of the tongue and another of the roof of the mouth. Many speakers feel that that is enough for one session. Palatographic investigations should be planned carefully, allowing enough time to get sufficient words from as many speakers as possible. As with all phonetic studies, there will be more variation between speakers than within repetitions by the same speaker, so it is important to photograph a number of different people.