

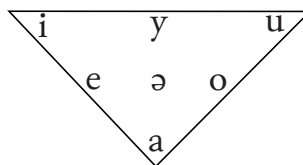
# The difference between ‘cardinal’ and ‘natural’ vowels (or vocoids)

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We draw attention in particular to the real nature of such an important subject as this, and how to deal with it in the best possible way.

Of course, it is absolutely unnecessary to criticize the old and absurd triangular diagram as in fig 1 (where we only put 7 elements, since it has no real application, not even considering the fact that often it was presented upside down, completely ignoring obvious facts about how vowels are articulated).

fig 1.  
Unscientific way  
of showing the  
vowels.

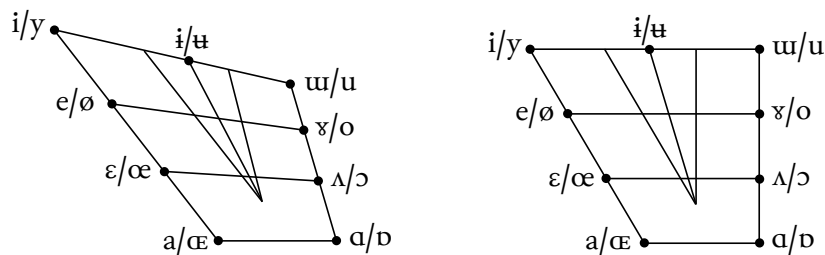


Certainly, we will only concentrate on two partially different, but at least scientific, ways of describing the vowels/vocoids of all languages.

The one promoted by Daniel Jones, based on X-ray photographs of the oral cavity (made in 1917, using a thin metal chain alongside the central part of the tongue), takes as its reference elements his *four* extreme points of the tongue, within the articulatory space in the mouth for the vocoids, beyond which non-vocoidal (or non-linguistic) sounds were inevitably produced.

The problem of that approach was to consider Jones’ *highest points* reached by his tongue, in producing the 18 so-called ‘cardinal’ vowels.

fig 2.1. The 18 cardinal vowels as shown by Jones in two partially different diagrams.



Instead, our ‘natural’ vowels (or, better, vocoids) were equally produced using a thin metal chain, as for the ‘cardinal’ vowels, but considering the very *same point at the center* of the chain (fig 5), while uttering normal vocoids, thus resulting *natural*.

In fig 2.2, using our diagram, conveniently called *vocogram*, we show the 18 cardinal vowels, but represented by means of our symbols (first vocogram). In addition, the second vocogram shows the practical *middle values* of the symbols of the same 18 cardinal vowels.

fig 2.2. The 18 cardinal vowels with our *canIPA* symbols in our vocogram (1), and their average values with *offIPA* symbols, again on our vocogram. Of course, the vocoids of specific languages very rarely fall exactly on the center of our boxes, as they certainly do not fall on the dots of Jones' diagrams (although, too often, many authors absurdly put them precisely there).

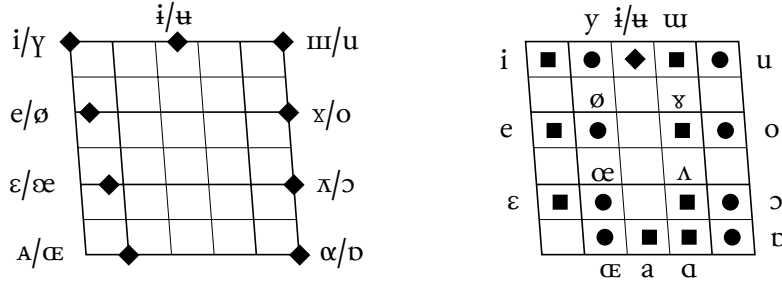
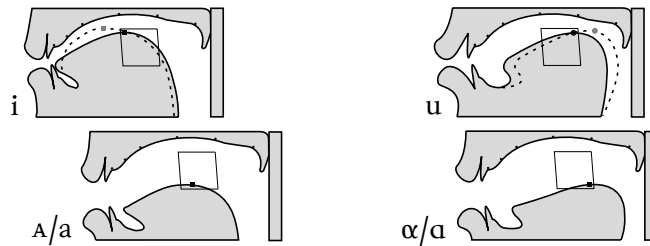


fig 3 (on top) shows the difference between 'cardinal' [i] and [u] (by means of dotted lines and grey 'natural' markers), while, at the bottom, we show *canIPA* [A] and [α], which correspond to 'cardinal [a] and [ɑ]' (given after a slant).

We think that this figure makes it clearer which actually is the difference between the two approaches considered here.

fig 3. Useful comparison between Jones' four extreme articulatory *cardinal* points and the four corresponding *natural* (or *canIPA*) vocoids.



Our (principal) vocoids are 60 (30 slit, or un-rounded, and 30 rounded), differently from the 18 cardinal vowels. But, the articulatory space in the mouth is exactly the same. Notice that fig 4 shows our 60 vocoids (while fig 6- presents their average

fig 4. The 60 *canIPA* vocoids.

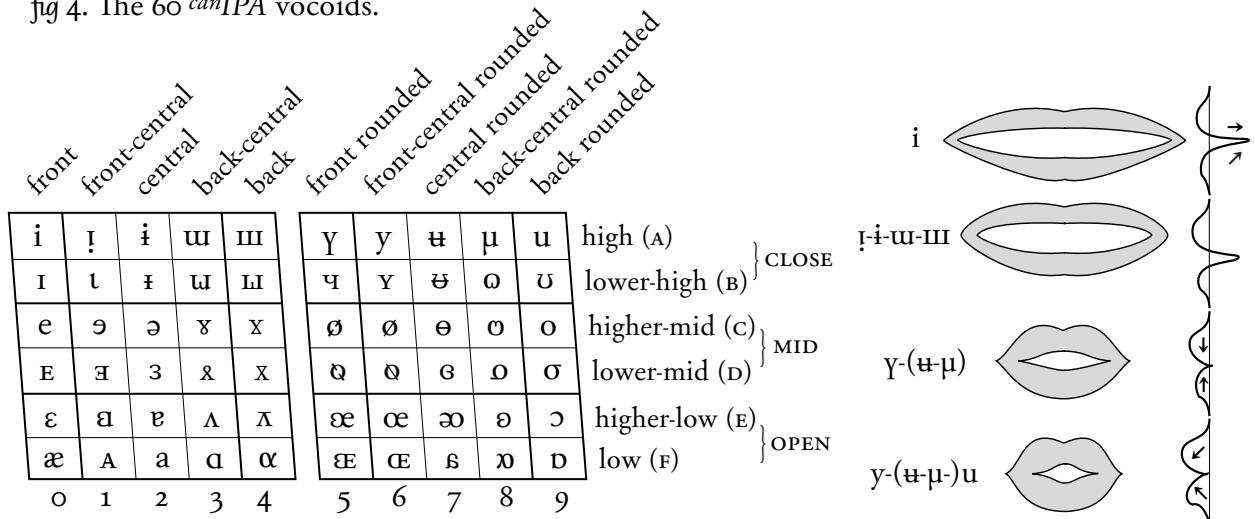
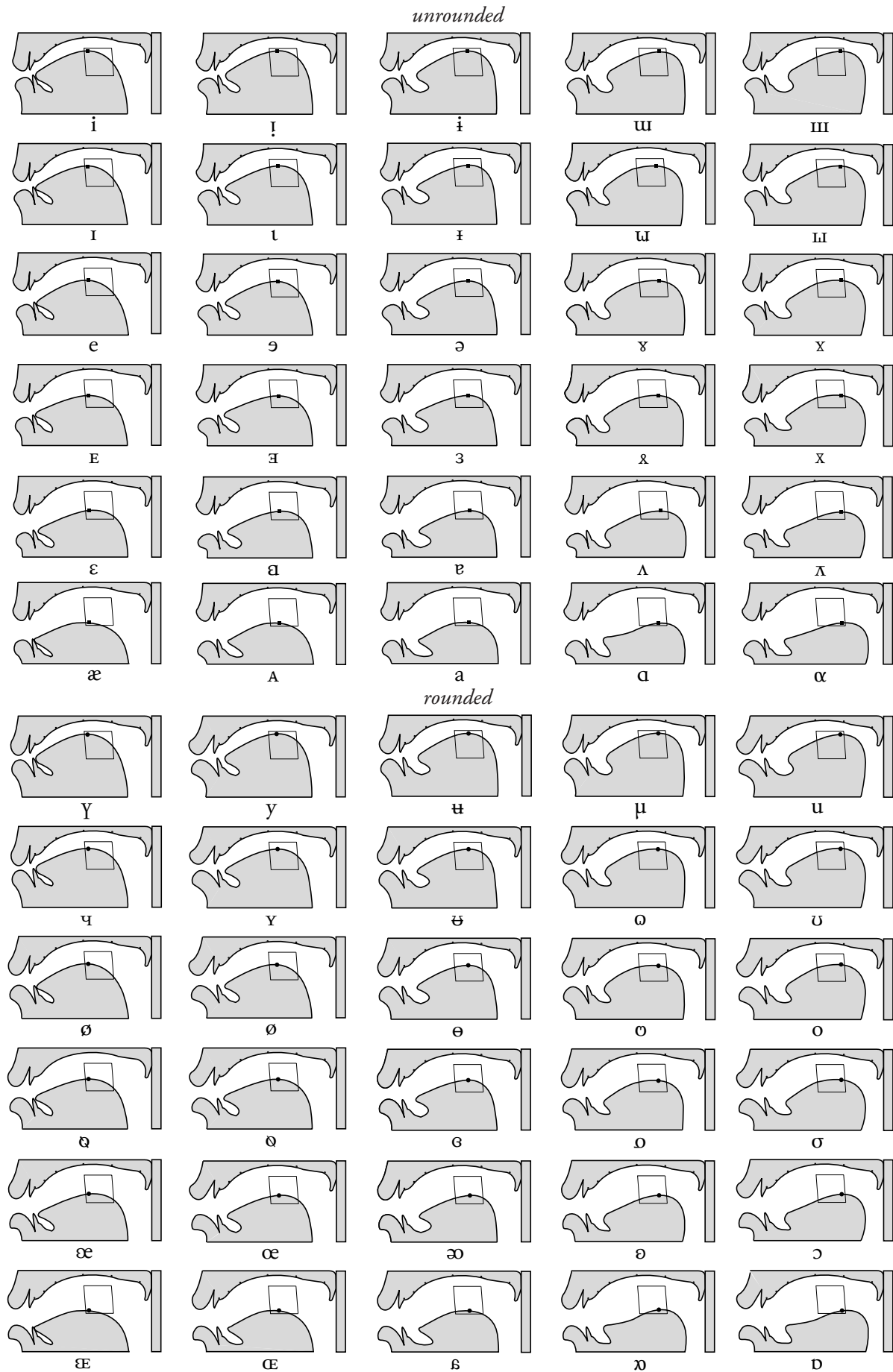


fig 5. The orograms of the 60 *canIPA* vocoids.



measurements). In addition, fig 5 shows the ograms of the 60 natural vocoids.

Finally, note that instead of Jones' dots, we distinguish three kinds of markers: the dot for rounded vocoids, the square for the unrounded (or slit) ones, while a lozenge indicates half-rounded lips (or coincident slit and rounded, as in fig 2.2).

fig 6. Average measurements of the 60 *can*IPA vocoids.

<i>vocoids</i>	<i>lips, for rounded V</i>	<i>lips, for unrounded V</i>	<i>between the teeth</i>	<i>from palate to tongue</i>	<i>reference to the boxes</i>
high	4 mm	6 mm	4 mm	6 mm	5-7 mm
lower-high	6 mm	9 mm	5 mm	8 mm	7-9 mm
higher-mid	8 mm	12 mm	6 mm	10 mm	9-11 mm
lower-mid	10 mm	15 mm	7 mm	12 mm	11-13 mm
higher-low	12 mm	18 mm	8 mm	14 mm	13-15 mm
low	14 mm	21 mm	9 mm	16 mm	15-17 mm