

Phonetic Goals

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Below is an outline version of lectures on understanding articulatory behavior. Main points are in large font; examples are given in smaller fonts.

1. Linguistic Hardware is composed of solid structures, muscular operators, and connections between them.
2. Muscular operators work by contracting when enervated. This muscular shortening causes whatever is attached to either end to approximate one another. E.g. the *levator palatini* runs laterally through the velum attaching to the skull. Contracting it, then pulls the velar tissue upwards and backwards sealing off the nasal passage.
3. We might try to think of phonetic intent in terms of neural commands, targeted at muscular groups which will move articulators in the direction we want them. E.g. a reasonable reading of Chomsky and Halle (1968) is that they actually envisaged this sort of model in the formulation of their phonetic bases for the phonological grammar. Others have also tried to explain phonetic commonness of speech sounds such as [i] [a] and [u] in terms of the enervation of muscle groups which would pull the tongue toward such configurations.
4. **HOWEVER**, the actual effect of muscular operation is determined also by other factors. First is the geometry of the solid structures. E.g., the *masseter* runs from the outside of the posterior part of the jaw upwards to the skull complex. Contracting it, however, does not just move the jaw upward, but actually swings the forward part of the jaw towards the alveolar process. This swinging is due to the connection of the jaw to the skull at the *temporo-mandibular joint*.
5. Another factor is the enervation other muscles. Muscles work as agonist-antagonist sets. E.g., it is possible that contraction of the *levator palatini* might have the effect of raising the tongue because the tongue is connected to the velum laterally by the *palato-glossus*. However this effect will or will not occur depending on whether the *palato-glossus* is contracted or not. In addition, we need to know if muscles which attach the tongue downward to the hyoid bone (the *hyo-glossus*) and eventually to the main part of the body are contracted or not.
6. The complexity of these combinations can be appreciated best by considering the **tongue**. It is not only attached to other structures by several muscles (*genio-glossus* – the inside of the jaw, *stylo-glossus* - the bottom of the skull, *palato-glossus* – the velum, *hyo-glossus* – the hyoid bone), but also is composed of complex array of interlocking muscular groups. The complexity of interactions between these muscular groups is truly astonishing.
7. **CONSIDER FURTHER** that the production a particular segment will require different sorts of movements, depending on where one is starting from. E.g., consider making an [u] following [a], which requires a raising of the tongue mass from a pharyngeal constriction location, and making an [u] following [i], which requires a retraction of the tongue mass. These two movements will obviously require different types of muscular contraction.
8. **CONSIDER FURTHER** that people are very good at making speech sounds a variety of ways. E.g., smokers can talk with a cigar in their mouths, despite the fact that it is removing the functionality of the jaw from their speech. Other, more dramatic, examples can be found in the literature

of speech achievement even when experimenters deliberately and unexpectedly interfere with an articulator while a person is speaking.

9. All these considerations suggest that modeling phonetic behavior without the notion of 'intent' is not going to work. Here, if we look too close at the physiological activity, we fail to see what is really happening.

10. Question: what are 'phonetic intents'?

11. Saltzman and Munhall suggested that intents are 'gestures'. Muscles are grouped together flexibly around the goal of making constriction in the vocal tract.

12. Perkell and others suggested that intents are 'acoustic patterns'. Thus, even non-locally related articulators can be grouped together. Examples of this are labial and lingual interactions in making back rounded vowels and semi-vowels. What links the lips and tongue in these cases is the common acoustic effect of lowering general vowel timbre.

13. HOWEVER, Lindblom and others have pointed out that, whatever might be posited as an intent, people often fail to achieve it. What is more, there is some systematicity to their failures. E.g. certain 'speech modes' are characterized by underarticulation and reduction.

14. This sort of work suggests that, whatever intents one might posit to understand the details of phonetic activity, such intents are nested within a larger intent, communication. Hence, in speech modes characterized by mumbling, the intent of communication is relatively less imposing than other intents, or than the general propensity of a biological system to settle into low-cost operation.

15. Communication is enabled by a shared information encoding system, language. Hence, it is also possible that 'low cost' operation of the phonetic system is actually part of the language. For example, vowel reduction in unstressed syllables is clearly specified as part of English; non-native speakers generally don't do this right. Similarly, overarticulating in various ways is probably proscribed in various casual registers.

16. Hence the proper model of phonetic intent must relate specific individual intents in specific contexts to the conventionalized system, which is language. This is the heart of linguistic phonetics. As linguists interested in language, each phonetic action is an indirect indicator, through conventionalization and intent, of our topic of interest.

17. Finally ... what's the relationship between phonetics and phonology?

18. Which one? There are (at least) three.

19. First, standard Laboratory Phonology (aka, experimental phonetics aimed at language analysis), examines phonetic activity with a view to inferring the linguistic conventions which (partially) determine the phonetic events. A language's phonology is inferred as being what conventionally governs the phonetic behavior.

20. Second, some phonetic work is aimed at determining what languages should be like, based on functional principles. Phonology is inferred as being what is a likely usage of the phonetic apparatus.

21. Third, there is another kind of phonetics which bridges the other two. It seeks to understand how the general exigencies of communication exert themselves on phonological systems to give rise to specific languages as we see them.