

Of all the complex cognitive tasks we perform, phonological processing — the ability to perceive and produce the lowest level of linguistic structure — may not be the one that we grant central importance. Traditionally the domain of structural linguists, empirical research has recently placed an increasing focus on the cognitive side of phonology, which is the intermediary between a linguistic signal — whether auditory as in spoken language, or visual as in signed and written language — and a meaningful representation. In this presentation, I aim to introduce an unfamiliar audience to the state of the art and present an argument of why phonology appears to be of central importance in understanding the cognitive mechanisms behind language, and perhaps more general cognition.

To achieve this, I first survey some dominant phonological theories: rule-based phonology, where phonology is seen as a series of operations on abstract mental representations of units called *phonemes*; Optimality Theory, where phonology is seen as an attempt to realize these abstract mental representations in the optimal way given a set of constraints; and feature geometry, where phonological units are given deeper structures based on shared physical characteristics. I explain the motivations behind each theory (structuralism and generativism, computational approaches to cognition, and parsimony) before presenting recent developments that challenge these traditional approaches.

Specifically, I refer to three domains: sign language literature, which shows that phonology can apply in different modalities and thus is unlikely to be modality-specific, and also allows for the development of new sign languages and their phonologies to be studied; computational work, which shows that hierarchical compression and predictive algorithms in various domains appear to show some emergent likeness to our understanding of phonology at the lowest level of representation; and second language acquisition, which shows that early phonological acquisition is highly predictive of degree of acquisition, and further that second languages' phonological systems are often copies of the first languages' system.

To conclude, I explain the significance of these challenges to conventional understandings of phonology primarily through an applied lens. Conventional language-learning pedagogy foregrounds vocabulary and grammar, often diminishing the importance of phonological acquisition. However, if we take the position that phonology is an emergent step in data compression used for language processing, then it follows that phonological acquisition should be given a much greater place in language education. I provide some examples of language-learning curricula where this is followed, and make an appeal for research to be conducted on this topic.