

## VOCAL TRACT ANATOMY AS A TIME MACHINE: WHAT CAN WE INFER ABOUT THE “DEEP” LINGUISTIC PAST?

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It is usually thought that languages change too fast for them to retain any information about events and processes in the “deep” past, with those beyond a “time horizon” of about 10,000 years or so before the present being effectively lost (Renfrew et al., 2000). While this might well be the case for “classical” historical linguistics (Campbell, 2004; Lass, 1997), new (and sometimes quite controversial) methods and data seem to suggest otherwise. As such, modern Bayesian phylogenetic methods borrowed from evolutionary biology applied to cognacy judgments on basic vocabulary lists (Atkinson & Gray, 2005) have allowed detailed reconstructions of a few large language families (such as *Indo-European* and *Austronesian*) which may go back 7-8,000 years before present (Bouckaert et al., 2012; Gray & Atkinson, 2003; Honkola et al., 2013). More controversially, similar methods have been recently used to suggest that some Eurasian language families might be related through a shared ancestor some 15,000 years ago (Pagel et al., 2013), a suggestions also supported by a different approach using phylogenetic inferences on the alignment of actual transcriptions from the ASJP database (Jäger, 2015). A very indirect support may be offered by between-families patterning of the stability of structural features of language, suggesting not only that some Eurasian families were connected in the “deep” past, but also that the language families of America and north-eastern Eurasia might have been linked, presumably 15,000 years ago or so (Dediu & Levinson, 2012). However, while these new findings may be able push back the “time horizon”, it still concerns but a sliver of the at least 500,000 years or so of modern language and speech (Dediu & Levinson, 2013, 2018).

In this talk, we propose that recent work linking features of vocal tract anatomy with phonetics and phonology might allow inferences about some features of languages spoken in the “deep” past. First, we will review evidence that some of the hard structures of the vocal tract can be recovered from the osteological and fossil records in fine enough detail to allow such inferences to be made, focusing on the *hyoid bone* (Martínez et al., 2008), the *lower jaw* (Bosman et al., 2017) and the *hard palate* (Baetsen, 2016). Second, we will use recently published and ongoing work to show that metric variation in particular features of the vocal tract (using both “classic” measurements, such as *distances and angles*, and *geometric morphometric* approaches separating shape from size; Zelditch et al., 2012), showing inter-individual and inter-group variation, do influence speech. We focus on the effects of the *alveolar ridge* on click consonants (Moisik & Dediu, 2017), of *bite* on labiodentals (Blasi et al., 2019), of the *hard palate* on [ɿ] (Dediu & Moisik, 2019), and of *larynx position* and *hard palate midsagittal shape* on vowels (Dediu et al., 2019; Janssen et al., 2019). Finally, work in the tradition of the iterated learning model (ILM) suggests that such weak biases may be amplified by the repeated use and learning of language (Dediu et al., 2019; Kirby et al., 2007), and that such anatomical variation might indeed affect sound change (Dediu & Moisik, 2019) either directly (through its immediate articulatory and acoustic effects) or indirectly (by changing the probabilities of sound change elsewhere through covert coarticulatory influences).

Taken together, these suggest that, by looking at the osteological and fossil record, we may be able to make probabilistic inferences about the languages of the past. Thus, we can pretty safely infer that obstruents closer to the glottis were less likely to be voiced (Everett, 2018) as far back as speech existed (and that this tendency might have been even stronger for higher larynx positions), and that labiodentals were much less frequent before the spread of agriculture (Blasi et al., 2019). Other inferences require more data that is currently available, such as the hard palate shape of populations in Africa before the Bantu expansion (were clicks more widespread there at that time?) and elsewhere (were clicks present? and, if any, what variations of [ɿ] would be most prevalent?). More importantly however, is that such studies allow quantitative, empirical inferences about the past.

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