

Phonetic universals live in the body, not the mind

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This talk begins with basic observations showing that humans can produce some of our most complex motor behaviors without a brain or experience. Experimental results and simulations using biomechanically realistic models in the ArtiSynth platform (www.artisynth.org; e.g., Fels et al. 2003, Stavness et al., 2012, Gick et al. 2014) will be presented showing that the body offers only a very small inventory of possible reliable postures for speech sounds and emotional expression. A model is described based on recent research in neurophysiology in which this inventory comprises semi-closed neuromuscular structures, or "modules" in the body. I show how these modules emerge through use as part of a learner's strategy to optimize the biomechanics of speech production, and how similar biomechanical properties may be seen in a range of body structures used for speech, including the lips/face, palate, larynx and tongue. Note that this model gives robust and highly predictive results with no brain, no experience, and no anatomically defined body parts/articulators (e.g., "lips", "jaw", etc.). The result is a theory of embodied phonetics built on an inventory of highly specialized body structures, each of which is "discovered" by the nervous system and used to serve a specific phonetic function.