States of the Glottis:
An Articulatory Phonetic Model Based on Laryngoscopic Observations

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Our laryngoscopic observations suggest that the traditional classification of states of the glottis needs to be revised. We aim to show that the sound-generating role of the epilaryngeal tube – comprising the ventricular folds, the aryepiglottic folds and the laryngeal sphincter mechanism – adds a vertical dimension to the 'source' signal, contributes to phonation type, and prompts us to redefine states of the glottis to include a larger range of categories than before. States of the glottis as traditionally defined include: breath (sometimes voicelessness), nil phonation, voice, creak, whisper, and stop. But since languages use the full variety of sound-producing capabilities in the larynx and pharynx, many of their contrastive features are not adequately explained by the traditional model of the glottis simply closing and opening.

One problem arises with the notion of just what a 'completely closed glottis' is (Catford, 1977, p. 107). At ICVPB '97, it was shown that Catford's category of epiglottal sounds, including epiglottal stop, frication and trilling, is a function of the aryepiglottic sphincter, in coordination with extreme lingual retraction, essentially as subcomponents of the pharyngeal articulator (Esling, 1996, 1999). Since then, we have made laryngoscopic observations of speakers of nine different languages to evaluate the articulatory relationship of pharyngeal to laryngeal behaviour. Our laryngoscopic studies suggest that partial ventricular fold adduction and slight constriction of the epilaryngeal tube through its supraglottal sphincter mechanism are key components in the production of a glottal stop. We have gathered evidence for a hierarchical continuum of stricture beginning with partial adduction of the ventricular folds as a minimum requirement for a glottal stop, further constriction of the sphincter mechanism for a moderate glottal stop, and full engagement of the laryngeal sphincter for an epiglottal stop, which Catford (1977, p. 105) termed a 'ventricular stop'. We propose to include 'epiglottal stop' as the state of the glottis representing maximum closure.

Another problem is that some 'simple' phonation types included in the existing taxonomy are physiologically entailed by the action of the sphincter. For example, 'breath' implies an open sphincter, while 'creak' implies a constricted sphincter. Because of this, we propose to integrate the multidimensional view of laryngeal behaviour into the model by adding compound phonation types to the set of states of the glottis.

A third problem arises in that Catford (1968, p. 319) considers breath (wide open glottis with turbulent airflow as in audible breathing) and nil phonation (wide open glottis with non-turbulent airflow as in silent breathing) to be the states for 'voiceless' sounds. But Catford makes no specific mention of the state of the glottis during the articulatory stricture phase of a voiceless unaspirated oral stop, for which neither 'nil phonation' nor 'unphonated' is appropriate. Our observations of Thai, Cantonese, Pame, Tibetan, Yi, and Bai (cf. Edmondson et al., 2000) confirm that at stop onset, the arytenoids are adducted as for voice, but the space between the vocal folds remains parted. We propose the term 'prephonation' to refer to this state of the glottis accompanying voiceless unaspirated oral stops. Our research has also shown that this configuration precedes an initial vowel in modal voice when not preceded by a glottal stop.

We propose to expand the basic states of the glottis to include: breath, prephonation, modal voice, breathy voice, whisper, whispery voice, creaky voice, glottal stop, and epiglottal stop. Adding these new components to the taxonomy will allow us to relate differences in larynx height to glottal activity more accurately and to integrate our explanations of the production of pharyngeal and laryngeal sound classes in the languages of the world. All categories will be illustrated in the presentation with video/audio clips of cardinal values and native-speaker language examples.

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