

# RESEARCH DIRECTIONS

## It's in the tone of your voice

**Professor Denis Burnham of MARCS Auditory Laboratories, along with researchers from Lancaster University, UK, and the Chinese University of Hong Kong, is investigating lexical tone perception in speech in a variety of tone languages. This research is funded by an Australian Research Council Discovery Project grant.**

'Many languages use only consonants and vowels to distinguish meaning, as in "bin" vs "pin" or "pin" vs "pan", however, a surprising 70% also use lexical tone, the pitch of the voice on each syllable of speech, to distinguish meaning', explains Professor Burnham. 'In Thai, for example, syllables can be pronounced in any one of five tones, such that "ka" with a rising tone means "leg" and "ka" with a low tone means "galangal" (Thai ginger root), as in the Thai soup "tom ka gai". Speech research on non-tonal languages such as English and most European languages can only be generalised to about 30% of languages. Tone is the third, forgotten aspect of speech sounds that is poorly understood with respect to the way in which it is perceived and produced, the way it is learned in infancy, and in terms of language learning difficulties. This project will examine the perception and production of both tones, and consonants and vowels.'

Both the auditory and the fine detail of visual (facial movements) aspects of speech will be measured using the OPTOTRAK apparatus (see picture) in speakers of Asian tonal languages (Cantonese, Mandarin, Thai) and compared with those who speak a non-tonal language such as English. In addition to this cross-language comparison, adults, children and young infants will also participate in speech perception experiments in order to address issues in the development of speech perception.



Understanding lexical tone perception and production for a wide range of languages will have significant implications for second language acquisition and language learning difficulties. The research will also pave the way for the advancement of communication aids for using computer auditory-visual speech recognition, and improving prosthetic aids for tone language speakers with a hearing impairment.

**Project Title:** Making speech three-dimensional: Adding tone to consonant- and vowel-based speech perception and language acquisition research, quantification and theory.

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