9:00

3aMUa4. Observing a chameleon: How to bridge a gap between the voice training and its scientific description. Jaan Ross (Koidu 122-61, 10139 Tallinn, Estonia, jaan.ross@ut.ee), Allan Vurma (Estonian Academy of Music and Theatre, Rävala Puiestee 16, 10143 Tallinn, Estonia, vurma@ema.edu.ee)

An overview of the authors' research on perception and production of singing voice as well as on the methods of voice training is presented. In the first study, a correlation was found for a group of voice students between the duration of training and the strength of the singer's formant, while the tone quality estimates were not significantly higher for students with longer practice years. In the second study we investigated possible acoustical correlates of the 'forward'/'backward' placing of a voice. A 'forward' placed voice may have higher F1, F2 and/or the singer's formant frequencies as well as a higher level of the singer's formant. In the third study we investigated the intonation accuracy in a cappella performance. There are considerable inter-individual differences between performers as to their adjustment of pitch level. The stability of intonation varies significantly both within a single rendition of the vocal exercise as well as between its consecutive renditions. There is a positive correlation between the deviation of a melodic interval from its equally tempered standard value and the number of out-of-tune judgments by the listeners. The dispersion of out-of-tune judgments is considerable, which suggests that listeners might have adopted different criteria for intonation accuracy.

9:20

3aMUa5. Rate of change of Fo in performance singing. Ronald C. Scherer (Bowling Green State University, Department of Physics and Astronomy, Bowling Green, OH 43403, USA, ronalds@bgnet.bgsu.edu), Nandhu Radhakrishnan (University of Missouri, 316 Lewis Hall, Department of Communication Science and Disorders, Columbia, MO 65211, USA, radhakrishnann@health.missouri.edu), Prakash Boominathan (Sri Ramachandra Medical College & Research Institute (DU), Dept. of Speech Language & Hearing Sciences, Porur, Chennai, 600 116 TamilNadu, India, Praxb77@yahoo.com), Haidee Tan (Bowling Green State University, 200 Health Center, Department of Communication Disorders, Bowling Green, OH 43403, USA, haideetan@hotmail.com)

Johan Sundberg has had a strong interest in the vocal behavior of singers of different styles and nationalities. This tribute talk emphasizes the voluntary change of rate of fundamental frequency in performance singing of ornaments and vibrato. The ″taan″ gestures from Northern Indian classical singing, the ″pulse patterns″ in Carnatic Southern Indian classical singing, and pitch change in classical western coloratura singing constitute the primary corpus for this study of Fo rate change. Rate of Fo change varied from approximately 20 to 120 ST/s for soprano pitch change, 8 to 20 ST/s for the Southern Indian pulse patterns, and 7 to 60 ST/s for the Northern Indian taan gestures. What these rates depend upon and rates from other ornaments will be discussed, as well as the relation to maximum Fo rates in the literature, performance needs, perceptual characteristics, and control.

9:40

3aMUa6. Singing out of tune: Disturbances of vocal performance in the general population. Simone Dalla Bella (Dept. of Cognitive Psychology, University of Finance and Management in Warsaw, Pawia Street 55, 01-030 Warsaw, Poland, sdallabella@vizja.pl)

Acoustical methods can provide a reliable and objective estimate of singing proficiency in the general population, in terms of pitch and temporal accuracy (e.g., Dalla Bella, Giguère, & Peretz, 2007). The majority, when asked to sing a well-known song at a slow tempo, are as proficient as professional singers. Nonetheless, some nonmusicians exhibit poor singing. This deficit is mostly limited to the pitch domain and sometimes is not accompanied by impaired perception. More recently singing proficiency was examined in nonmusicians with tasks extending beyond singing familiar melodies. Forty participants imitated single pitches, intervals, and short melodies; in addition, participants sung three well-known melodies at a spontaneous tempo and at a fixed slow tempo. Additional tasks (e.g., Montreal Battery of the Evaluation of Amusia) were carried out to assess participants' perceptual abilities. Acoustical analyses of vocal performance revealed that the majority of nonmusicians sung in tune and in time, thus confirming previous findings. Still, various patterns of poor singing emerged from the analyses of pitch and time accuracy (e.g., poor pitch singing with or without perceptual deficits). The relationship between perception and performance mechanisms in vocal production will be discussed.

10:00

3aMUa7. Hi-Fi voice: observations on the distribution of energy in the singing voice spectrum above 5 kHz. Sten O. Ternström (Kungliga Tekniska Högskolan, Dept. of Speech, Music & Hearing, Lindstedtsvägen 24, SE-100 44 Stockholm, Sweden, stern@kth.se)

Current audio technology enables the weak spectrum of the voice above 4-5 kHz to be studied reliably. It is known that energy in the 5-20 kHz range can be perceived even when it is 50 dB or more below the main voice spectrum peak. Also, these upper frequencies are conventionally emphasized in the production of popular vocal music; yet very few studies of the acoustic content of this range have been made. High fidelity recordings were made of singers sustaining vowels at varying levels of vocal effort. A general characterization of the two highest octaves (5-20 kHz) was sought. The prevalence of high-frequency energy, the variation of harmonics to noise over frequency, and the covariation with overall SPL were all highly variable, but several landmark features were identified. In addition to the commonly observed zero at 4-5 kHz, zeroes were often seen also around 6 and 12 kHz, as were clusters of resonances in the regions 7-10 kHz and 13-16 kHz. Harmonic energy was observed to over 16 kHz in strong female voices. The audibility of these features was assessed by listening tests with selective filtering. A feature-based nomenclature for these uppermost frequency bands is suggested.