FUNCTION OF THE SINGING VOICE

KTH-course DT 211 V of the CSC/Department of Speech, Music and Hearing Malmköping, Sweden, 28 July – 3 August 2012

The summer course *Function of the Singing Voice* has been organised by The School of Computer Science and Communication of The Royal Institute of Science since 2007. It takes place in Sandvik, Malmköping, a small, quiet and idyllic place 115 km southwest from Stockholm. The main teacher, Johan Sundberg former director of the music acoustic research group at the Department of Speech, Music and Hearing, has created a hands-on curriculum that explains how the voice functions when used as a musical instrument within the classical Western tradition and several contemporary genres. The course is divided between lectures and workshops, where participants are also given the opportunity to watch and analyze their voice and respiratory system in speech and singing.

The emphasis of this summer course was placed on how the voice works and how its timbral properties are controlled by physiological, such as breathing behavior, larynx positioning and vocal tract shaping, but room acoustics, basic sound recording technology and auditory perception of the voice were also included. Therefore, people with various backgrounds and professions (singers, speech and singing pedagogues, speech therapists, ear nose and throat doctors, and phoneticians) participated.

Lectures given on the topic of “Function”, “Formants”, “Tube phonation” and “Source” summed up the acoustic background, and lectures like “Functional anatomy” and “Breathing” introduced the anatomical bases needed for investigating the function of the human voice. From the second day on, current investigations and novel scientific results were presented (in lectures like “Hormones and the voice”, “Voice in the choir”, “Adding expressiveness to musical performance” or “Secrets of an ugly voice”). “Room acoustics” and “Microphones and microphone placement” laid the foundations for experimental use of audio recording.

The participants attended the workshops as smaller groups. They learned how to use *Respiratory inductive plethysmography* for recording breathing movement; *oscillogram* and *inverse filtering* for recording the *flow glottogram* of the pulsating glottal airflow (and also examined the differences of the functions caused by phonation types); the articulatory model *APEX* (developed by researchers of KTH) to analyze and build the vocal tract shapes of different vowels; *Madde* (also developed by KTH scientists) for synthesizing vowels with adjustable acoustic properties; *Phonetogram* for profiling the voice range (in speech and singing) and a pressure transducer with an oscilloscope and a manometer for measuring the *subglottal pressure* of singing at different levels of loudness. Finally, the

participants were also given the chance to watch the movement of the vocal folds and the larynx during phonation using a *fiberscope*.

A masterclass given by the famous opera singer Håkan Hargegård, demo lessons given by singing teacher Brian Gill and workshops held by Daniel Zangger Borch and Margareta Thalén gave the singers among the participants a unique opportunity to develop their training and teaching techniques in several genres and also balanced the interesting mixture of theory and experience defining the whole event. The course "Voice health" and "Bubble phonation" provided practical advice and useful information for those who are using or analyzing the voice as a profession as well.

The teaching staff (Christine Ericsdotter, Anders Friberg, Brian Gill, Svante Granqvist, Håkan Hargegård, Stellan Hertegård, Filipa Lã, Frank Müller, Camilla Romedahl, Gláucia Salomão, Thomas Schuback, Johan Sundberg, Sten Ternström, Margareta Thalén, Daniel Zangger Borch) consisted of musicians, singers, singing teachers, voice researchers, logopeds and ENT doctors from various universities and countries (Sweden, Germany, Portugal and the USA).

Besides the exhaustive scientific work, the summer course also included a great social program. The lessons were held in a quiet ranch in absolute isolation from 9 am to 9 pm, thus the participants from different backgrounds were not only working together in the courses, but also got included in scientific discussions and socialization during the breaks and leisure time.

The main teacher Johan Sundberg demonstrating inverse filtering at a workshop.

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