

AVFA

Advanced Voice Function Assessment

COST Action 2103

International Workshop 2011

CoMeT

Collegium Medicorum Theatri

Annual Meeting

2011

May 15-16

May 16-17

## Program

# COST Action 2103 / CoMeT 2011

Organized by the

Department of Phoniatics and Pediatric Audiology

Chair: Prof. Katrin Neumann, MD

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CoMeT

STORZ  
KARL STORZ — ENDOSKOPE

Dear colleagues and friends of the fields of voice science, voice therapy, and performing arts,

It is my pleasure and a special honour to welcome you to the **International AVFA Workshop 2011**, organized by the **COST Action 2103 “Advanced Voice Function Assessment”**, held together with the **2011 Annual Meeting of the Collegium Medicorum Theatri – CoMeT**.

The **COST Action 2103 "Advance Voice Function Assessment"** (<http://www.cost2103.eu/>) is a joint initiative of voice and speech processing teams of engineers and physicists and of the European Laryngological Research Group (ELRG) under the umbrella of COST (European Cooperation in Science and Technology), with 17 countries participating. Its main objective is to create a European network of voice experts by bringing together research institutions, universities, and companies involved in signal processing and voice disorders with the aim of gaining new insights, through interdisciplinary cooperation, into basic research problems as well as clinical/therapeutic applications. Its aim is the development of objective and clinically useful methods for the investigation of voice quality and for the prevention and treatment of occupational voice disorders in professional speakers. This objective requires an understanding of the relationship between biomedical changes at the level of vocal folds and alterations of the acoustical voice signal, which in turn asks for objective voice assessment. Hence, the Action combines previously unexploited techniques with new theoretical developments to improve the assessment of voice for the various European languages, to refine existing voice production models, and to improve models of pathological processes.

**CoMeT** is composed of doctors, scientists, voice coaches, and voice pathologists from different regions of the world, who are connected with major theaters, operas, or conservatories, or who have demonstrated special dedication to the physiology and pathology of the voices of singers and actors. CoMeT strives for the scientific investigation of the physiology and pathology of the voice of singers and actors, clinical studies on these professional voice users, the exchange of knowledge and ideas among the members in this field, the facilitation of the referral of a singer or actor to a well qualified specialist in another city where the artist is scheduled to perform and the development of educational activities related to the vocal problems of singers and actors.

Because of the overlap of the issues of both COST Action 2103 and CoMeT, we will perform a shared event with oral presentations, roundtables, and workshops. Moreover, in a special session we want to present the main issues of our research in an easy understandable way to students and local professionals.

The topics of our event are

- Signal processing and acoustic voice analysis
- Perceptual voice analysis
- Modelling of the voice
- Assessment of voice disorders
- Physiology and pathophysiology of the singer's and speaker's voice
- Special voice problems in singers and actors
- Evidence-based vocal medicine
- Voice therapy
- Phonosurgery
- Vocal training and pedagogy for voice professionals

# COST Action 2103

# CoMeT

## Program Committee

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## Registration

### **Registration fees (for each of the two events):**

<b>Students:</b>	<b>30 €</b>
<b>Speech therapists and singing teachers:</b>	<b>180 €</b>
<b>Full rate:</b>	<b>230 €</b>
<b>Accompanying persons:</b>	<b>100 €</b>
<b>Conference dinner:</b>	<b>60 €</b>
<b>Ticket for Verdi Requiem:</b>	<b>35 / 42 €</b>

**Attendance at the COST Workshop is free for members of the COST Action 2103.**

## Venue

**Villa Giersch, Lerchesberg 90, 60598 Frankfurt am Main**

## Accommodation

**Ibis Hotel Frankfurt Centrum**

**For any requests, please contact:**

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**Venue:** Villa Giersch, Lerchesbergring 90, 60598 Frankfurt

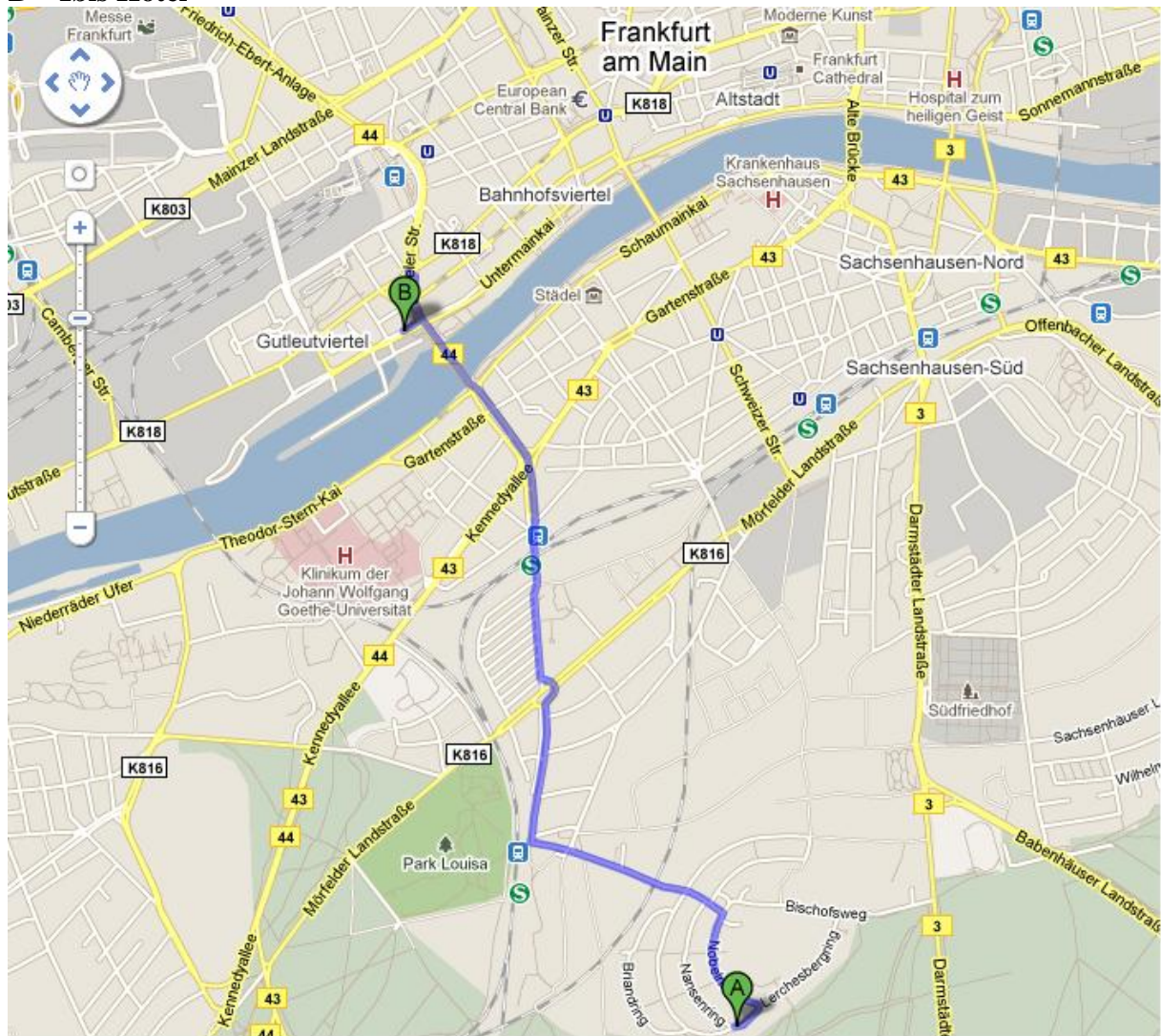
**Directions to Villa Giersch from Ibis Hotel:**

From Ibis Hotel, Speicherstraße 4, 60327 Frankfurt:

- walk to the bus stop “Baseler Platz” (approximately 3 minutes)
- take bus number 35 towards “Lerchesberg”
- get off at the bus stop “Lerchesbergring”
- walk to the conference location (approximately 9 minutes) to Villa Giersch, Lerchesbergring 90, 60598 Frankfurt

A – Villa Giersch

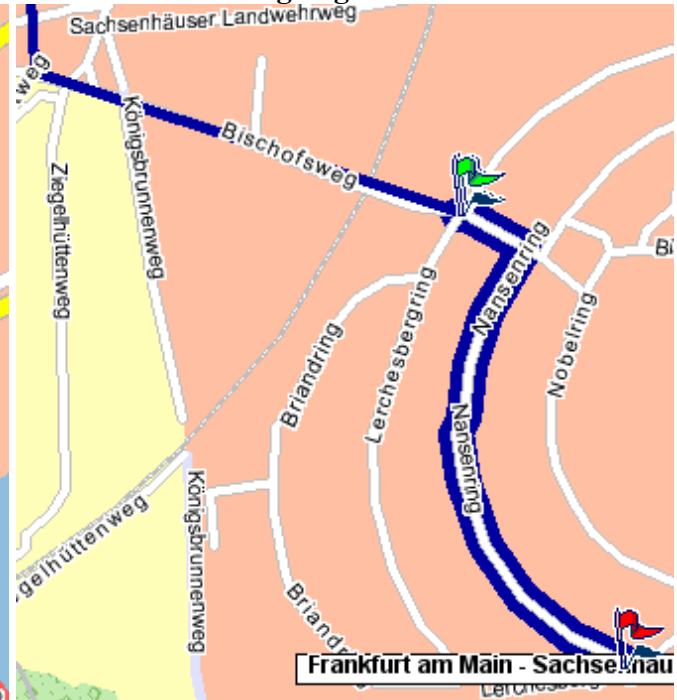
B – Ibis Hotel



### From Ibis Hotel to “Baseler Platz”



### From “Lerchesbergring” to Villa Giersch



Our event will be accompanied by pianist Tobias Hartlieb.

Tobias Hartlieb studied piano at the University of Music Hamburg with Volker Banfield. He continued his studies with a scholarship of Rotary International at the renowned Indiana University Bloomington, USA.

Leonard Hokanson, Menahem Pressler and Elisabeth Wright under which he studied Lied, chamber music and pianoforte, count to his teachers. Tobias Hartlieb was distinguished several times with prizes and scholarships, among them the 1st prize at "Jugend musiziert", the 1st prize at the international Johannes Brahms Wettbewerb, Austria, a scholarship of the Max Kade Foundation, New York.

As a pianist he appeared furthermore at the Karajan Academy of the Berlin Philharmonic Orchestra, at the state opera Nuremberg (opera Late Night), the Nuremberg Symphony Orchestra, the Hamburg Symphony Orchestra, with the Bavarian Chamber Orchestra Bad Brückenau as well as with the Ensemble Kontraste Nuremberg. Recordings at the Bavarian Broadcasting and NDR as well as CD recordings with chamber music and art song display his artistic activity.

Tobias Hartlieb is a lecturer in piano and chamber music at the University of Music Frankfurt / Main.



### **Clemens Rech**

began playing the guitar at the age of eleven and studied music at the Wiesbaden Conservatoire, class of Horst Klee, as well as musicology and philosophy at the Johannes-Gutenberg-University, Mainz. He completed his instrumental education with Wilfried Halter at the Dr. Hoch's Conservatoire, Frankfurt, and attended international master classes by, among others, Wolfgang Lendle and Prof. Karl Scheit.

Early encounters with the art of Dietrich Fischer-Dieskau and Peter Pears awakened his interest in song accompaniment and led to a continuing collaboration with singers like the tenor Ralph Nickles and the soprano Sigrun Haaser (CDs: "Meine Lieder, meine Sänge"; „Meine Liebe, schläfst Du noch?“). Additionally in recent years the guitarist developed an interest in historically informed performance, playing Romantic music on 19<sup>th</sup> century period instruments.



The soprano Sigrun Haaser has received a training to be a singer at the cathedral choir of Speyer since the age of seven. Already at an early stage did she sing smaller parts of sacred music as a soprano soloist. It was at one of these occasions that the singer of chamber music Mrs. Erika Köth took notice of her; encouraged and supported her until the start of her voice studies with private lessons. Her voice study started with Mrs. Prof. Eva-Maria Molnar in Mannheim, followed by further studies with Prof. Klaus Dieter Kern at the High school of Music in Karlsruhe, where she received a diploma with distinctions as a concert singer.

Her art career as a singer continued in Karlsruhe with studies of classic songs under Prof. Hartmut Höll and Mitsuko Shirai.

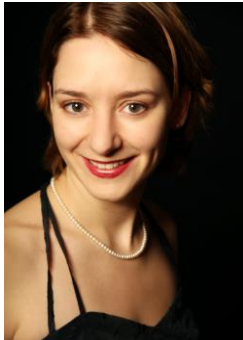
She took part in numerous master classes for opera and operetta, as well as for the art of songs and oratorios, for instance under Bernd Weikl (in Austria), Edith Mathis (in Switzerland), Anna Reynolds (in England), Sena Jurinac and Hilde Zadek (in Vienna), Barbara Schlick (baroque singing in Karlsruhe) and Charlotte Lehmann with Dr. Huber-Contwig (in Lichtenberg). This resulted in invitations to song evenings, oratorios, opera- and operetta-engagements during concerts. During these operetta concerts she displayed a wide repertoire for the various parts in operettas from Lehar, Johann Strauß and Robert Stolz. In October 2000 she sang one of the main parts of the only preserved opera "La constanza vince l'inganno" by Christoph Graupner. Since October 2000 Sigrun Haaser lectures singing at the University of Würzburg.



**Dimiter Ivanov** was born in Sofia/Bulgaria and grew up in Würzburg/Germany. At the age of eight he took his first lessons of violin. During his studies in Germany (Hochschule für Musik, Würzburg and Hochschule für Musik Hanns Eisler, Berlin) and the US (Indiana University/Bloomington) he was a scholarship holder of the "Studienstiftung des deutschen Volkes" and "Deutsche Stiftung Musikleben". Dimiter Ivanov is prize winner in several international violin competitions e.g. the "Groblicz-Family" (Krakau/Poland), "Andrea Postacchini" (Fermo/Italy)

“Henryk Szering“ (Mexico) “Johannes Brahms“ (Pörtlach/Austria), “Rodolfo Lipizer“ (Gorizia/Italy) and “Gerhard Taschner“ (Berlin/Germany). He has performed as a soloist in violin at the “Radio-Sinfonieorchester Krakau“, the “Nürnberger Sinfonikern“, the “Philharmonischer Orchester Würzburg“ and the “Berlin-Brandenburgischen Sinfonie-Orchester“ as well as the “Konzerthausorchester Berlin.“

2005-2008 Dimiter Ivanov was the first concertmaster at the “Orchestra del Teatro lirico di Cagliari“(Sardinia/Italy), since season 2008/09 he continued his work in the same position at the “Museumsorchester der Oper Frankfurt“. In 2010 he became a member of the staff of the “Hochschule für Musik Hanns Eisler“.



**Elisa Fenner-Ivanov** was born in Berlin/Germany. She received her first singing lessons by Maria Zahlten-Hall. In 2008 she finished her studies at the “Hochschule für Musik Hanns Eisler“ (Berlin/Germany) and deepened her Italian repertoire in Cagliari (Sardinia/Italy).

Elisa Fenner-Ivanov performed in several important opera parts e.g. the Ännchen in "Der Freischütz" (Weber), the Echo in "Ariadne auf Naxos" (R. Strauss). In the course of the festival "Oper Oder-Spree"(federal state of Brandenburg) she played the Celidora in "Die Gans von Kairo" (Mozart) and the Zerlina in “Don Giovanni“(Mozart). She was also involved in the debut performance of "Mephistopheles"(Boito) as Helena in the Philharmonie, Berlin and as Marie in „Die verkaufte Braut“(Smetana) at the Schloßtheater Rheinsberg.

She attended within the framework of the “Schleswig-Holstein Musikfestival“ and as a scholarship holder of the “Schubert Stichting Amsterdam“, mastercourses by Rudolf Jansen, Robert Holl, Elly Ameling and Irwin Gage. As well as by Hector Urbón, Julia Varady, Thomas Quasthoff, Thomas Heyer, Jutta Schlegel, Willy Decker and Gerd Uecker.

2001 she was awarded with the „Lotte Lehmann-Förderpreis“ (Perleberg/Germany). Since March 2009 Gundula Hintz is her vocal coach.

In 2010 Elisa Fenner-Ivanov became a member of the ensemble of the “Kammeroper Köln“ and started her studies in logopedics at the “Hochschule Fresenius“ (Frankfurt am Main/ Germany).



Scientific Program  
AVFA Workshop 2011 and CoMeT 2011 Meeting

May 15

AVFA Workshop 2011

- 8:00-9:00    **Registration**
- 9:00-10:00    **Keynote speech:**  
Ingo Titze. The importance of source-filter interaction in speaking and singing
- 10:00-10:40    **Oral presentations *Acoustic signal analysis*; Chair: Jan G. Svec**  
Philippe Dejonckere, Jean Schoengen, Claudia Manfredi. Perceptual and computer performances in cycle-pattern recognition of irregular voices  
Claudia Manfredi, Andrea Giordano, Jean Schoentgen, Samia Fraj, Leonardo Bocchi, Philippe Dejonckere. Validity of jitter measures in non quasi-periodic voices
- 10:40-11:00    **Coffee break**
- 11:00-12:40    **Oral presentations *Modeling and acoustic signal analysis*; Chair: Claudia Manfredi**  
Klára Visci, Viktor Imre. Voice disorder detection on the basis of continuous speech  
Jaromír Horáček, Petr Sváček. Numerical simulation of phonation onset: comparison of finite element glottal flow approximation with a simplified model  
Evaldas Vaiciukynas, Atanas Verikas, Adas Gelzinis, Marija Bacauskiene, Virgilijus Uloza. Exploring fusion of generative and discriminative models for similarity-based classification of larynx pathology  
Jan G. Svec, Hana Sramkova, Tomas Fürst, Svante Granqvist. What is the dynamic range of human voice?  
Fredric Lindström, Marcus Wirebrand, Sten Ternström, Maria Södersten. A discussion on what type of data a voice usage database should consist of
- 12:40-13:30    **Lunch break**
- 13:30-14:30    **Oral presentations *Clinical applications*; Chair: Philippe Dejonckere**  
Grażyna Demenko, Magdalena Jastrzębska. Analysis of vocal stress in conversations to call centers

Víctor Osma-Ruiz, Juana María Gutiérrez-Arriola, Juan Ignacio Godino-Llorente, Janaina Mendes-Laureano, Nicolás Sáenz-Lechón, Rubén Fraile, Julián David Arias. EntrenaVox, a computer program for voice rehabilitation through games

Mette Pedersen. Highspeed films for evaluation of reflux to help rock popular singers

Katrin Neumann, Malte Kob, Harald A. Euler1, Tobias Weissgerber, Alexander Wolff von Gudenberg, Anne-Lise Giraud, Christian Kell. How does the brain process prosody? An fMRI study with persons who stutter

14:30-15:30 **Workshop**

Hugo Lycke. Voice classification by phonetography: the ‘why’ and the ‘how’.

15:30-17:00 **MC meeting**

## May 16

### AVFA Workshop 2011 and CoMeT 2011 Meeting

8:40-9:00 **Opening**

9:00-10:00 **Keynote speech:**

Eckart Altenmüller. Is music the universal „language“ of emotions? The neurobiology and psychology of aesthetic feelings

10:00-11:10 **Oral presentations *Assessment of the professionals' voice*; Chair: Tom Harris**

Vojtěch Radolf, Anne-Maria Laukkanen, Radan Havlík, Jaromír Horáček. Effects of a vocal warm-up on the vocal tract setting of a male voice professional. An MRI and modelling study

Matthias Echternach, Louisa Traser, Bernhard Richter. Tenors' vocal tract configurations in different registers and vowel conditions

Samuli Siltanen, Aku Seppänen, Antti Nissinen, Ville Kolehmainen, Anne-Maria Laukkanen. Feasibility of electrical impedance tomography for the imaging of the larynx – preliminary results

Lionel Fawcett. Singing – a dual system

Josef Schlömicher-Thier, Matthias Weikert, Hannes Tropper, Alexandra Pichler, Silvia Hißmayr. Medical and educational occupational voice care for teacher-students at the College of Education in Salzburg

11:10-11:30 **Coffee break**

11:30-13:00 **Oral presentations *Phonosurgery*; Chair: Tadeus Nawka**

11:30-11:45 Tadeus Nawka. Introduction to the topic and demonstration of the RADIESSE Voice system

11:45-12:05 Nobuhiko Isshiki. Phonosurgical procedure and outcome in case of a laryngeal paresis of an operatic singer

12:05-12:20 Jaechul Bae. Report on his voice recovery as an operatic singer after a laryngeal paresis and a subsequent phonosurgery

12:20-12:30 Totaro Wajima. Report on the voice recovery of Mr. Jaechul Bae by his producer

12:30-12:45 Giovanna Cantarella, Giovanna Baracca, Stella Forti, Elisabetta Iuffrida, Riccardo F. Mazzola. Treatment of glottic insufficiency by structural fat grafting

12:45-13:00 Eugenia Chávez. Results of indirect endoscopic surgery in singers

13:00-13:30 Roundtable with the presenters, Tom Harris, and John Rubin. Open discussion on phonosurgical issues; Chair: John Rubin

13:30-14:20 **Lunch break**

14:20-15:45 **Workshops**

Leah Frey-Rubine. Master class ‘Honing the professional singing voice’

Olaf Nollmeyer. Singer's/ -speaker's formant in real life

15:45-16:00 **Closing of the AVFA 2011 Workshop**

16:00-18:00 **Special session for students, artists, therapists, and other professionals: Say it easy – how does the voice function? John Rubin, Ingo Titze.**

VENUE: University hospital Frankfurt/M, Theodor-Stern-Kai 7, House 22, lecture room 2

18:00-19:30 **CoMeT Annual General Meeting**

**May 17**  
**CoMeT 2011 Meeting**

- 09:00-10:00 **Keynote speech:**  
Malte Kob. The acoustics of over- and undertone singing
- 10:00-11:00 **Oral presentations *Voice classification and assessment*; Chair: Krzysztof Izdebski**  
Hugo Lycke, Wivine Decoster W, Felix I. de Jong. Voice classification in practice: criteria in contemporary singing education  
Hugo Lycke, Wivine Decoster, Anna Ivanova, Marc M. van Hulle, Felix I. de Jong. The reliability of voice range profile derived parameters in the discrimination of three basic female voice categories.  
Philipp Aichinger, Birgitta Aichstill, Felicitas Feichter, Berit Schneider-Stickler. Towards standardized DSI-measurement in clinical practice  
Erkki Bianco. Individual harmonic listening in spectral sounds of the voice
- 11:00-11:20 **Coffee break**
- 11:20-12:50 **Oral presentations *Special issues of the singers' and speakers' voice*; Chair: Katrin Neumann**  
Krzysztof Izdebski. Phonetotopic organization of phonation. Evidence from electrophysiology, aerodynamics, acoustics and kinesthetics  
Katrin Neumann, Judith Thoma, Tobias Weissgerber, Felix Langenbruch, Jörn Loviscach, Malte Kob. Female register transitions  
Philippe Dejonckere. Actress' formant: does it exist?  
Geert Berghs, Felix I. de Jong. Singing voice and ageing  
Geert Berghs, Felix I. de Jong. Vibrato and ageing of the voice in professional choir singers
- 12:50-13:40 **Lunch break**
- 13:40-14:20 **Oral presentations *Occupational issues*; Chair: Berit Schneider-Stickler**  
13:40-14:00 Sara Harris. Speech therapy for the injured singer  
14:00-14:20 Eugenia Chávez. Singers resonance, allergies and environment

14:20-15:45 **Workshops**

Eugen Rabine. Workshop ‘Double ventile function – breathing and posture in singing’

Margaretha Bessel. Workshop ‘Sing aaaaah, free your voice!’

15:45-16:00 **Closing CoMeT Meeting**

## **Sunday, May 15: AVFA Workshop 2011**

**Sunday, May 15, 9:00-10:00**

### **Keynote Speech:**

***The importance of source-filter interaction in speaking and singing***

Ingo R. Titze

Executive Director; National Center for Voice and Speech; The University of Utah, lead institution  
University of Iowa Foundation Distinguished Professor; Department of Communication Sciences  
and Disorders; The University of Iowa

The source-filter theory has been the flagship of speech and voice science for over half a century. Traditionally, the source (glottal airflow in vocal fold vibration) and the filter (the vocal tract airway) have been treated independently. One could not affect the other. Recent discoveries challenge that concept. As in wind instruments, the filter (vocal tract) can have a strong influence on the source. Specific vowel shapes are matched by specific glottal configurations. This is of particular importance in characterizing singing styles and voice qualities in speech.



### **Prof. Dr. Ingo R. Titze:**

Prof. Dr. Ingo R. Titze is a University of Iowa Foundation Distinguished Professor in the Department of Communication Sciences and Disorders and the School of Music. He also directs the National Center for Voice and Speech, which is an Institute of the University of Utah in Salt Lake City, with a companion site at the University of Iowa. The NCVS also collaborates with many institutions around the country.

Although he was formally educated as a physicist (Ph.D.) and engineer (M.S.E.E.), Prof. Dr. Titze has applied his scientific knowledge to a lifelong love of clinical voice and vocal music. Specifically, his research interests include biomechanics of human tissues, acoustic phonetics, speech science, voice disorders, professional voice production, musical acoustics, and the computer simulation of voice.

Prof. Dr. Titze has published over 250 articles in scientific and educational journals, authored three books entitled *Principles of Voice Production*, *The Myoelastic-Aerodynamic Theory of Phonation*, and most recently *Fascinations with the Human Voice*. He has also co-edited two books in a series entitled *Vocal Fold Physiology*. He is currently completing an additional book entitled *Vocology*.

He is an associate editor of the *Journal of Singing* and has written a bi-monthly column in this Journal for 20 years.

Prof. Dr. Titze is the father of *vocology*, a specialty within speech-language pathology. He defined the word and the specialty as “the science and practice of voice habilitation.” In many ways, it parallels audiology. The discipline focuses on the sound-producing organ rather than the sound-receiving organ in terms of prevention and care. A Summer Vocology Institute is ongoing, in which speech language pathologist, otolaryngologist, speech trainers, and singing teachers can get intensive, graduate level training in voice.

Most recently, Prof. Dr. Titze has formally begun to address the vocal problems of teachers, which comprise about 4% of the working population. Because of the many hours of vocal engagement with students, many teachers fatigue after three to four hours of talking. They don't recover from day to day, or week to week. Research is underway in Prof. Dr. Titze's laboratories to study the effects of long-term vibration on cells and extra-cellular tissues in the vocal folds. Also underway is the development of therapy techniques to improve the economy of sound production in teachers.

An outgrowth of Prof. Dr. Titze's research on voice physiology, biomechanics, and acoustics has been a singing and speaking robot, Pavarobotti. He has used it widely for creating entertaining lectures on the human voice. Prof. Dr. Titze and Pavarobotti perform operatic arias together. It is expected that, in time, this technology will be widely used for assistive devices in speech communication, in speech training, and in education. The unique feature of his approach is that all the computer simulations are done on the basis of anatomy and physiology, rather than sound processing.

Prof. Dr. Titze is a recipient of the William and Harriott Gould Award for laryngeal physiology, the Jacob Javits Neuroscience Investigation Award, the Claude Pepper Award, the Quintana Award of the Voice Foundation, and the American Laryngological Award. He is a Fellow of the Acoustical Society of America, the American Speech Language and Hearing Association, and the American Laryngological Association. He and his work have been featured in several well-known television programs, including *Innovation*, *Quantum*, and *Beyond 2000*.

Prof. Dr. Titze has served on a number of national advisory boards and scientific review groups, including the Scientific Advisory Board of the Voice Foundation, the Division of Research Grants of the National Institutes of Health, and the Advisory Council of National Institutes on Deafness and Other Communication Disorders. In addition to his scientific endeavors, Prof. Dr. Titze continues to be active as a singer, giving several recitals a year in the U.S. and Europe.

His wife, Kathy, is a piano teacher and his daughter is a speech-language pathologist; and his three sons are all pursuing college degrees.

**Sunday, May 15, 10:00**

**Oral Presentation: Acoustic signal analysis**

***Perceptual and computer performances in cycle-pattern recognition of irregular voices***

Philippe Dejonckere<sup>1,2,3</sup>, Jean Schoengen<sup>2</sup>, Claudia Manfredi<sup>4</sup>

<sup>1</sup> Catholic University of Leuven, Neurosciences, Exp. ORL, Belgium

<sup>2</sup> Federal Institute of Occupational Diseases, Brussels, Belgium

<sup>3</sup> Utrecht University UMC, The Netherlands. AZU Heidelberglaan 100, F.02.504, NL 3584 CX Utrecht.

<sup>4</sup> Department of Electronics and Telecommunications, Università degli Studi di Firenze, Via S. Marta 3, 50139 Firenze, Italy

Objective measurement of the severity of dysphonia typically requires signal processing algorithms applied to acoustic recordings. Since Lieberman (1963) introduced the concept of perturbation analysis in the area of voice, the best-known acoustic parameter in clinical practice is conventional *jitter*. However jitter measurements have some critical limitations. According to a widely accepted guideline, in sustained vowels of dysphonic voices, only perturbation measures less than about 5% are reliable: this is related to period extraction methods. This limit of 5% deserves critical analysis, certainly when there are indications that some acoustic analysis programs can be applied to quite irregular voices such as substitution voices. The present experiment demonstrates that – on signals of synthesized deviant voices (sustained vowel) with moderate additive noise – different raters are able to visually identify in a very consistent way the period durations of successive cycles up to values of about 13% jitter. Furthermore, even for higher values – over 30 % – the jitter % computed with the period values rated by visual perception is, for some of the raters, very comparable to the real value. This suggests that improved acoustic programs using more reliable algorithms could validly transgress the traditional limit of 5% if they demonstrate the correspondence of their computations with the true jitter values. This is now made possible by synthesizers generating artificial deviant voices that cannot be distinguished from true dysphonia, and in which the jitter put in is exactly known.

**Sunday, May 15, 10:20**

**Oral Presentation: Acoustic signal analysis**

*Validity of jitter measures in non quasi-periodic voices*

Claudia Manfredi<sup>1</sup>, Andrea Giordano<sup>1</sup>, Jean Schoentgen<sup>2,3</sup>, Samia Fraj<sup>2</sup>, Leonardo Bocchi<sup>1</sup>, Philippe Dejonckere<sup>4,5,6</sup>

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In this paper the effect of noise on both perceptual and automatic evaluation of the glottal cycle length in irregular voice signals (sustained vowels) is studied. The reliability of four tools for voice analysis is compared to visual inspection made by trained clinicians using two measures of voice signal irregularity: the jitter (J) and the coefficient of variation of the fundamental frequency (FOCV). The purpose is also to test to what extent of irregularity trained raters are capable to visually determine the glottal cycle length as compared to devoted software tools.

For a perfect control of the amount of jitter and noise put in, data consist of synthesised sustained vowels corrupted by increasing jitter and noise.

All the tools give almost reliable measurements up to 15% of jitter, for low or moderate noise, while only few of them are reliable for higher jitter and noise levels and would thus be suited for perturbation measures in strongly irregular voice signals.

For low noise levels the results obtained by visual inspection from expert raters are comparable or even better than those obtained with the analysis tools presented here, but results rapidly deteriorate with increasing noise. Hence, the use of a robust tool for voice analysis can give a valid support to clinicians in term of reliability, reproducibility of results and time saving.

*Key Words:* perceptual and objective voice analysis, jitter, glottal cycle length, coefficient of variation, synthesised signals, noise.

**Sunday, May 15, 11:00**

**Oral Presentation:**

***Voice disorder detection on the basis of continuous speech***

Klára Vicsi, Viktor Imre

Laboratory of Speech Acoustics, Budapest University of Technology and Economics  
Department of Telecommunications and Media Informatics

During vocal diagnostical analyses there were made more examinations in connection with that question, whether sustained voice, or continuous speech is more effective in distinguishing healthy voice from pathological voice. While in phoniatrial practice mainly continuous speech is applied by doctors, we also want to concentrate to the examination of the continuous speech. First a detailed statistical analyses of acoustical parameters of vowels in continuous speech and sustained voice databases were examined, and compared the results in case of healthy speech and pathological ones. Now, in this lecture we present our classification experiments, how it is possible

to separate the healthy speech from the pathological one automatically on the base of continuous speech. It is cleared out, that by a multi-step processing methodology, most of those examples at which uncertainties occurred at the measurement of the acoustical parameters can be grouped separately, and in this way, the automatic classification results of the healthy and pathological voices are improved in a big extent.

**Sunday, May 15, 11:20**

**Oral Presentation:**

***Numerical simulation of phonation onset: comparison of finite element glottal flow approximation with a simplified model***

Jaromír Horáček<sup>1</sup>, Petr Sváček<sup>2</sup>

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The phonation onset in biomechanics of voice is an important characteristic of human voice production. From the point of view of the flow-induced vibrations it means a state of the system when it is losing the aeroelastic stability, i.e. when the airflow parameters like subglottal pressure or air flow rate cross a limit value and the system becomes unstable by flutter. Frequency-modal analyses of a simplified three-mass model of the vocal fold in interaction with a potential flow separated at the superior edge of the vocal fold showed that the two eigenfrequencies are coupled when the instability occurs (Horáček and Švec, 2002).

In this contribution the instability threshold is studied in the time domain using the two-dimensional finite element model of the viscous incompressible flow coupled with two-degrees of freedom model of the vocal folds. The incompressible Navier-Stokes equations are spatially discretized with the aid of the stabilized finite element method. The motion of the computational domain is treated with the aid of Arbitrary Lagrangian Eulerian method. The structure dynamics is replaced by a kinematically equivalent system with the two degrees of freedom governed by a system of ordinary differential equations and discretized in time with the aid of an implicit multistep method and strongly coupled with the flow model. The influence of inlet/outlet boundary conditions is studied and the numerical analysis is performed and compared to the related results obtained for the phonation onset by using the simplified flow model.

Horáček, J., and Švec, J. G. (2002). "Aeroelastic model of vocal-fold-shaped vibrating element for studying the phonation threshold," J. Fluids Struct. 16(7), 931–955.

**Sunday, May 15, 11:40**

**Oral Presentation:**

***Exploring fusion of generative and discriminative models for similarity-based classification of larynx pathology***

Evaldas Vaiciukynas<sup>1</sup>, Atanas Verikas<sup>1,2</sup>, Adas Gelzinis<sup>1</sup>, Marija Bacauskiene<sup>1</sup>, Virgilijus Uloza<sup>3</sup>

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<sup>3</sup> Department of Otolaryngology, Lithuanian University of Health Sciences

In our experiments identification of laryngeal disorders using cepstral parameters of human voice is researched. Mel-frequency cepstral coefficients (MFCCs) and also some other frequency domain features, extracted from audio recordings of patient's voice, are further approximated by building Gaussian mixture model (GMM) for each patient. The effectiveness of similarity-based classification techniques in categorizing such data into normal voice, nodular, and diffuse vocal fold lesion classes is explored. Also calibration and fusion of different classifiers is evaluated. Basic classification with GMM is outperformed by GMM supervector based SVM and also by the use of distance kernels in GMM-SVM combination. The results indicate that features, modeled with GMM, and kernel methods, like SVM, exploiting this information, is an interesting fusion of generative (probabilistic) and discriminative (hyperplane) models for similarity-based classification.

**Sunday, May 15, 12:00**

**Oral Presentation:**

***What is the dynamic range of human voice?***

Jan G. Svec<sup>1</sup>, Hana Sramkova<sup>1</sup>, Tomas Fürst<sup>2</sup>, Svante Granqvist<sup>3</sup>

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The literature on the dynamic range of human voice reveals considerable discrepancies in published sound levels. Furthermore, different studies use different methods for level measurement. The purpose of this study was to find the dynamic range of human voice using a method that is independent from a single specific device.

Loudest and softest phonations of 37 subjects (23 women and 14 men) without voice problems were captured using two microphones (head mounted and stand mounted) calibrated for a standard distance 30 cm from the mouth and recorded digitally. The sound levels were then obtained using the specifications according to IEC-standard (standard frequency-weighting filters A, C or Z, “Fast” time weighting for the soft phonations).

The peak sound pressure levels of the loudest phonations were found  $118\pm 5$  and  $121\pm 4$  dB(Z) for women and men, respectively, with the highest level of 127 dB(Z) at 30 cm. The minimum time-weighted sound levels for the softest voiced phonations were found  $45\pm 4$  and  $37\pm 5$  dB(A) for women and men, with the lowest level of 31 dB(A) at 30 cm.

These levels appear to be more extreme than those measured previously. The results were used to derive recommendations on microphone specifications for human voice measurements.

**Sunday, May 15, 12:20**

**Oral Presentation:**

*A discussion on what type of data a voice usage database should consist of*

Fredric Lindström, Marcus Wirebrand, Sten Ternström, Maria Södersten

Our knowledge of how we use our voice in a daily manner is very limited. There is a need for more studies investigating how factors such as occupation, gender, age, culture, language, etc affect the voice usage. There is also a need for more research on how voice usage is related to certain voice problems.

In recent years wearable measurement equipment has made it possible to register voice parameters such as phonation time or fundamental frequency; allowing larger population voice usage studies. However, in order to efficiently advance the research field it is important to standardized the data collecting procedures so that data collected by different research groups can be compared and that general conclusion can be drawn.

In this presentation we present some database data fields which have been used in different research projects in Sweden collecting voice usage data from mainly voice patients and pre-school teachers. Also some preliminary findings are presented and their impacts on required data fields are discussed.

**Sunday, May 15, 13:30**

**Oral Presentation:**

*Analysis of vocal stress in conversations to call centers*

Grażyna Demenko, Magdalena Jastrzębska

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This paper presents how voice stress is manifested in the acoustic and phonetic structure of the speech signal. Out of 60 000 of the authentic Police 997 emergency phone calls, 22 000 were automatically selected, a few hundred of which were chosen for acoustic evaluation, the basis for selection being a perceptual assessment.

In highly stressful conditions (e.g. panic) a systematic dynamic over-one-octave shift in pitch and significant increase in speech tempo was observed. In states of depression a systematic down shift in pitch and significant decrease in speech tempo was observed. Basic statistical measurements for stressed and neutral speech run over the database showed the relevance of the arousal and potency dimension in stress processing. In speech produced under fear an upward shift in pitch register was significant (in comparison to neutral speech), while speech recorded during experiencing anger was characterized by an increase in F0 range.

*Key Words:* acoustics of real emotional speech signals, call centers interfaces, emotional speech

**Sunday, May 15, 13:45**

**Oral Presentation:**

***EntrenaVox, a computer program for voice rehabilitation through games***

Víctor Osma-Ruiz<sup>1</sup>, Juana María Gutiérrez-Arriola<sup>1</sup>, Juan Ignacio Godino-Llorente<sup>1</sup>,  
Janaina Mendes-Laureano<sup>1</sup>, Nicolás Sáenz-Lechón<sup>1</sup>, Rubén Fraile<sup>2</sup>, Julián David Arias<sup>3</sup>

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<sup>3</sup> Facultad de Ingeniería Electrónica y Biomédica, Universidad Antonio Nariño, Carrera 3 este No 47-15, Bogotá, Colombia

We have developed a computer program aimed for clinical use to assess, rehabilitate and work on the aesthetics of voice for people with phonation problems or who have temporarily lost the voice due to disease or surgery.

The application consists of different PC games built on a patient information system, which allows the speech therapist to manage and customize the treatments for every patient, adjusting for example when to start the exercises, the duration and the frequency of each test, the degree of difficulty, etc. It also provides the ability to visualize the degree of compliance (both qualitatively and quantitatively) achieved by each patient.

Patients are thus provided with a visual tool in the form of a game that gives an immediate feedback of the emitted stimuli, allowing them to work different characteristics of the voice. The features that are the basis for the treatments and that are trained through such games are the utterance of voiced and voiceless sounds, the fundamental frequency or pitch, and the intensity of the voice.

## **Oral Presentation:**

**Sunday, May 15, 14:00**

### ***Hightspeed films for evaluation of reflux to help rock popular singers***

Mette Pedersen<sup>1</sup>, Mike Ellingsen<sup>2</sup>

<sup>1</sup> Ear-Nose-Throat specialist, FRSM, Danish representative COST2103. The Medical Center, Oestergade 18, 1100 Copenhagen, Denmark, [www.mpedersen.org](http://www.mpedersen.org).

<sup>2</sup> Nanotechnology student at Copenhagen University, Denmark.

*Objective:* The objective of the study was to evaluate the use of hightspeed films to quantify swelling in the larynx due to reflux in order to help singers.

*Material and methods:* It is known that mucus can be regurgitated to the larynx due to reflux. Hightspeed films from Wolf Ltd. have 8000 pictures during a period of two seconds. On hightspeed films the mucus was discovered in the larynx during a period of 0,2 seconds, after which there only was a slight oedema on the arytenoids region. Especially rock singers tend to have problems with reflux in their career. Two films are shown of rock singers with reflux.

We have tried to make video scores of the abnormality of the arytenoids region in hightspeed films. In an earlier study, it was shown that acoustical measures were different when scores were abnormal. In this study we compared visual scores on high speed films a group of patients before and after treatment for laryngeal reflux with one of three groups receiving either: lifestyle guidance and no other related medication, lifestyle guidance and 40mg esomeprazole, or lifestyle guidance combined with 40mg esomeprazole and alginate.

*Results and conclusion:* Statistically the arytenoids oedema was reduced on hightspeed films in all patients. Due to the fact that online evaluation of the larynx on hightspeed films is the correct visual picture, it is our experience that hightspeed films are superior to video stroboscopy for evaluating reflux in singers.

On high speed films, inter-arytenoids oedema was found to be the basic objective finding in patients with reflux to the larynx. If the reflux is discovered early and lifestyle changed, the influence on a singing career is probably minimal.

Reference: (1) Pedersen M, Munck K (2007). A prospective case-control study of jitter%, shimmer% and Qx%, glottis closure cohesion factor (Spead by Laryngograph Ltd.) and Long Time Average Spectra. *Congress report Models and analysis of vocal emissions for biomedical applications (MAVEBA)*; pages 60-4.

**Sunday, May 15, 14:45**

**Oral Presentation:**

***How does the brain process prosody? An fMRI study with persons who stutter***

Katrin Neumann<sup>1</sup>, Malte Kob<sup>2</sup>, Harald A. Euler<sup>1</sup>, Tobias Weissgerber, Alexander Wolff von Gudenberg<sup>3</sup>, Anne-Lise Giraud<sup>4</sup>, Christian Kell<sup>5</sup>

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Introduction: Previous neuroimaging studies on speech prosody have mainly investigated perceptive aspects (Kotz et al., 2003; Wildgruber et al., 2006). They have shown left-hemispheric activations during linguistic prosodic tasks and either right-hemispheric or bilateral brain activations during affective prosodic tasks in the temporal cortex, the peri-sylvian cortex, the frontal operculum, and in the basal ganglia. All these regions show either abnormal activations or abnormal morphology in persons who stutter (PWS) compared to non-stuttering control subjects (PWNS). An effective stuttering therapy should normalize the disturbed speech prosody in PWS. On the other hand, therapy approaches such as fluency shaping methods exploit prosodic cues for therapeutic aims for example by practicing special voice onsets and speech bows.

The aim of this study was the examination of the brain activations during speech motor tasks performed with neutral, linguistic, and affective prosody of PWS before and after an effective fluency shaping therapy compared with those of PWNS.

Method: An fMRI experiment was performed with 13 male PWS (mean age 27 years, range 18 – 39, mean handedness score 50, SD = 54) before and after an intensive course of the Kassel Stuttering Therapy and 13 males who had recovered from stuttering spontaneously during speech production (Kell et al., 2009).

Results: PWNS activated mainly in the left-sided anterior insula, inferior frontal gyrus, and supramarginal gyrus as well as in the right cerebellum. There were no remarkable activation differences between affective and linguistic prosodic tasks. PWS were not able to activate this network before therapy. However, directly after therapy the activation of PWS for affective prosody already normalized relative to PWNS. Contrasting, a normalization of the activation for the linguistic prosodic task was not observed at that time but one year after finishing the therapy. The activation changes were paralleled by a normalization of prosody parameters.

Conclusion: Cerebral activations shown in PWNS reflect the prosodic network in normal speaking subjects. The described activation changes in PWS may be attributed to local insular and left inferior frontal trainee effects which are accompanied by subcortical overactivation.

References

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Kotz SA, Meyer M, Alter K, Besson M, D. Yves von Cramon D, Friederici AD (2003) On the lateralization of emotional prosody: An event-related functional MR investigation. *Brain and Language*, 86, 366-376.

Wildgruber D, Ackermann H, Kreifelts B, Ethofer T (2006) Review Cerebral processing of linguistic and emotional prosody: fMRI studies. *Progress in Brain Research*, 156, 249-268.

**Sunday, May 15, 14:30**

**Workshop:**

***Voice classification by phonetography: the ‘why’ and the ‘how’***

Hugo Lycke

Lab. Exp. ORL, Dep. Neuroscience, K.U.Leuven (Belgium)

An age-related and gender-specific pattern card of the human voice was elaborated on phonetographic analysis of intensity related parameters in 632 subjects (422 females and 210 males) with different background of vocal experience. The age of the female subjects ranged from 8 to 65 years (mean age 23.8 years). The age of the male subjects ranged from 10 to 76 years (mean age 27.8 years). This referential database enables a basic voice classification of any subject.

The following topics are discussed in this workshop:

1. Introduction: Subject classification and voice classification in voice research and the need for a basic classification for every human voice.
2. Methodology of voice classification by phonetographic analysis.
3. Workshop participants are invited to cooperate in classifying female and male voices.
4. Discussion: Application of voice classification in the education of speech and the singing voice and in voice therapy.

**Monday, May 16: AVFA Workshop 2011 and CoMeT 2011 Meeting**

**Monday, May 16, 9:00-10:00**

**Keynote Speech:**

***Is music the universal „language“ of emotions? The neurobiology and psychology of aesthetic feelings***

Eckart Altenmüller



Institute of Music Physiology and Musicians' Medicine, University of Music, Drama and Media, Hannover, Emmichplatz 1, D-30175 Hannover

Although music is generally acknowledged as a powerful tool for eliciting emotions, little is known concerning the neurobiological basis of these emotions. We investigated the psychological and neurobiological basis of strong emotional responses to music (SEM), leading to shivers down the spine (chills) and changes in heart rate. From previous studies it is known that these SEMs are accompanied by the activation of a brain network that includes areas involved in reward, emotion and motivation.

In order to observe distinct acoustical and music structural elements related to chill reactions, in a series of experiments, on-line emotional self report and psychophysiological data was obtained while participants were listening to music inducing strong emotions and aesthetic feelings.

Despite of highly individual emotional reactions towards music, some inter-individually constant characteristics of music eliciting chill responses can be found. Chills were much more frequent in previously known music and in familiar music styles. Furthermore, distinct musical events frequently caused strong emotional responses, especially when violating expectancies.

These results demonstrate that strong emotional responses are not only related to the psychoacoustic properties of the respective pieces of music, but furthermore to biographical memories, personality traits and social environments.



**Dr. Eckart Altenmüller:**

Eckart Altenmüller (b. 1955) holds a Masters degree in Classical flute, and a MD and PhD degree in Neurology and Neurophysiology. Since 1994 he is chair and director of the Institute of Music Physiology and Musicians' Medicine. He continues research into the neurobiology of emotions and into movement disorders in musicians as well as motor, auditory and sensory learning. During the last ten years, he received 18 grants from the German

Research Society (DFG). Since 2005 he is President of the German Society of Music Physiology and Musicians' Medicine and Member of the Göttingen Academy of Sciences.

**Monday, May 16, 10:00-10:15**

**Oral Presentation:**

***Effects of a vocal warm-up on the vocal tract setting of a male voice professional. An MRI and modelling study***

Vojtěch Radolf<sup>1</sup>, Anne-Maria Laukkanen<sup>2</sup>, Radan Havlík<sup>3</sup>, Jaromír Horáček<sup>1</sup>

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Vocal warm-up is supposed to improve voicing either through changing the laryngeal or supralaryngeal setting or by causing beneficial physiological changes (improved blood circulation, mucus secretion etc.) The present study concerned the possible changes in the vocal tract setting.

Inverse method was used for numerical simulation of acoustic characteristics of a professional musical actor before and after a vocal warm-up. The geometrical data for a 1D model of the acoustic cavities of the vocal tract were evaluated from magnetic resonance images (MRI) registered during sustained phonation of vowels [a:, i:, u:] before and after the warm-up. The numerically simulated voice signals are compared with acoustic recordings, and the warm-up related changes in the vocal tract are discussed.

*Key Words:* Biomechanics of voice, singer's and speaker's formant cluster, acoustic effects of vocal exercises

**Monday, May 16, 10:15-10:30**

**Oral Presentation:**

***Tenors' vocal tract configurations in different registers and vowel conditions***

Matthias Echternach<sup>1</sup>, Louisa Traser<sup>2</sup>, Bernhard Richter<sup>1</sup>

<sup>1</sup> Institute of Musicians' Medicine, Freiburg University Medical Center, Germany

<sup>2</sup> Medical Student, Charite, Berlin, Germany

*Objective:* The role of the vocal tract in registers is still unclarified. In previous studies, in 10 tenors strong vocal tract modifications were observed reaching high pitches in their stage voice on vowel /a/. The aim of this study was to analyse the influence of vowel conditions on vocal tract configurations in register functions.

*Material and Methods:* Dynamic real time MRI of 8 frames per second was used to analyze the vocal tract profile in four world wide leading tenors (one oratory/classical song, one light lyrical, one young dramatic, and one Heldentenor) , who sang on the vowels /a,e,i,o,u, ae/ an ascending scale between C4 (261Hz) to A4 (440Hz). The scale included in one condition their register transition from modal register to falsetto and in another condition the continuation of stage voice above passaggio.

*Results:* Transitions from modal register to stage voice above passaggio were associated with stronger modifications of the vocal tract compared to register transitions to falsetto. Magnitude of vocal tract modifications in register transitions was different in the different vowel conditions and also differs strongly between the subjects.

**Monday, May 16, 10:30-10:45**

**Oral Presentation:**

***Feasibility of electrical impedance tomography for the imaging of the larynx – preliminary results***

Samuli Siltanen<sup>1</sup>, Aku Seppänen<sup>2,3</sup>, Antti Nissinen<sup>2,3</sup>, Ville Kolehmainen<sup>2</sup> and Anne-Maria Laukkanen<sup>3</sup>

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Electrical impedance tomography (EIT) is a non-invasive medical imaging method. In EIT, the three-dimensional (3D) distribution of the electrical conductivity inside a person is reconstructed on the basis of harmless and painless electrical measurements using electrodes attached to the skin of the person. Since various tissues have different conductivities, EIT can be used for imaging anatomical and physiological features. EIT has been applied to several biomedical applications, including monitoring of ventilation and diagnosing breast cancer. Here, the feasibility of EIT for the imaging of the larynx is discussed. This can be considered as an extension of electroglottography (EGG), a widely used method in speech research. EIT extends EGG by using a greater number of electrodes and measurement channels. Further, while EGG is based on direct analysis of the raw measurement signals, EIT involves advanced mathematical modeling for 3D image reconstruction based on the multi-channel measurement data. The focus of this research is the possibility of (1) detecting and quantifying vocal loading and (2) measuring the consequences of vocal loading by monitoring the glottis using EIT. The hypotheses behind this idea is two-fold. First, the closing speed of the glottis can probably be estimated more accurately by using EIT instead of EGG; the closing speed is in turn assumed to correlate with impact stress. Second, EIT may allow precise localization of increased blood flow or chemical changes in glottal structures, possibly leading to novel measurements of the consequences of vocal loading. Computational reconstructions of simulated larynx anatomies are presented, suggesting that EIT is a promising method for functional imaging of the larynx. An encouraging feature of EIT is that the measurements involve only electrodes on the skin, it is possible in principle to monitor the glottis during an extended period of minimally disturbed professional voice use.

*Key Words:* occupational voice loading, non-invasive measurement, imaging, electrical impedance tomography, ill-posed inverse problem

**Monday, May 16, 10:45-11:00**

**Oral Presentation:**

***Singing – a dual system***

Lionel Fawcett

Humans are in every sense “dual beings”, always involved in coordinating two elements which should, or could, be complementary, but more often than not are antagonistic. The dualism of mind and matter, of good and evil, of the emotional and the rational, all point to the quintessentially human contradiction between our need for other people on the one hand, and our individualism on the other. It is the dialectical process inherent in this contradiction which allows an individual to be a godlike genius or a despicable criminal. The art of singing is also fundamentally dualistic.

We all have two vocal folds governed by two opposing muscle systems (the cricothyroids responsible for pitch and the arytenoids responsible for volume), two types of breathing (the thoracic for air pressure and the abdominal for air flow), and two directions of resonance (the labial for bright and pharyngeal for dark sounds). The coordination of these opposites produces not just singing of remarkable tonal and dynamic range, but also vocal agility and stamina and vocal health. Vocal pedagogy must understand and respect the natural ability of these vocal mechanisms with their inherent dualism, while at the same time taking account of the emotional and psychological constitution behind singing as a physical event – in other words both body and soul.

Artistic singing requires functional voice training which is able to diagnose sung sound on the basis of its acoustical properties and as indicator of the underlying muscular and physical condition. The sound-orientated development of the natural voice through functional voice training enables the singer to become conscious of each sound experience and facilitates reflection on the same in the form of sound experiments. The mere projection of the singing teacher’s own personal experience or method is not objective enough and therefore not sufficiently scientific. Sung sound imparts physical sensations, which by serving as a guide to the teacher’s critical powers eventually result in a therapy based on empathy. Pure sound aesthetics, on the other hand, are too personal and cannot lead to an objective functional assessment of the singing voice, or to a way of improving the sung sound. Improving the agility and expressive capacity of the vocal apparatus can be achieved honestly only by a proper understanding of how it works. After all, vocal beauty cannot be an end in itself, but must serve as a medium for musical expression – which in turn is an expression of human feeling and passion.

All vocal pedagogy, therefore, grows first and foremost out of the teacher’s will and ability to understand the system and to accept its inherent dualism and contradictions. The Italian singing teachers of the 18<sup>th</sup> century had no idea how the voice worked, but they knew how to work the voice. Their conclusions rested on sound quality, which they described as “chiaroscuro”, providing us with yet another pointer to the dual system that governs our singing. This “light/dark” description of vocal sound is indicative of a present day physical and medical definition of singing long before Manuel Garcia’s invention of the laryngoscope in 1854.

If we know how the voice works, then we know how to work the voice!

**Monday, May 16, 11:00-11:10**

**Oral Presentation:**

***Medical and educational occupational voice care for teacher-students at the College of Education in Salzburg***

Josef Schlömicher-Thier, Matthias Weikert, Hannes Tropper, Alexandra Pichler, Silvia Hißmayr

Austrian Voice Institute, Salzburgerstrasse 7, A-5202 Neumarkt, AUSTRIA, Tel.: +43-6216-4030, Fax: 0043-4030-20, E-Mail: austrianvoice@sbg.at, Website: www.austrianvoice.at

From February 2002 until November 2009 there were 1300 female and male students attended to in a workshop format. In a retrospective study the voice function screening of the following parameters of the of 548 female and male students were analyzed by Statistics-Program SPSS Version 12.01, Coefficient of correlation Spearman and Kolmogorov-Smirnov-Test:

- Habitual pitch range of the speaking voice
- Voice range in Semitones
- MPT
- Dynamic of the shouting voice
- Voice Handicap Index (VHI)
- R-B-H Scala
- Voice technic habits
- Analysis of acoustic Parameters in a small group
- Subjective voice evaluation and voice technic habits:

Voice scanning is a voice precaution project of the Austrian Voice Institute at the College of Education in Salzburg. The task of the Austrian Voice Institute in this matter is to educate on basics of voice hygiene and voice physiology in lectures and by organizing workshops. Furthermore there is a necessity to identify with this “voice scanning” methods students whose voices are rated diseased to provide a medical and educational occupation-accompanying voice care for them. Pathological rated voices that need further phoniatrian assistance can be identified, as well as voice talents, that can be motivated to starting a professional voice career. These project shows, that an interdisciplinary cooperation between voice teachers and phoniatrians is necessary before a reliable evaluation of the parameters is possible.

**Monday, May 16, 11:30-11:45**

**Oral Presentation: Phonosurgery**

***Introduction to the topic and demonstration of the RADIESSE Voice system***

Tadeus Nawka

**Monday, May 16, 11:45-12:05**

**Oral Presentation: Phonosurgery**

***Phonosurgical procedure and outcome in case of a laryngeal paresis of an operatic singer***

Nobuhiko Isshiki

Professor emeritus at Kyoto Univ., Japan

A world-famous opera singer, Mr. Jaechul Bae had been operated upon for his left malignant Struma and neck metastasis. Inevitable section of the superior and inferior laryngeal nerves and the phrenic nerve resulted in his loss of professional voice. In an attempt to restore the voice, type 1 and 4 Thyroplasties were performed under local anesthesia, while the voice was carefully monitored as the procedures went on.

How to adjust the tension of the paralyzed vocal fold so that he could produce a wide range of vocal pitch was a core of surgery and took 4 hours to finish.

At the end of operation, he could sing a hymn he had been so accustomed to singing, so slowly as if he were searching for and confirming the right musical note. It was so solemn and moving.

I feel this provided only the basis on which he has built an unbelievably magnificent structure. Worthy of special mention is his incredibly intensive self-training of singing songs.

**Monday, May 16, 12:05-12:20**

**Oral Presentation: Phonosurgery**

***Report on his voice recovery as an operatic singer after a laryngeal paresis and a subsequent phonosurgery***

Jaechul Bae

I was making my career as an opera singer playing the main tenor's roles in numerous operatic theaters in Europe since 1996. However I had a thyroid cancer 2005 while I was singing in Saarland State Opera House, and had lost my voice completely by cutting 3 main nerves for producing voice. Generally it would be impossible to come back again on stage with this situation. In fact, I was informed by the doctor who operated me for thyroid cancer in Mainz that it would be like an athlete with only one leg if I wanted to sing again. But I was fortunate to meet the plastic surgery The Type 1 of Isshiki's Operation, and even more I got this operation by Dr. Isshiki himself in April 2006 in Kyoto.

After 2 years of personal rehabilitation, I have come back on stage as an opera singer. I feel my voice is coming back 60 % now. I am convinced from my experience that the voice can return even from the worst situation like mine if we take the right way. I would like to also sing 2 pieces to

prove that on this occasion, hoping my presentation could encourage all the people who suffer from the voice problem.

### **Monday, May 16, 12:20-12:30**

#### **Oral Presentation: Phonosurgery**

##### ***Report on the voice recovery of Mr. Jaechul Bae by his producer***

Totaro Wajima

Presenting the world rare case of Mr. Jaechul Bae as his producer who observed his voice and his life in these 7 past years, I would like to share the hope and endless possibility of recovering the voice with all the people who participate in CoMET according to the following theme.

1. The detailed process of recovery of his voice after the plastic surgery by Dr.Isshiki
2. The condition of his current voice – what it has lost, what it has gained.
3. Thankfulness to the development of medical operation -from the producers point of view
4. Duet of Music and Medicine, duet of Korea and Japan

### **Monday, May 16, 12:30-12:45**

#### **Oral Presentation: Phonosurgery**

##### ***Treatment of glottic insufficiency by structural fat grafting***

Giovanna Cantarella<sup>1</sup>, Giovanna Baracca<sup>1</sup>, Stella Forti<sup>2</sup>, Elisabetta Iuffrida<sup>1</sup>, Riccardo F. Mazzola<sup>1,3</sup>

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<sup>3</sup> Dipartimento di Scienze Chirurgiche Specialistiche, University of Milan, Italy

Objectives: Aims of this study were to evaluate results of vocal fold structural fat grafting for glottic insufficiency and to compare the outcomes obtained in unilateral vocal fold paralysis (UVFP), and in congenital or acquired soft tissue defects in vocal folds.

Design: Prospective study.

Setting: University Hospital.

Patients: Eighty-one consecutive patients with breathy dysphonia in 54 cases (age 16-82 years) related to UVFP and in 27 (age 16-82 years) to vocal fold iatrogenic scar or sulcus vocalis.

Intervention: Autologous structural fat grafting into vocal folds. Lipoaspirates were centrifuged at 1200 g for 3' to separate and remove blood, cell debris and the oily layer, and the refined fat was injected under direct microlaryngoscopy in a multilayered way.

Main outcome measures: Grade, roughness, breathiness, asthenicity and strain (GRBAS) perceptual evaluation, maximum phonation time (MPT), self-assessed Voice Handicap Index (VHI), and voice acoustic analysis, considered preoperatively and at 3 and 6 months after fat grafting.

Results: After surgery, MPT, VHI (all subscales), G and B improved in both groups ( $p < 0.05$ ). In particular, G and VHI functional subscales decreased more significantly in patients with UVFP ( $p < 0.05$ ). Conversely acoustic variables improved significantly only in the UVFP group ( $p < 0.005$ ). From 3 to 6 months postoperatively most considered variables showed a trend to further improvement.

Conclusions: Vocal fold structural fat grafting is effective in treating glottic insufficiency due to UVFP or soft tissue defects. Perceptual, acoustic and subjective assessments statistically confirm that patients with UVFP have a better outcome than those with soft tissue defects.

**Monday, May 16, 12:45-13:00**

**Oral Presentation: Phonosurgery**

***Results of indirect endoscopic surgery in singers***

Eugenia Chávez

**Monday, May 16, 13:00-13:30**

**Roundtable with the presenters, Tom Harris, and John Rubin. Open discussion on phonosurgical issues. Chair: John Rubin**

**Monday, May 16, 14:20-15:45**

**Workshop:**

***Masterclass 'Honing the professional singing voice'***

Leah Frey-Rubine



**Monday, May 16, 14:20-15:45**

**Workshop:**

***Singer's/ -speaker's formant in real life***

Olaf Nollmeyer

Hubertusweg 13, 26133 Oldenburg, ++494414855490, [www.stimme-koerper-klang.de](http://www.stimme-koerper-klang.de)

Although the Singer's/Speaker's Formant is considered an asset of high quality voices, it is commonly used only in *evaluating* voice qualities in scientific context or in speech therapists practices rather than playing an open key role in voice training or therapy. Therapists are commonly more focused on pathological aspects of the voice rather than listening to its potentials. Teachers of voice in singing and speech tend to think of the sound as something being simply the result of a (primary) physiological process: its outcome.

Functional voice training, as initiated in Lichtenberg, Germany in the late 1980's on the other hand, takes into account the manifold ways sound *interacts* with the physical processes. Glottal movement is not independent of the sound reflected back on it. A more differentiated concept of sound – including the two aspects of vowels and the singer's formant -along with a more differentiated hearing opens ways to new and simple exercises in training and therapy.

This workshop shows ways of putting knowledge of the Singer's Speaker's formant into practice. It shows how vowel formants and singer's formants can be easily experienced and played with in many ways helping voices instantly to become richer in sound while being produced with considerably more ease.

*Key Words:* Signal processing and acoustic voice analysis, voice professionals, voice therapy, vocal training

**Monday, May 16, 16:00-18:00**

**Special session for students, artists, therapists, and other professionals:**

***Say it easy — how does the voice function?***

John Rubin, Ingo Titze

## Tuesday, May 17: CoMeT 2011 Meeting

Tuesday, May 17, 9:00-10:00

### Keynote Speech:

#### *The acoustics of over- and undertone singing*

Malte Kob

Director of studies "Music Transmission" and head of the Erich Thienhaus Institute at the University of Music Detmold

Singing voice production covers an impressive range of acoustic phenomena that are responsible for the basic voice properties such as fundamental frequency, formant structure, voice intensity and radiation efficiency. Less obvious are the conditions that determine the properties of special singing such as overtone and undertone singing. An investigation of the participating structures and airways reveals the interaction of resonances that interact such that voice features extend the range of classic singing in ambitus and sound quality. The presentation reviews current approaches for measurement and description of these phonation types.



#### **Prof. Dr.-Ing. Malte Kob:**

Malte Kob is professor for Theory of Music Transmission at the University of Music Detmold. He lectures basics of electrical engineering, informatics science and acoustics as well as advanced courses in music acoustics and audio signal acquisition and processing. During his studies at the Technical University and work at the Physikalisch-Technische Bundesanstalt in Braunschweig he enjoyed doing jazz and church music. From 1991 he focussed on acoustics with emphasis on music acoustics and acoustic measurement techniques. In 1999 he joined the ICVPB in Berlin and decided to start his Ph.D. work on physical modeling of the singing voice at the Institute of Technical Acoustics in Aachen. In 2001 he started to work on voice analysis and diagnosis at the Department of Phoniatics, Pedaudiology and Communication Disorders at the University Hospital Aachen. Since 2009 he works in Detmold where he continues research in singing voice and music acoustics. Malte Kob is executive council member of the German Acoustical Society (DEGA) and the European Acoustics Association (EAA).

Tuesday, May 17, 10:00-10:10

### Oral Presentation:

#### *Voice classification in practice: criteria in contemporary singing education*

Hugo Lycke<sup>1</sup>, Wivine Decoster<sup>1</sup> and Felix I.C.R.S. de Jong<sup>1,2</sup>

<sup>1</sup> Centre of Excellence for Voice, Lab. Exp. ORL, K.U.Leuven (Belgium)

<sup>2</sup> Department of ENT- Head and Neck Surgery, University Hospitals K.U. Leuven, (Belgium).

**Objectives:** In Classical singing education great emphasis is put upon voice classification but little is known of how contemporary singing teachers deal with voice classification. The purpose of this study was to explore how contemporary singing teachers deal with voice classification and which criteria they use.

**Study Design:** explorative study using questionnaires.

**Methods:** One questionnaire was sent to 200 singing teachers via internet and a second questionnaire to 22 singing teachers of one Classical conservatory and two Musical Theatre conservatories.

**Results:** Of the 200 singing teachers, 72 responded (36%). In 61.1% voice classification was important for at least one reason, while 38.9% did not find voice classification an important issue. Most used acoustical parameters for voice classification were frequency range/tessitura (56.0%), voice quality/timbre (56.0%), volume (12.1%) and register transition (9.0%). The 22 conservatory singing teachers classified their students (n = 165). Frequency range/tessitura, voice quality, register transition, and volume were the most frequently used criteria. However, each singing teacher reported a varying individual set of voice classification criteria, depending on the singing student and on the specialty of the department.

**Conclusions:** Apparently there is no consensus about the advisability and criteria of voice classification among singing teachers.

**Tuesday, May 17, 10:10-10:20**

**Oral Presentation:**

***The reliability of voice range profile derived parameters in the discrimination of three basic female voice categories***

Lycke Hugo<sup>1</sup>, Decoster Wivine<sup>1</sup>, Ivanova Anna<sup>2</sup>, Van Hulle Marc M.<sup>3</sup>, de Jong, Felix I.C.R.S.<sup>1,4</sup>

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<sup>2</sup> Leuven Statistics Research Centre, K.U.Leuven (Belgium)

<sup>3</sup> Lab. Neuro- & Psychophysiology, K.U.Leuven (Belgium)

<sup>4</sup> Department of ENT – Head and Neck Surgery, University Hospitals K.U.Leuven (Belgium)

**Objectives.** Assessing whether ‘clever feature combinations’ of the voice range profile can be constructed with which a clear cluster separation between the three basic female voice categories be found, and whether these findings, in turn, can contribute to resolve the lingering riddle of voice classification.

**Methods.** The data obtained by voice range profiling of 206 female conservatory singing students were studied by cluster analysis based on data points corresponding to the value of more traditional voice frequency and intensity parameters.

Results. Out of 49 features the 3 cluster solution proved to be the most consistent one, across all single- and combinations of features considered. The clusters were verified to largely correspond to the three basic female voice categories. The best cluster solutions, when ranking them according to the R-squared cluster separation metric, contained the feature *R4* (*R4* – ratio perimeter chest voice/perimeter total).

Conclusions. ‘clever feature combinations’ of the voice range profile led to the identification of 3 clusters that could be successfully linked to the three basic female voice categories. The most important feature turned out to be the ratio perimeter chest voice/perimeter total. We assert that our findings can help to resolve the riddle of voice classification.

**Tuesday, May 17, 10:20-10:35**

**Oral Presentation:**

***Towards standardized DSI-measurement in clinical practice***

Philipp Aichinger, Birgitta Aichstill, Felicitas Feichter, Berit Schneider-Stickler

Medical University of Vienna, Währinger Gürtel 18-20, A-1090 Vienna, Austria

The dysphonia severity index (DSI) is an unidimensional quantitative measure that is designed to measure the overall vocal quality. The index is being used internationally in clinical voice diagnostics and scientific voice research. In order to evaluate the validity of the DSI in its clinical application, newly measured data is compared to reference DSI data. Further on, the DSI's test-retest reliability is evaluated. Therefore, the DSIs of 30 subjects (18 euphonic, 12 dysphonic; 18 female, 12 male; aged between 15 and 66 years) is measured using two commercially available measurement devices in parallel. The results indicate that different measurement devices measure different DSI-values, which furthermore do not correspond to DSI reference data. Technical and methodical aspects of the measurements' reliability and validity are discussed. The necessity to revise measurement procedures and to define a standardized procedure is shown.

**Tuesday, May 17, 10:35-10:50**

**Oral Presentation:**

***Individual harmonic listening in spectral sounds of the voice***

Erkki Bianco

ENT & Phoniatre, anc. laryngologue de l'opera de paris, Paris, France

*Purpose:* Provide new acoustic experience of the sounds produced by the voice, isolating the harmonics one by one with Audiosculpt.

HSDI of the vocal cords were recorded during phonation produced by internationally known singers (male and female from bass to high soprano including countertenors) on a single vowel using Wolf GmbH, Germany HSD system, Fourcin & Frokjaer Jensen laryngographs .

When analyzed frame-by-frame, astonishing movements of the vocal cords were noted. (Specifically, different patterns of vibration in falsetto when sung by barytone or countertenor, asymmetry of the mucosal wave was present at the beginning of each vocal cord cycle ) It became important to analyse the sounds produced and to listen to them separating each harmonic with the audiosculpt system.

*Methods:* Analysing the recorded sounds: vowels by a baritone, phrases by M.Callas M.Caballe J.Brel J.Vickers E.Kitt M.Anderson R.Alagna N.Dessay and others with Audiosculpt and listening, analysing and modifying the harmonics one by one.

*Results:* When isolated different parts of the sounds can be perceived.

*Conclusions:* Listening to the harmonics of the vocal signal one by one provides a new perception of the voice. This allows a new understanding of the quality of the voice and validates the singing technique called “poussé-tiré” de la voix.

*Key Words:* HSDI, vocal cycle, audiosculpt, harmonics, perception singing voice, singing technique, poussé-tiré de la voix, emotion.

**Tuesday, May 17, 11:10-11:30**

**Oral Presentation:**

***Phonetotopic organization of phonation. Evidence from electrophysiology, aerodynamics, acoustics and kinesthetics***

Krzysztof Izdebski

Pacific Voice and Speech Foundation, San Francisco, CA, USA

*Purpose:* To present neurophysiologic evidence of phonation organization, and to elaborate on voice pitch pattern predictability as evidence for our understanding of phonation training and disordered phonation processes.

*Method:* Data from electromyographic, aerodynamic, kinesthetic and acoustic signals acquired simultaneously during the production of phonatory ranges, intensities and reaction times. From these data a model of phonatory organization was constructed, termed the “phonetotopic model of phonation.”

*Results:* It was found that human voice pitch production follows a predictable pattern. This pattern follows phonetotopic organization of all intrinsic and extrinsic laryngeal muscle activity corresponding to given pitch, intensity and quality targets. Based on this phonetotopic organization, pattern deviations are predictable and consequently indicative

of voice conditions present in the various vocal pathologies and/or during artistic training.

Therefore, when examining voice production by referring observations to phonetotopic patterns, an unequivocal description of any phonation is possible. Accordingly, pitfalls or deficits of phonation production will correspond in an organized fashion to the specific conditions observed. Depending upon these conditions, phonation patterns will differ with organic (mucosal), neurologic (motility), traumatic (motility and mobility) and/or functional dysphonias including malingering, or when the subject is undergoing vocal training.

**Key Words:** Phonatory neurophysiology, voice, pitch, intensity, laryngeal muscles, dysphonias, modeling, vocal training, vocal pathology.

*References:* Izdebski, K. Clinical Voice Assessment: The Role & Value of the Phonatory Function Studies. Chapter 29, In Lalwani, A. K. (ed.) Current Diagnosis & Treatment in OTOLARYNGOLOGY-HEAD & NECK SURGERY, Lange Medical Books/McGraw-Hill, New York, 3rd Edition, 2011

**Tuesday, May 17, 11:30-11:50**

**Oral Presentation:**

***Female register transitions***

Katrin Neumann<sup>1</sup>, Judith Thoma<sup>1</sup>, Tobias Weissgerber<sup>1</sup>, Felix Langenbruch<sup>2</sup>, Jörn Loviscach<sup>2</sup>, Malte Kob<sup>3</sup>

<sup>1</sup> Dept. of Phoniatics and Pediatric Audiology, University of Frankfurt am Main, Frankfurt am Main, Germany

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<sup>3</sup> Erich-Thienhaus-Institute, University of Music, Detmold, Germany

*Objectives:* The appropriate performance of register transitions is essential for a classical singer to smoothly reach all regions of her voice range. The definition of register transitions, however, often gives reason for discussions among voice professionals. In particular in female singers it seems to be difficult to define registers precisely in their number and boundaries (Miller, 2000).

Conventional register definitions rely largely on singers' self-reports, and perceptual studies presumed that expert listeners concurred with such reports. However, singers themselves are frequently unable to localize their point of transition and to distinguish clearly between registers. The problem of subjective register distinction is aggravated by the fact that listeners and even experienced singing teachers cannot distinguish between different registers with certainty, especially if sung with register equalization. There has thus been and still is a need for objective criteria for the distinction of vocal registers.

Recently we detected typical frequency patterns of the male upper register transition (Neumann et al., 2005). The aim of the study presented here was to find changes in the spectral patterns which characterize the lower female register transition between chest and middle register. The aim of this

study was the development of an algorithm to extract patterns of the acoustic signals for an objectification of female register transitions.

*Method:* Ten classical singers (14 sopranos, 8 mezzo-sopranos, 6 altos) sung ascending scales of the vowels [a:], [e:], [i:], [o:], and [u:], five times each. Recordings of the audio and electroglottographic signals and of an equivalent of the subglottal pressure signal were made and underwent a subsequent signal analysis which was compared with a perceptive evaluation of the regions of register transitions. Two first trials for the development of an algorithm have been made using the register transitions during singing a sustained [a:] by three representatives of each voice category.

*Results:* A first algorithm which has recently been developed revealed that a precise identification of register transitions basing on a single parameter seems to be not very probable (Langenbruch et al., 2011). There is, however, a clear tendency of the feasibility of some parameters. These parameters are in particular the spectral centroid of register transitions and the phase information of the single partial tones related to the phase of the fundamental tone. Because of a timbre change during the register transition it is suggested to use spectral parameters for its detection. Since, on the other hand, singers minimize this timbre change an involvement of the phase information seems to be useful.

*Discussion:* As suggested earlier the register transition between ‘chest’ and ‘middle’ registers seem to be a rather laryngeal phenomenon, seen in the EEG signal, and the transitions between ‘middle’ and ‘head’ as well as between ‘head’ and ‘flageolet’ seem to be caused rather by a resonance adaptation in the vocal tract.

*Conclusion:* Also for the female singer’s voice there seem to exist typical spectral, phase, and EGG patterns which allow for a definition of register transitions basing on objective parameters. A combination of single parameters and the involvement of local minima and maxima may lead to a higher detection rate as achieved with our first trials. It can be expected that the application of an automated training of the algorithm basing on a subjective perceptive analysis will further improve the detection rate.

References:

Miller DG: Registers in singing. Thesis. Groningen, Rijksuniversiteit Groningen, 2000.

Neumann K, Schunda P, Hoth S, Euler HA (2005) The interplay between glottis and vocal tract during the male passaggio. *Folia Phoniat Logoped* 57, 308-327.

Langenbruch F, Thoma J, Loviscach J, Neumann K, Kob M (2011) Entwicklung eines Algorithmus für die Detektion von Registerübergängen. *Proceedings der 37. Jahrestagung der Deutschen Arbeitsgemeinschaft für Akustik*. Düsseldorf, 21.-23. März 2011.

**Tuesday, May 17, 11:50-12:10**

**Oral Presentation:**

***Actress' formant: does it exist?***

Philippe Dejonckere<sup>1,2,3</sup>, H. Stoffels<sup>3</sup>

<sup>1</sup> Catholic University of Leuven, Neurosciences, Exp. ORL, Belgium

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<sup>3</sup> Utrecht University UMC, The Netherlands. AZU Heidelberglaan 100, F.02.504, NL 3584 CX Utrecht.

The “singer's formant” is a prominent spectrum envelope peak near 3 kHz, typically found in voiced sounds produced by classical operatic male singers. According to previous research (Sundberg & Titze), it is mainly a resonatory phenomenon produced by a clustering of formants 3, 4, and 5.

Work by Weiss & al. (2001) does not support its presence in the soprano voices of trained female singers. High female voices rather rely upon formant tuning for reaching extra power and brilliance.

Leino (1993) proposed the term "actor's formant" or "speaker's formant" for a similar – but less pronounced – acoustic phenomenon in projected voices of male actors. The spoken voice of female actor's should theoretically be suited for applying comparable vocal tract adjustments, but it remains unclear if actresses actually use the "actor's formant". Actresses – as well as actors – obviously (can) use a perceptually different timbre when performing, particularly dramatic passages.

In order to investigate the acoustic specificities of acting voice in females, a pilot study was conducted with 6 professional – classically trained – actresses. They interpreted a similar highly ‘dramatic’ passage from Euripides’ tragedy ‘Medea’. The LTAS-data were compared with those of the same passage read by the same subject with a (controlled) louder than normal voice, but without dramatic interpretation.

Results clearly demonstrate that production and perception of dramatic voice projection is associated with LTAS-changes, mainly consisting of a relative supplement of spectral power in the zone of 2,2 to 4,4 KHz. Experiments are going on, but the pilot-study seems to confirm that – at least in specific acting conditions – professional actresses demonstrate an acoustic phenomenon similar to the singer's and actor's formant.

**Tuesday, May 17, 12:10-12:20**

**Oral Presentation:**

***Singing voice and ageing***

Geert Berghs<sup>1</sup> and Felix I.C.R.S.<sup>2, 3</sup>

<sup>1</sup> Singer, singing teacher, Bussum, The Netherlands

<sup>2</sup> Dep. ENT, Head and Neck Surgery, K.U.Leuven, Belgium

<sup>3</sup> Centre of Excellence for Voice, Lab. Exp. ORL, K.U.Leuven, Belgium

A professional singer's life most commonly starts in adolescence and can carry on over the age of 60. As the years increase, singers may notice a loss of vocal quality, due to ageing.



Interindividually, there may be a great difference between age-dependent changes of the voice. Some singers have to quit professional singing before 50, while others perform well even over the age of 65. Amongst others, for reasons of employment and prevention it is important to identify the incidence and severity of vocal problems due to ageing. In this ongoing study, 16 male and 32 female professional choir singers were examined (age between 21 and 60 years). Voice analysis was carried out by Voice Range Profile (VRP; Voice Profiler 4.0 Spectral) measurements and acoustic analysis (PRAAT). Additionally, maximum phonation time was determined. The VRP parameter “highest frequency” was found to correlate rather strongly negatively with age in both males and females (males,  $\rho=-0.467$ ,  $p=0.008$ ; females,  $\rho=-0.532$ ,  $p=0.038$ ). This was also found for “frequency range” (males,  $\rho=-0.465$ ,  $p=0.008$ ; females,  $\rho=-0.507$ ,  $p=0.045$ ). For the parameters “lowest frequency”, “lowest intensity”, “highest intensity” and “intensity range” no significant correlation with age was found. Also for “maximum phonation time” no significant correlation with age was found. The dysphonia Severity Index correlated negatively with age in both males and females (males,  $\rho=-0.560$ ,  $p=0.024$ ; females,  $\rho=-0.395$ ,  $p=0.028$ ). The correlation was more pronounced in males than in females. These findings indicate parameters for the ageing voice. The results of ongoing analysis are presented.

**Tuesday, May 17, 12:20-12:30**

**Oral Presentation:**

***Vibrato and ageing of the voice in professional choir singers***

Geert Berghs<sup>1</sup> and Felix I.C.R.S.<sup>2, 3</sup>

<sup>1</sup> Singer, singing teacher, Bussum, The Netherlands

<sup>2</sup> Dep. ENT, Head and Neck Surgery, K.U.Leuven, Belgium

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Vibrato parameters express vocal quality. Vibrato was correlated with age in this ongoing study, comprising 16 male and 32 female professional choir singers (age between 21 and 60 years). Voice analysis was carried out by Voice Range Profile (VRP; Voice Profiler 4.0 Spectral) measurements and acoustic analysis (PRAAT). From these data, vibrato was analyzed by FoTraceAnalysis. Both in the males and females Vibrato Amplitude, SD Amplitude, Vibrato Frequency and SD Frequency were found not to be correlated with age. In spite of the widespread complaints about the vibrato of elderly singers, this could not be demonstrated in this study. It does correspond, however, with the information given by 72% of the singers, who had experienced positive developments in their singing over the years, especially in vibrato control. The results of ongoing analysis are presented.

**Tuesday, May 17, 13:40-14:00**

**Oral Presentation:**

***Speech therapy for the injured singer***

Sara Harris

What is an injured singer? This talk will look at the type of problems we see in a UK voice clinic that can be considered to constitute an “injured singer” and what might lie behind these problems in terms of aetiology. Possible therapy options that will meet the needs of these singers will be outlined and illustrated through case studies.

**Tuesday, May 17, 14:00-14:20**

**Oral Presentation:**

*Singers resonance, allergies and environment*

Eugenia Chávez

**Tuesday, May 17, 14:20-15:45**

**Workshop:**

*Double ventile function – breathing and posture in singing*

Eugen Rabine

The Rabine Method for functional vocal pedagogy, vocal therapy and vocal training has its basis in the „double valve function“ within the larynx and in the functional integrated unity within the „double valve system“. The double valve system embodies the multifarious interrelated relationships within the biological, neurological, physiological, psychosomatic and acoustical reciprocal functions in vocal communication and thereby incorporates information regarding all aspects of human activities and behaviour. The method in its application concentrates on self perception, sensorimotoric learning and mental concept development. „How a person thinks is how he/she will adjust posture, perform movements, produce voice and express himself in physical-acoustical emotional communication.“

**Tuesday, May 17, 14:20-15:45**

**Workshop:**

*Sing aaaaah, free your voice!*

Margaretha Bessel

Dipl. Gesangspädagogin, Ludwig-Reinheimer-Str. 2, 60439 Frankfurt am Main, Home: +49 – (0)69 – 978 40 225, Cell: +49 – (0)177 – 78 40 225

Content: Group exercises for self-awareness of vocal mechanisms (*Free Your Voice Training*), using vowels, consonants, tonality, pitch and volume; Audio examples and functional analysis of sound qualities; *Tune up Your Voice* – tools to take home