

# International Conference of Students of Systematic Musicology (SysMus14)



18-20 September, 2014  
Goldsmiths, University of London

Hosted by the Music, Mind, & Brain Research Group  
With support from SEMPRE & the Goldsmiths Graduate School

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Amy Fancourt

Nicolas Farrugia

Georgia Floridou

Justin Gagen

Naoko Skiada

Daniel Müllensiefen & Lauren Stewart, supervisors



On behalf of the Organising Committee we welcome you to London and SysMus14. We hope you have an inspiring and engaging conference!

Thanks to SEMPRES and the Goldsmiths Graduate School for providing funding to support this event.

The SysMus14 SEMPRES travel award recipients are: Riikka Ahokas, Alexandria Sultan von Bruseldorff, Jean-Philippe Després, Florian Eckl, Thais Fernandes, Andreas Juwan, Katharina Killy, Fabian Moss, Nicola Pennill, Nora Schaal, Jan Stupacher, Marco Susino, Liila Taruffi, & Dietmar Tscherne

A special thanks to the excellent reviewers of the Scientific Committee who reviewed the SysMus14 submissions to a high standard and provided valuable feedback to all authors.

### **SysMus14 Scientific Committee**

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Thanks to the Session Chairs, who are helping the conference to run smoothly and efficiently:  
Anna-Katharina Bauer, Nicolas Farrugia, Georgia Floridou, Justin Gagen, Niels Christian Hansen, Kelly Jakubowski, Nora Schaal, Liila Taruffi

Thanks to Manuela Marin and Michelle Phillips for all your helpful advice on so many aspects of the planning process for SysMus14.

## SysMus14 Schedule

NOTE: All sessions will take place in the Professor Stuart Hall Building/New Academic Building. (Paper Sessions & Keynotes in Room LG01; Poster Sessions in the Atrium)

### Thursday, 18 September

9:00-9:30: Registration & Coffee (Room 302)

9:30-10:00: Welcome Address/Conference Information Session (Room LG01)

10:00-11:00: **Keynote Speech 1: Professor John Sloboda** (Guildhall School of Music & Drama, UK)- *Musicians and their live audiences: Researcher-practitioner collaborations informed by psychology*

11:00-12:30: **Paper Session 1: Rhythm & Dance (Session Chair: Nicolas Farrugia)**

11:00- *Rhythmical structures in music and body motion in Afro-*

*Brazilian Samba and Norwegian Telespringar* (Mari Romarheim Haugen, University of Oslo, Norway)

11:30- *Timbre-based rhythm analysis* (Michael Blaß, University of Hamburg, Germany)

12:00- *Understanding the club experience: Emotional and bodily*

*experiences of electronic dance music* (Ragnhild Torvanger Solberg, University of Agder, Norway)

12:30-13:30: Lunch (Room 302)

13:30-14:30: **Paper Session 2: Music Psychology & Attention (Session Chair: Nora Schaal)**

13:30- *How does concurrent cognitive load affect the appearance of involuntary musical imagery? Inducing earworms in the lab* (Georgia Floridou, Goldsmiths, University of London, UK)

14:00- *The effect of musical training on auditory grouping* (Sarah Sauvé, Goldsmiths, University of London, UK)

14:30-15:30: **Paper Session 3: Music Rehearsal & Performance (Session Chair: Justin Gagen)**

14:30- *Musical communication of flutists in ensemble performance* (Thais Fernandes, Universidade Federal de Minas Gerais, Brazil)

15:00- *To read or not to read: How pianists practise to perform with music score and from memory* (Leina Lu, University of Sydney, Australia)

15:30-16:00: Coffee Break (Room 302)

16:00-17:00: **Paper Session 4: Pitch & Tonality (Session Chair: Niels Christian Hansen)**

16:00- *A causal involvement of the left supramarginal gyrus during the retention of musical pitches* (Nora Schaal, Heinrich-Heine-University, Germany)

16:30- *Tonality and functional equivalence: A multi-level model for the cognition of triadic progressions in 19th century music* (Fabian Moss, University of Music and Dance- Cologne, Germany)

## Friday, 19 September

### 9:00-10:30: **Paper Session 5: Music, Language, & Education (Session Chair: Georgia Floridou)**

9:00- *Syntactic integration in language and music: On the relation of the syntactic equivalence hypothesis and the shared syntactic integration resource hypothesis* (Patricia Pohlenz, University of Cologne, Germany)

9:30- *Musical concepts as explanation for children's musical preference in primary school age* (Nicola Bunte, University of Bremen, Germany)

10:00- *Engagement and burnout among music performance students* (Anna Zabuska, Royal Northern College of Music, UK)

10:30-11:00: Coffee Break (Atrium)

11:00-12:30: **Workshop with Dr. Daniel Müllensiefen** (Goldsmiths, University of London, UK)-  
*Three things to know about the participants in your study: Measuring individual differences in music research with real people*

12:30-13:30: Lunch (Atrium)

13:30-15:00: **Poster Session 1**

15:00-15:30: Coffee Break (Atrium)

### 15:30-16:30: **Paper Session 6: Historical & Computational Perspectives (Session Chair: Kelly Jakubowski)**

15:30- *Systematic musicology meets historical musicology: Quantitative indices of non-linear changes in rhythmic variability of European art music* (Niels Christian Hansen, Aarhus University & Royal Academy of Music, Denmark)

16:00- *Learning Elementary Musical Programming with Extempore: Transposing Arvo Pärt's Fratres into Live Code Snippets* (Fabia Bertram, University of Cologne, Germany)

### 16:30-17:30: **Paper Session 7: Music Analysis (Session Chair: Anna- Katharina Bauer)**

16:30- *The psychology of leitmotive processing in Richard Wagner's music* (David Baker, Goldsmiths, University of London, UK)

17:00- *Harmonic factors of melodic stability in oral transmission* (Berit Janssen, University of Amsterdam, Holland)

18:15-19:00: Evening Piano Recital by Gabriela Perez (Free, Room RHB 167)

19:30: Conference Dinner

## Saturday, 20 September

9:30-10:30: **Keynote Speech 2: Professor Barbara Tillmann** (Lyon Neuroscience Research Center, Auditory Cognition and Psychoacoustics Team, France)- *Studying tonal expectations: A window into musical structure processing and implicit learning*

10:30-11:45: **Poster Session 2**, with Coffee (see “Poster Session Assignments” below)

### 11:45-13:15: **Paper Session 8: Music & Emotion (Session Chair: Liila Taruffi)**

11:45- *Functions of sad music in daily life: An explorative study on the influence of exposure, coping strategies, and personality* (Karim Weth, Centre for Systematic Musicology, Graz, Austria & University of Bamberg, Germany)

12:15- *Cross-cultural emotional experience in music* (Marco Susino, University of New South Wales, Australia)

12:45- *Measuring listeners’ emotionally expressive responses to music* (Finn Upham, New York University, USA)

13:15: Closing remarks

13:30: Conference ends

### **Poster Session 1 (Friday)**

Musical Structure & Analysis:

1. *The role of attention in the perception of music structure* (Jordan Smith, Queen Mary, University of London, UK)

2. *The perception and recognition of Wagnerian leitmotifs in multimodal conditions* (Henning Albrecht, University of Hamburg, Germany)

3. *Fingerpicking/fingerstyle: A musicological uncovering of a neglected guitar technique* (Anita Mellmer, University Mozarteum, Austria)

Performance & Improvisation:

4. *Leadership in string quartets: Paradox and possibility* (Nicola Pennill, Royal College of Music, UK)

5. *Expert improvisers in Western classical music: Perceptions, learning pathways and creative processes* (Jean-Philippe Després, Laval University Faculty of Music, Canada)

Rhythm & Timing:

6. *The auditory temporal attending theory revisited* (Katharina Bauer, Carl von Ossietzky University, Germany)

7. *Capturing the speed of music in our heads: Developing methods for measuring the tempo of musical imagery* (Kelly Jakubowski, Goldsmiths, University of London, UK)

8. *Decrypt the groove: Audio features of groove and their importance for auditory-motor interactions* (Jan Stupacher, University of Graz, Austria)

Computational Perspectives:

9. *Apprehending works of computer music through a representation of the code* (Maxence Larrieu, Université Paris-Est, France)

10. *Stochastic modeling of expressiveness: Representing the temporal evolution of the descriptors using HMM* (Gabriel Pereira Pezzini, Universidade Federal de Minas Gerais, Brazil)

11. *Adapting computational music similarity models to geographic user groups* (Daniel Wolff, City University London, UK)

## Poster Session 2 (Saturday)

### Music & Emotion:

1. *Does rhythmic entrainment induce pleasure?* (Julian Cespedes-Guevara, University of Sheffield, UK)
2. *Exploring positive and negative empathic behavior in beginner violin-group players* (Annamaria Minafra, Institute of Education, University of London, UK)
3. *Emotion recognition of faces and music in Asperger Syndrome: A crossmodal priming study* (Katharina Killy, University of Vienna, Austria)
4. *Comparison between music perceived emotions and facial expressions* (Diana Kayser, University of Oslo, Norway)
5. *Why do people seek and appreciate sadness in music?* (Liila Taruffi, Freie Universität, Germany)

### Music & Well-Being:

6. *The Relax in Pregnancy project* (Chineze Nwebube, Goldsmiths, University of London, UK)
7. *Effects of music and alpha-wave frequencies on meditation* (Florian Julius Eckl, University of Graz, Austria)
8. *Motivational qualities of music in exercise* (Dietmar Tscherne, University of Graz, Austria)

### Development & Education:

9. *Brain and body percussion: The relationship between motor and cognitive functions* (Riikka Ahokas, Jyväskylä University, Finland)
10. *Western tonal knowledge in 3- and 4-year-old children* (Nina Politimou, Middlesex University, UK)

### Acoustic Analysis:

11. *An acoustic analysis of Ban and Zil singing by Azerbaijan female Mugham singers using the LTAS* (Alexandria Sultan von Bruseldorff, Westminster Choir College of Rider University, USA)
12. *Perceived spaciousness in music presented through headphones, loudspeakers and wavefield synthesis* (Claudia Stirnat, University of Hamburg, Germany)
13. *Loudness war and hypercompression: Quantifying the perception of compression effects* (Andreas Juwan, University of Graz, Austria)
14. *Ontological description of vocal production in world's music cultures – a physiological approach* (Polina Proutskova, Goldsmiths, University of London, UK)
15. *A comprehensive approach in music and audio analysis: Similarities in Helmut Lachenmann's music compositions* (Ivan Simurra, University of Campinas, Brazil)

## Keynote Speakers

We are very pleased to be welcoming the following keynote speakers to SysMus14.

### **Professor John Sloboda**

Professor John Sloboda is Research Professor at the Guildhall School, where he directs its Understanding Audiences research programme. He is also Emeritus Professor at Keele and was a staff member of the School of Psychology at Keele from 1974-2008, where he was Director of its Unit for the Study of Musical Skill and Development, founded in 1991.

John is internationally known for his work on the psychology of music. He is a Fellow of the British Psychological Society and has been President of both the Psychology and General Sections of the British Association for the Advancement of Science, as well as President of the European Society for the Cognitive Sciences of Music, where he has served on the editorial board of its journal *Musicae Scientiae*. He is a committee member of the Society for Education and Music Psychology Research, and was Editor-in-Chief of its journal *Psychology of Music* from 1985-1989. He was the recipient of the 1998 British Psychological Society's Presidents Award for Distinguished Contributions to Psychological Knowledge, and in 2004 was elected to Fellowship of the British Academy.

John is Honorary Consultant to the AHRC Centre for Music Performance as Creative Practice, a network participant in *Theatrum Mundi* and a contributing researcher to the AHRC Knowledge Exchange Hub *Creativeworks London*. He is also a member of the Senior Management Group of the think-tank Oxford Research Group and co-founder of the Iraq Body Count Project. His most recent book (co-edited with Patrik Juslin) is *Handbook of Music and Emotion* published by Oxford University Press in 2009.

### **Professor Barbara Tillmann**

After a PhD in cognitive psychology and postdoctoral research in cognitive neuroscience, Barbara Tillmann integrated the CNRS and is now directing the team "Auditory Cognition and Psychoacoustics" at the Lyon Neuroscience Research Center (<http://crnl.univ-lyon1.fr/index.php/en/Research/Teams/10>). Her research is in the domain of auditory cognition and uses behavioural and neurophysiological methods. More specifically, she is investigating how the brain acquires knowledge about complex sound structures, such as music and language, and how this knowledge shapes perception. She is further interested in investigating new perspectives for stimulating cognitive processes with music as well as in investigating the phenomenon of amusia, a deficit in music perception and production.



## Paper Session 1: Rhythm & Dance (Session Chair: Nicolas Farrugia)

### *Rhythmical Structures in Music and Body Motion in Afro-Brazilian Samba and Norwegian Telespringar*

Mari Romarheim Haugen; Department of Musicology, University of Oslo, Norway

Afro-Brazilian samba and Norwegian telespringar are both often characterized by their complex rhythmical patterns. More specifically, recent studies have identified the existence of systematic anticipation of the third and fourth sixteenth note in a beat in samba groove, while telespringar, normally notated in  $\frac{3}{4}$ , is recognized for a type of asymmetrical meter featuring a long – average – short (L – A – S) duration pattern at beat level. Considering the strong relationship between music and dance in both samba and telespringar, the present study proposes that, in addition to sound data, motion data from both musicians and dancers should be incorporated into analyses of these rhythmical structures.

Here, then, we investigate whether the microtiming features previously shown in samba and telespringar music are also represented in the body motion of performers who are playing and dancing. We derive our discussion from motion-capture experiments where skilled samba and telespringar performers were recorded using an advanced optical infrared motion-capture system. This system tracked the movements of reflective markers attached to the participants' bodies. The sound and motion data were analyzed using the MIR and MoCap Toolboxes for MatLab, and our statistical analyses were performed using SPSS (IBM, Inc.).

Our study's audio analysis of samba confirms the existence of a systematic anticipation of the third and fourth sixteenth note in a beat. Moreover, it reveals a synchronized systematic microtiming pattern in both the musician's heel-tapping and the dancer's steps. Our study's audio analysis of telespringar also confirms the L – A – S pattern at the beat level, with an average ratio of 38:34:28. A synchronized L – A – S pattern was also found in the foot-stamping of the musician, accompanied by upper-body swaying at bar level. It is therefore clear that the microtiming features found to be characteristic of the sound of samba and telespringar are also present in performers' body movements. These observations support the view that these systematic microtiming features are not a matter of deviation from an underlying perceived pulse with isochronous subdivisions in samba or from an underlying isochronous pulse in telespringar. Instead, they actually constitute an essential feature of the samba and telespringar.

Mari Romarheim Haugen is a PhD research fellow at the Department of Musicology at the University of Oslo, Norway, and participant of the interdisciplinary research group fourMs – Music, Mind, Motion, Machines. In 2010/2011, Mari was a MA research fellow of the research project Music, Motion, and Emotion. Theoretical and Psychological Implications of Musical Embodiment, lead by professor Hallgjerd Aksnes, UiO. Mari's research is within the field of embodied music cognition. The point of departure is that music is not only a sonic phenomenon, but also a multimodal phenomenon including both mind and body. Mari's research interests include music and motion, motion capture, motion analysis, rhythm perception, groove and systematic microtiming. Mari is also interested in the importance of implicit knowledge, human subjective experience and cultural background in perception and cognition of music.

## *Timbre-based Rhythm Analysis*

Michael Blaß & Rolf Bader; University of Hamburg, Germany

Musical rhythm is a complex experience, which is structured in time. Furthermore, every musical event has a distinct sound. Thus, it is plausible that investigations in rhythm have to consider its sound, too. Commonly, sounds are discriminated by their timbre. Therefore, rhythm can be described as succession of distinct timbres. We developed a method to model drum patterns in such a manner. Timbre is approximated as a one-dimensional feature consisting of weighted spectral centroid. An onset detection algorithm based on fractal geometry determines the time frames of measurement within the input audio file. The resulting time series is used to train an  $m$ -state Hidden Markov Model. The model's transition probability matrix serves as a fingerprint of the sample's rhythm. Sampling new time series from the model returns drum patterns that differ from the input, but convey the same rhythmical experience. Even rests can be represented and thus timing information are learned by the model using only spectral data. This method can therefore be used to compare music quantitatively and to reveal and cluster musical similarities in sound recording archives.

I was born 1983 in Saarbrücken, Germany, attended an economic high school and studied one semester physics at the University of Kaiserslautern, Germany. After I had canceled that I earned a bachelor's degree in Historic Musicology at the Saarland University, Saarbrücken, Germany. Then I moved to Hamburg where I earned a master's degree in Systematic Musicology from the University of Hamburg this year. I developed the idea of this project together with my supervisor Prof. Dr. Rolf Bader, who is therefore the co-author of this paper. Currently, I am working as a research associate at the Institute of Systematic Musicology of the University of Hamburg, Germany. This semester I give my first lecture, which is about programming techniques in musical acoustics and psychology. At the moment I have one publication in the proceedings of the International Workshop on Machine Learning and Music from the ECML/PKDD conference 2013 in Prague. I am also a Ph.D. student at the Institute of Systematic Musicology. Furthermore, I am working as a music educationist at "Das Klingende Museum Hamburg", which is a museum for musical instruments. Besides rhythm, I am very interested in Music Information Retrieval, music computing and musical instruments. My long time goal is to develop a new, timbre-based rhythm theory out of my previous work and to look for similarities and musical universals in audio-based ethnological music archives.

*Exploring the club experience:  
Emotional and bodily experiences of electronic dance music*

Ragnhild Torvanger Solberg; Department of Popular Music, University of Agder, Norway

Euphoric dance and intense emotions are signature attributes of the club experience, and DJs use a range of production techniques with the explicit aim to synchronize the clubbing crowd's bodily and emotional engagement. This doctoral research investigates the correlations between musical features of Electronic Dance Music (EDM) and pleasurable emotional and bodily experiences. But how and to what extent do structural and sonic features of EDM relate to clubbers' experiences? Particularly the EDM sections 'build-up' and 'drop' are filled with tension-building musical features with the purpose to peak the dance floor, and my claim is that certain features occurring in these sections, such as i) extensive use of sounds and effects with upward movements, ii) compression of rhythmical structures, iii) large changes in frequency spectrum and textural density, and iv) removal and reintroduction of bass and bass drum, can be associated with arousal in emotional responses and bodily movements. This PhD research examines these musical structures and how they are perceived in terms of motor activity, physiological responses and cognitive appraisal.

The project includes a two-part empirical study comprising a physiology study and a dance study. In the dance study 16 participants danced to a DJ mix in a club-like atmosphere—created in a motion capture lab. The crowd's bodily movements were recorded and measured using an infrared marker-based motion capture system. A self-report questionnaire completed after dancing gathered information on pleasure and bodily and cognitive appraisal of the music. The physiology study, which includes monitoring skin conductance activity and heart rate level, remains to be carried out.

The results from the dance study indicate correlations between the participants' degree of movement, the self-reported intensity of their emotional experience and the above-mentioned musical features. The participants reported about the same musical features and moments as especially pleasurable and as causing arousal in their emotional and bodily engagement. This was further supported by the motion capture data, which showed a high level of synchronization at these moments and an increase in the degree of their body movements. Evidence from the qualitative data indicated that this experience was also consciously shared.

Ragnhild Torvanger Solberg is a PhD research fellow at Department of Popular Music, University of Agder. She also collaborates with the research group FourMs at University of Oslo, and University of Sheffield through her supervisor Professor Nicola Dibben. Solberg started her PhD project September 2013, and her primary research interest is the relationship between EDM, emotions and movements. Through empirical studies and music analysis Solberg examines how musical structures in EDM relate to intense affective and bodily experiences. She holds a Master's degree in Musicology from the University of Oslo.

## **Paper Session 2: Music Psychology & Attention (Session Chair: Nora Schaal)**

*How does concurrent cognitive load affect the appearance of involuntary musical imagery? Inducing earworms in the lab.*

Georgia Floridou, Victoria Williamson, & Lauren Stewart; Goldsmiths, University of London, UK

Involuntary musical imagery (INMI, or earworms) is a term referring to the ubiquitous experience of a repetitive musical snippet coming to the mind unbidden and persisting in an uncontrolled manner. Studies to date provide contradictory reports regarding the role of concurrent cognitive load in this phenomenon: some support that INMI appears more during low cognitive load while others suggest the opposite. In the present study this question was addressed by gradually increasing the cognitive load. One hundred and sixty people watched two film trailers with popular soundtracks (one lyrical and one instrumental) and completed a “film appraisal questionnaire”. Next they engaged in one of four 5-minute tasks representing gradually increasing cognitive load. Finally they completed a “mind activity questionnaire” specifically designed for implicit INMI sampling. After 24 hours the same questionnaire was completed again. INMI induction rate at baseline was 65% and decreased as cognitive load increased. The lyrical music was experienced more as INMI and there was a recency effect for the last song presented. In the 24-hour follow up study, 20.4% people reported INMI. This new implicit, single blind paradigm has shed light on the effects of increasing cognitive load on INMI appearance and has provided us with important methodological insights for future INMI studies.

Georgia Floridou is a second year PhD student in the Music, Mind and Brain group at Goldsmiths, University of London (Psychology Department). She is interested in involuntary musical imagery, involuntary memories, individual differences and musical creativity. She is involved in different studies related to involuntary musical imagery and other factors, such as personality, musicality, environmental conditions and cognitive mechanisms. She has attended and presented her work (either as a poster or a spoken paper) in various conferences around the world and her first study on INMI can be found in the proceedings of ICMP-ESCOM 12 (Thessaloniki, Greece)

## *The effect of musical training on auditory grouping*

Sarah Sauvé,<sup>1</sup> Lauren Stewart,<sup>1</sup> & Marcus Pearce<sup>2</sup>

<sup>1</sup>Goldsmiths University of London

<sup>2</sup>Department of Engineering and Computer Science, Queen Mary University of London

**Background.** Auditory streaming is a process highly relevant to analyzing everyday sound environments, particularly with respect to timbre. The phenomenon of auditory streaming has a history of being studied in terms of Gestalt principles (Bregman, 1990), of pitch (van Noorden, 1975), of tempo (Bregman & Campbell, 1971; van Noorden, 1975), of timbre (Bregman & Pinker, 1978; Marozeau et al., 2013), and of attention (Botte et al., 1997; Carlyon & Cusack, 2001). All of these parameters influence the extent of auditory streaming in various ways.

An increase in performance in many types of auditory tasks is seen in musicians, including streaming (Zendel & Alain, 2008), presumably a result of training and brain plasticity.

**Aims.** This experiment seeks to corroborate this observed effect of musical training, and further define the effects of training on specific instrument. Another goal of this experiment is to clearly demonstrate the influence of attention on streaming.

**Method.** In testing both non-musicians and musicians trained on specific instruments in a simple ABA-paradigm where timbre is manipulated (similar timbres presumably making streaming more difficult (Singh & Bregman, 1978; Hartmann & Johnson, 1991; Iverson et al., 1995)), we can find and analyze the fission and temporal coherence boundaries between groups. Participants will be exposed to trials via Max/MSP, and responses will be collected in the same patch. A manipulation of instructions to participants will evaluate the influence of attention on streaming: they will be instructed to hold on to either the galloping rhythm (integration) or the 2:1 rhythm (streaming).

**Results.** This experiment corroborates the previously observed effect of musical training on perception, demonstrated by different threshold profiles between musicians and non-musicians. It also clearly demonstrates an influence of attention on streaming while suggesting further effects of training on specific instruments. The manipulation of attention formed two boundaries, identified as the fission boundary and the temporal coherence boundary, significantly different between musicians and non-musicians and additionally affected by specific timbres.

Sarah Sauvé recently completed an MSc on the Music, Mind and Brain course in the Psychology Department at Goldsmiths, University of London. Her research interests include auditory streaming, the perception of time, and the influence of attention on perception. Sarah's research experience include three consecutive summer internships at the LOEX tissue engineering lab in Québec City with Dr. Lucie Germain, her independent undergraduate research project, undertaken from research question to write-up and my current studies. She will be continuing her research career next year as a PhD candidate at Queen Mary under the supervision of Dr. Marcus Pearce.

### Paper Session 3: Music Rehearsal & Performance (Session Chair: Justin Gagen)

#### *Musical communication of flutists in ensemble performance*

Thais Fernandes Santos, Aluizio Barbosa De Oliveira Neto, & Mauricio Alves Loureiro;  
School of Music, Universidade Federal de Minas Gerais, Brazil

**Background.** Several empirical studies have shown that performer's musical intentions are conveyed through manipulations of acoustics parameters. Therefore, during ensemble performance, musicians need to coordinate their musical ideas, through manipulation of different parameters.

**Aims.** This paper aims to discuss timbre modification, due to coupling interpretation of ensemble performance. We compared the sound quality of solo performances of orchestral excerpts played by professional flutists, with their own performances when following clarinet and bassoon playing the same excerpt in unison. In this study, timbre was represented by two of the descriptors discussed by McAdams and colleagues, the logarithm of attack time and spectral centroid. Note segmentation, end of attack and beginning of release were determined using Expan tool developed in previous studies.

**Results.** We were able to observe that flute players tend to modify their timbre when following clarinet and bassoon with different tendencies for each instrument.

The flutist Thais Fernandes played in Espírito Santo Symphony Orchestra and Minas Gerais Symphony Orchestra (Brazil) as invited flutist. She received her Bachelor of Music degree from the Universidade Federal de Minas Gerais and Master of Music from the Universidade Federal do Rio Grande do Sul, both in flute performance. She is currently working on her PhD at the first institution, and her supervisor is the professor Mauricio Loureiro. Thais investigates about body movements of musicians and manipulation of acoustics parameters. She is member of research group CEGeME (Center for Studies of Musical Gesture and Expression), school of Music.

*To read or not to read: How pianists practise to perform with music score and from memory*

Leina Lu; Sydney Conservatorium of Music (University of Sydney), Australia

Professional musicians preparing for performance demonstrate sophisticated practice strategies to facilitate accurate, efficient and reliable processing of music. To perform from memory, musicians instinctively identify technical, structural, expressive and interpretive cues during their practice which in turn will become cues in performance. There is an expectation that pianists will perform from memory and that these performance cues serve as memory prompts. If memory is an integral part of the existing practice and performance framework, how do musicians practise if they are asked to perform with the music? Changing the performance goal may reveal different approaches and strategies to practising and performing and expand our knowledge of expert practice strategies of performing from memory. To date, no studies have considered the differences between practice strategies of expert musicians required to practise and perform the same piece from memory and with music.

The aim of this study is to investigate how pianists practise to perform from memory and with music and to compare their practice strategies for each performance goal. Four tertiary piano students practised the same unknown piece for performance over two weeks in 4-6 practice sessions. Two pianists were instructed to perform from memory and two with music. Pianists audio recorded their practice sessions and gave verbal commentary to elucidate their practice goals and strategies. Recordings were initially transcribed to count the number and location of pianists' repetitions, errors, starts and stops and to note any comments. Recording these features and transcribing verbal commentary gives insights into the strategies of pianists preparing to perform from memory and with the music score. Each of these markers was tallied and interpreted to identify each pianist's technical, expressive, interpretive and performance cues. Pianists who performed from memory gave more detailed verbal commentary than those who performed with music. Recurring reading errors were more common in practice sessions of pianists performing with music. Results will be discussed with reference to the music practice literature. These findings will have implications for performers, pedagogues in understanding how performers approach learning and/or memorising new repertoire under different performance goals.

Leina Lu is a Masters research student at the Sydney Conservatorium of Music (University of Sydney). She is studying a Masters of Music (Applied Research in Performance) and currently in the third semester of her degree. She is interested in music performance research and music psychology; in particular music perception.

## **Paper Session 4: Pitch & Tonality (Session Chair: Niels Christian Hansen)**

### *A causal involvement of the left supramarginal gyrus during the retention of musical pitches*

Nora K. Schaal; Heinrich-Heine-University, Germany

Brain stimulation studies using transcranial direct current stimulation have shown that the processes involved in memorising pitch rely on activity within the left supramarginal gyrus (SMG). Building on this, the present study investigated which of the main phases of pitch memory processing may depend on the left SMG: retention or encoding. Repetitive transcranial magnetic stimulation (rTMS) was used to modulate the retention stage of a pitch recognition task in experiment 1 and the encoding phase in experiment 2. Stimulation was applied on a trial-by-trial basis over either the left SMG (targeted site) or the Vertex (control site). A baseline block (without rTMS) was also completed. The results of experiment 1 revealed that only rTMS over the left SMG during retention lead to significantly increased reaction times. In experiment 2 no modulation effects were found when applying rTMS during encoding. Taken together, these findings highlight a phase-specific involvement of the left SMG for the retention period of pitch memory only, thereby indicating that the left SMG is selectively involved for the perpetual storage of pitch information.

Nora K. Schaal is currently a PhD student and research assistant at the Heinrich-Heine-University in Düsseldorf in the Department of Cognitive Psychology. She has started working at the Heinrich-Heine-University in October 2012 after successfully completing my Master of Science in Music, Mind and Brain (Psychologie) at Goldsmiths College in September 2012. The focus of her PhD thesis is on investigating underlying neural structures of pitch memory using non-invasive brain stimulation techniques (tDCS, tACS and TMS) as well as looking into functional differences of the pitch memory process in non-musicians, musicians and amusics.

Furthermore, Nora's research interests are:

- Memory for melodies and its underlying neural structures
- Investigating the motor system of professional drummers
- Musical Sophistication in Germany
- Comparing musical (auditory) memory to other memory domains (e.g. visual and spatial memory)
- Memory for rhythms



*Tonality and functional equivalence: A multi-level model for the cognition of triadic progressions in 19th century music*

Fabian C. Moss; University of Music and Dance Cologne, Germany

The subject of this paper is the cognition of triadic progressions in 19th century tonal music. Music psychological research concerning the cognition of harmonic progressions mainly relies on diatonic music in which triads are easily relatable to a key. Triadic distance is therefore measured in terms of root relationships to the tonal center, the tonic (Krumhansl & Kessler, 1982). This conception is not directly applicable to chromatic music where musical coherence is not only obtained by common a key. Transformational music theory puts strong emphasis on voice-leading parsimony as a measure of distance. The most efficient transformations between major and minor triads are P (parallel), R (relative) and L (leading- tone exchange), which is also in accordance with empirical findings of diatonic triadic relatedness (Krumhansl, 1998). Notably, P and R generate an octatonic scale containing eight major and minor triads which are claimed to be functionally equivalent. Transformational analyses result in sequential patterns of triadic progressions and an overarching key is not required. Based on an extended notion of function and acknowledging that there are compelling arguments for both hierarchical and sequential representations of the cognition of harmonic progressions a multi-level model is proposed that combines both approaches, adopting features of the generative model by Rohrmeier (2011). The two main components of the model are the concept of functional equivalence and the distinction between the hierarchic-syntactic cognition of functional progressions and the schematic cognition of functional values.

Fabian Moss lives in Cologne, Germany, where he studied mathematics and music education at the University of Cologne and musicology at the University for Music and Dance Cologne. He received his M.A. in musicology in 2012.

## **Paper Session 5: Music, Language, & Education (Session Chair: Georgia Floridou)**

### *Syntactic integration in language and music: On the relation of the syntactic equivalence hypothesis and the shared syntactic integration resource hypothesis*

Patricia Pohlenz, University of Cologne, Germany

My presentation will be dealing with the comparison of processing music- and language syntax plus neural and functional correlates of them. The focus is on the processes in the Broca area, which is said to be involved in the processing of both music- and language-syntax. There are two points of view about the processing of syntax in both domains. On the one hand, there are neuroimaging studies which are proving an overlap of brain mechanisms while processing music and language syntax. On the other hand, studies in neuropsychology are proposing dissociation between music and language syntax because of single case studies in which patients are suffering from amusia without aphasia and vice versa. To take both approaches into consideration Patel developed the Shared Syntactic Integration Hypothesis (SSIRH). This hypothesis proposes that the processing of music- and language syntax overlap, but the mental representations are independent.

However, the SSIRH is being further developed by Stefan Koelsch. He suggests the Syntactic Equivalence Hypothesis which is criticizing Patel's Hypothesis because it integrates solely late brain processes like P600 for proving an overlap of processing music- and language syntax. Koelsch includes in his hypothesis early processes (e.g. studies dealing with ERAN) in addition to the finding of the SSIRH. The core argument of his hypothesis is that there are cognitive operations (including Broca area) that are involved in music-syntactic, language-syntactic, action-syntactic and mathematical-syntactic processing. But these cognitive operations are not required for the processing of acoustic deviance or language-semantic processing.

The presentation will be critical evaluating the relationship between Shared Syntactic Integration Resource Hypothesis and Syntactic Equivalence Hypothesis in the comparative studies in language and music research. And if the SSIRH is only a "subset" of the Syntactic Equivalence Hypothesis as Koelsch claims.

Patricia Pohlenz (\*13.06.1989) received her B.A. in musicology, linguistic and phonetic at the University of Cologne in 2011. In December 2014 she will be receiving her M.A. In August 2012 she participated in the "International Summer School for Systematic Music" at University of Hamburg. The topic of her presentation dealt with the subject: "Can Alzheimer disease as a natural lesion prove distinct neural networks for forms of musical memory?". In 2013 she made an internship at the Max-Planck-Institute for human cognitive and brain sciences in Leipzig. In March 2014 Patricia Pohlenz again participated in the „International Summer School for Systematic Music“ at the University of Genua. Her research interests mainly focus on the cognitive aspects of music and language.

*Musical concepts as explanation for children's musical preference in primary school age*

Nicola Bunte; University of Bremen, Germany

**Background.** Building on Behne's (1975) construct of musical concepts (beliefs, attitudes, information, etc. held by an individual concerning a musical object), the study explores the power of such concepts for explaining the development of musical preferences in primary school children. This ties in with the assumption that growing stylistic sensitivity is relevant to age-related changes in "open-earedness" (Hargreaves, 1982, p. 51; i.a. Gembris & Schellberg, 2003).

**Aims.** The following questions are investigated: Can musical concepts be found in primary school children? If so: How do these concepts develop during primary school? Are musical concepts important for the evaluation of music?

**Methods.** As part of the longitudinal study SIGrun (Busch et al., 2013), 31 children were interviewed in small groups about their music preferences at two interview points (in second and fourth grade). A content analysis was conducted focusing on the development of musical concepts. The results are triangulated with earlier findings about the development of musical preferences ratings (Busch et al, 2014) measured by a sound questionnaire as part of the SIGrun study. The analysis follows an exploratory design.

**Results.** The interview analysis discloses musical concepts used by children to describe their music preferences. A change in relevance of genre-specific concepts, especially of rock music and the gender-specific concepts of boys' music and girls' music between second and fourth grade is observed. It will be argued that musical concepts have explanatory potential for age- and sex-dependent differences observed in the sound questionnaire.

Since 2012 Nicola Bunte has been a research fellow in systematic musicology at the Department of Musicology and Music Education, University of Bremen. Her Ph.D. project supervised by Prof. Dr. Veronika Busch focuses on primary school children's musical concepts as an explanation for their music preferences. This topic combines her interests in cognitive and social psychology of music with her former research on subjective theories about practicing. She holds a Bachelor's degree in "Philosophy & Economics" (University of Bayreuth), a diploma in "Music Business & Management" (Berklee College of Music, Boston) as well as a Master's degree in "Popular Music & Media" (University of Paderborn). During and after her studies in Paderborn, she worked at the Department of Cognitive Psychology, the Department of Elementary School Pedagogy and the Institute for Research on Musical Ability.

## *Engagement and burnout among music performance students*

Anna Zabuska, Royal Northern College of Music, UK

The psychological and physical demands of the music profession can take their toll, putting musicians' health and wellness at risk. Despite its potential impact on the changes in attitudes towards music-making, well-being remains under-researched in the context of tertiary music education.

The current paper reports a study of two facets of well-being: engagement with performance and burnout among music performance students at conservatoires. The study aimed to establish and compare the levels of engagement and burnout in music students in the UK and Australia, exploring their potential social-environmental determinants and health- and performance-related consequences. In line with the literature on sport and dance, Basic Psychological Need Theory (Deci & Ryan, 2002), which seeks to explain the role of satisfaction of autonomy, competence and relatedness in well-being, was used as the theoretical framework for studying the possible determinants of engagement and burnout.

A cross-sectional design and questionnaire methods were employed in the study. Data were collected from 146 performance students from several conservatoires in the UK and a single conservatoire in Australia. The results revealed that while burnout was not prevalent in the sample, the respondents tended to experience moderate to high levels of engagement. Overall, there were no differences between the students in the UK and Australia in terms of engagement and burnout. The findings of the study suggest that the social context of the conservatoire and the sense of competence may play a major role in the psychological well-being of music performance students, confirming the basic tenets of Basic Psychological Need Theory. Only weak correlations were found between engagement and burnout, and health issues, musculoskeletal pain and practice strategies employed by respondents.

The study sheds light on determinants and consequences of well-being in music education setting, thus contributing to the better understanding of healthy careers in music and forming the basis of practical advice for institutions and principal studies tutors on how to enhance music-related well-being in conservatoire students.

As a PhD student at the Centre for Music Performance Research (Royal Northern College of Music), I study engagement and burnout among music performance students using both quantitative and qualitative methods. I read psychology at the University of Gdansk in Poland, graduating with a very good degree. Post-graduation, I worked as a psychologist within education and social care settings. My previous research projects include a quantitative study of the relationship between performance anxiety and self-handicapping among tertiary music students. The results of the study were presented as papers in conferences on music education held in Poland, and published as a book chapter. At RNCM, I conducted a series of interviews with music performance students that were aimed at shedding light at the determinants, symptoms and consequences of decreased motivation towards music making. Both as a psychologist and as a musician, I am particularly interested in psychological and physical well-being in students and professional musicians, performance anxiety and strategies enhancing performance.

## Paper Session 6: Historical and Computational Perspectives (Session Chair: Kelly Jakubowski)

### *Systematic musicology meets historical musicology: Quantitative indices of non-linear changes in rhythmic variability of European art music*

Niels Christian Hansen; Aarhus University & Royal Academy of Music, Denmark

**Background:** Research has used the normalised Pairwise Variability Index (nPVI) to examine relationships between musical rhythm and durational variability in composers' native languages (Patel & Daniele, 2003a, 2003b; Huron & Ollen, 2003). Syllable-timed languages like Italian and French have low nPVI while stress-timed languages like German have higher nPVI. Recent analyses of historical developments have ascribed linearly increasing nPVI in Austro-German, but not Italian music to waning Italian and increasing German influence on Austro-German music after the Baroque (Daniele & Patel, 2013). This is, however, a post-hoc hypothesis (VanHandel, 2005), and since we cannot perform controlled experiments on historical data, replication with more sensitive methods and new repertoires is required. Turning to French music, we hypothesise both an initial increase and a subsequent decrease, based on documented increasing German influence on French music after the Baroque and reported decreasing nPVI in French vocal music composed 1840-1900 (VanHandel, 2005). This prediction necessitates polynomial modelling.

**Aims:** We aim to replicate, refine and extend previous findings by including French composers and investigating the advantage of more sophisticated analytical strategies to detect non-linear historical developments.

**Method:** Mean nPVIs were computed for 34 French composers (midpoint years: 1700-1941); previous data (Daniele & Patel, 2013) were available for 21 Austro-German (1672-1929) and 15 Italian composers (1613-1928). Polynomial modelling was used to predict mean nPVI from midpoint years.

**Results:** A 2nd-order polynomial outperformed a linear function for French composers,  $\text{Adj. } R^2 = .294$ ,  $F(2,31) = 7.875$ ,  $p < .002$ ; adding another parameter did not improve this fit significantly,  $F(1,30) = 2.324$ ,  $p = .138$ . Linear analyses replicated decreasing nPVI specifically for composers born after 1820,  $r(21) = -.420$ ,  $p = .046$ , and a preceding increase identical to that previously found for Austro-German composers. Previous findings for Austro-German (linear increase,  $\text{Adj. } R^2 = .489$ ,  $F(1,19) = 20.138$ ,  $p < .001$ ) and Italian composers (no change) were replicated.

**Conclusions:** Using musical nPVI analysis, we provide quantitative support for music-historical accounts of an Italian-dominated Baroque (composer birth years 1600-1750), a Classical Era (1750-1820) with Austro-German centres of gravity (e.g. Mannheim, Vienna), and a Romantic Era (1820-1900) with greater national independence.

Niels Chr. Hansen is a PhD student at the Music in the Brain Group in Aarhus, Denmark, under the supervision of Prof Peter Vuust and Dr Marcus Pearce. He holds an MSc in Music, Mind & Brain, an MMus in Music Theory, and a BA in Classical Piano. In 2014 Niels Chr. Hansen received an EliteForsk Travel Scholarship (DKK 300,000) from the Danish Ministry of Higher Education & Science. His research has been published in Dutch Journal of Music Theory, Music Education Research, Danish Yearbook of Musicology, and Journal of Music and Meaning. He has performed concerts in DK, SE, PL, NL, DE, UK, LV, and IT.

*Learning Elementary Musical Programming with Extempore: Transposing Arvo Pärt's Fratres into Live Code Snippets*

Fabia F. A. E. Bertram; University of Cologne, Germany

Live coding is a live audiovisual performance practice located in the sector of new media art. It works through the real-time implementation of code ("on-the-fly programming", Wang and Cook; "just-in-time programming", McLean) and thus differs vastly from conventional languages.

Since the movement's beginning, various live-performance and live-coding systems have emerged (MAX – mid-1980s, SuperCollider - 1996, ChucK – 2003, Impromptu - 2005, EXTEMPORE - 2011) which fit individual preferences of artists for their visual and/ or audio art.

This paper focusses on EXTEMPORE, an environment created by Andrew Sorenson who is an internationally renowned pioneer and expert on the terrain. EXTEMPORE (after the afore mentioned Impromptu) is already his second development of such an environment. It amplifies the previous program's ability to perform given tasks by introducing xtlang, a language that combines the high-level expressiveness of Lisp (esp. Scheme) with its low-level counter, C. The environment is one of the most recent ones.

Furthermore, live coding sparks interest outside of its artistic manifestation and in the topics of unorthodox paths to programming education. Via its direct implementation, the user can easily retrace and understand his movements and advance his overall knowledge of computer science. It would thus be of the utmost interest to document how a musician with no formal informatics training and motivated by the implementation of his own artistic ideas would get insight into the general mechanisms of programming.

The paper follows a two-part form. Starting first with a chronology of the live coding's movement, its main cornerstones, programs and artists, it continues on into a specialization and in-depth analysis of Sorenson's work. The second part consist of a musician's submersion into EXTEMPORE. How will the musician with a professional classical music training but no specialized programming abilities master the subject at hand?

The work concludes with a collection of audio and visual material exemplifying structures and possibilities of the environment as well as own composition protocols that have been executed via EXTEMPORE.

Fabia Bertram is currently enrolled as a Master student at the University of Cologne and writing her thesis in Systematic Musicology about live coding ("Live Coding: An Artist Movement and Elementary Musical Programming with Extempore") under the guidance of Prof. Dr. Uwe Seifert. Before starting her Master's Degree, she fulfilled two Bachelor degrees, a B.A. in Musicology as well as a B.M. in piano performance. For her Honors Bachelor thesis, she conducted an auto-test-based study about the success rates of various piano practice techniques and has now immersed herself into learning how to live code with Extempore.

## **Paper Session 7: Music Analysis (Session Chair: Katharina Bauer)**

### *The psychology of leitmotive processing in Richard Wagner's music*

David Baker, Goldsmiths University of London, UK

The leitmotives in Richard Wagner's *Der Ring des Nibelungen* serve a range of compositional and psychological functions, including the introduction of musical structure and mnemonic devices for the listener. While there have been traditional musicological studies investigating the use and effect of different leitmotives in Wagner's compositional technique, the question of how they are processed in realtime by listeners with different levels of expertise remains very much unexplored.

Work by Deliege (1992), Morimoto (2009), and Albrecht (2013) has investigated how listeners perceive leitmotives in realtime, though these studies employed paradigms exposing subjects to leitmotives before the listening. For realtime processing, both musical characteristics of the leitmotives, as well as prior knowledge and musical experience in general are assumed to be relevant factors.

The current study gathered data from a psychological experiment that required subjects (N=68) to listen to a 10 minute excerpt from *Siegfried* and then to perform a 10 minute memory task which measured both explicit and implicit memory for leitmotifs. Subjects were also asked to make judgements about perceived emotional affect conveyed by each leitmotif. After the offline memory test, subjects selfreported their formal musical training, as well as their familiarity with Wagner and the *Ring*. Subjects also completed an objective knowledge test on the life and works of Wagner.

An item response theory (IRT) approach was used to estimate item difficulty parameters characterizing subject's ability to recognize leitmotives. In terms of listener expertise, ability parameters from the IRT model were regressed onto scores of musical training as well as Wagner expertise that was assessed via a selfreport inventory and an objective knowledge test. The objective Wagner knowledge score turned out to be the strongest and a significant predictor of leitmotive recognition while coefficients for selfreported Wagner familiarity and musical training did not reach significance. Measures and functions of perceived affect of leitmotif and compositional structure will be reported at the time of presentation. This suggests that the effect of Wagner knowledge is a special form of musical competence that is not related to musical training, yet can affect perception in a significant way.

David Baker has recently completed his coursework as a MSc student at Goldsmiths, University of London in the Music, Mind and Brain program working under the supervision of Dr. Daniel Müllensiefen. His current research is investigating the psychological processing of leitmotives in the music of Richard Wagner as part of the Transforming Musicology project. The goals of this experiment were to use the music of Wagner as a vehicle to better understand musical memory, cue abstraction, and to also provide a complement to the traditional musicological research that has already looked into Wagner's use of leitmotifs.

## *Harmonic factors of melodic stability in oral transmission*

Berit Janssen; University of Amsterdam, Holland

We base our research question on the observation that variants of melodies in oral transmission vary considerably in some parts, whereas other parts remain relatively unchanged. The latter phenomenon we call stability in oral transmission: a melody's resistance to change while being copied, over and over again, over generations and geographical regions. While recent computational methods have the potential to investigate stability experimentally, this phenomenon has received little scholarly attention so far. For the first time, therefore, this study analyzes a large database of folk songs to understand stability in oral transmission. To this end, we use a pattern matching algorithm, which computes how frequently a melodic pattern re-occurs between related melodies, and then use the frequency of a pattern as a measure for its stability, i.e. the higher the frequency the more stable the melodic fragment. We investigate three hypotheses on harmonic factors that might influence stability. The first hypothesis is based Krumhans's work on pitch profiles (1990): we predict that scale degrees which are perceived as conclusive might be easier to remember, and therefore more stable. The second hypothesis investigates Bharucha's concept of melodic anchoring (1996): we predict that successions of tones which fulfill strong harmonic expectations might be more stable. Thirdly, we investigate a statistical model for the expectation of scale degrees (Temperley, 2007): we predict that scale degrees which are frequent in Dutch folk songs will also be more stable. In order to test whether the three theories are related to melodic stability, we analyze 4120 transcriptions of Dutch folk songs computationally, asserting whether melodic patterns predicted to be stable according to one of the three hypotheses indeed re-occur more frequently within variants of related melodies. Observed correlations between the number of pattern matches, and the predicted stability scores, confirm the hypothesis that harmonic factors contribute to the stability of melodic fragments in oral transmission.

Berit completed a degree of Systematic Musicology in Hamburg, Germany, where she followed classes in Signal Processing, Music Theory, Jazz Arrangement, Electronic Music, Physical Modelling, Acoustics and Music Psychology. She also studied Electroacoustic Composition and Recording Techniques at Anglia Ruskin University, Cambridge, UK in 2005 and 2006. After receiving her MA with magna cum laude in 2009, she moved to the Netherlands, where she was involved in the research and development at the Studio for Electro-Instrumental Music (STEIM), Amsterdam, and worked in research and education as a production coordinator for the Digital Art Lab, Zoetermeer. Currently, she is a Ph.D. candidate at the Meertens Institute and University of Amsterdam, investigating the variation of folk song melodies through oral transmission.



## **Paper Session 8: Music & Emotion (Session Chair: Liila Taruffi)**

### *Functions of Sad Music in Daily Life: An Explorative Study on the Influence of Exposure, Coping Strategies and Personality*

Karim Weth; Centre for Systematic Musicology, Graz, Austria & University of Bamberg, Germany

People often deliberately listen to music that they consider sad, particularly during negative life events, when sad music can serve a range of self-regulatory functions (Van den Tol & Edwards, 2013). In general, traits such as coping strategies and self-efficacy determine how people react to difficult situations, yet it is unclear how sad music relates to these factors. However, sad music is also used for other reasons, e.g. to simply produce hedonic or aesthetic pleasure (Garrido & Schubert, 2011). The present study aimed to investigate the everyday functions and uses of sad music for a large number of participants, and the ambivalent emotions that they experience in response (Weth & Kicking, 2013). In an exploratory online study (n=582), participants were asked when and why they listen to sad music, and how it makes them feel. Individual coping strategies (Brief-COPE) and personality traits (empathy and self-efficacy) were measured. We also considered relationships between frequency of exposure to sad music and the corresponding functions and emotional outcomes, since exposure to music can change attitudes towards it (Szpunar et al., 2004). Results revealed a three-factor-structure regarding motives and a two-factor structure in terms of emotional outcomes which were labeled as 1)self-regulatory, 2)cursory, and 3)social motives and 1)positive and 2)negative affect, respectively. The three functions showed specific relationships to individual personality traits and coping strategies, e.g. that people with low self-efficacy and high empathy more frequently use sad music for self-regulation. Furthermore, frequent exposure to sad music seems to enable listeners to more often use sad music for cursory functions and respond with more positive and less negative affect.

Karim Weth studied psychology at the University of Salzburg, specializing on music & emotion research in his diploma thesis (title: „Ambivalent emotions in music“). Currently he is an external PhD student with Christian Allesch (University of Salzburg) and Richard Parncutt at the Centre for systematic musicology in Graz, Austria. He is affiliated with the Experimental psychology lab at the University of Bamberg, Germany, where he also collected working and lecturing experience. His main areas of interest are different aspects of emotional reactions to music, including the appeal of sad music and the effect of music on perceptual and cognitive factors. To date, he presented his work in various universities, as well as at international conferences.

## *Cross-Cultural Emotional Experience in Music*

Marco Susino; University of New South Wales, Sydney, Australia

The acceptance that music arouses emotions in a listener, and that listeners are able to experience emotions from music is ubiquitous, shared by both listeners (Juslin & Laukka, 2004) and performers (Laukka, 2004). However, are these emotions cross-culturally understood? While analyses of emotion experience in response to music has boomed in the last two decades (for some examples, see Becker, 2004; Coutinho & Dibben, 2013; Dibben, 2004, 2009; Eerola & Vuoskoski, 2010; Juslin, 2000, 2005; Juslin & Laukka, 2004; Juslin, 2010; Schellenberg, Juslin, & Vastfjall, 2008), the research community is still not able to establish if this experience transcends cultural boundaries, since our knowledge is based largely on “a handful of cross-cultural studies” (Adachi & Trehub, 2000; Eerola, Himberg, Toiviainen, & Louhivuori, 2006, p. 338). Since Gregory and Varney (1996), the first study of such cross-cultural emotion comparison to familiar and unfamiliar music, speculations to universality or cultural uniqueness of emotions in music are equivocal. This paper reviews empirical cross-cultural studies of emotion experience in music, published between 1996 and 2013, discussing the theoretical and methodological key issues in music psychology. Finally, an attempt for future directions in the field is addressed.

Marco Susino is a postgraduate (Masters) student at The University of new South Wales, Sydney, Australia. His research interest is music and emotion, in particular the effects of culture in the emotional experience to music. He works as a Head of Music Performance in a Performing Arts College in Sydney and has been an international music performance examiner for the past 6 years.

*Measuring listeners' emotionally expressive responses to music*

Finn Upham; New York University, USA

Surface Electromyographic recordings (sEMG) of facial muscles such as the zygomaticus and the corrugator supercilii have been used in several studies on emotional response to music. Though recorded continuously as music is presented to a listener, the relationship between felt emotions and contractions of these facial muscles have principally been considered in aggregate, over minutes of music and across participants, but results have been hard to interpret as these signals of affective response appear to be less consistent than subjective reports of felt emotion. Rather than treat facial sEMG measurements as directly reporting the feelings of subjects (as often promised by the idea of tracking microexpressions), I propose interpreting smiles and frowns as expressive behaviours, thus inviting factors such as social context of listening, social associations with the genre of stimulus, individual differences in emotional expressiveness and listener mood to modulate the relationship between facial muscle contraction and emotional response to the music. Examples demonstrating different conditions for expressive behaviour are taken from a case study of emotional responses collected during repeated presentations of wide variety of musical stimuli from one subject (the solo response project), and responses collected from groups of subjects presented with live and recorded concert music. Interpreting facial sEMG as a measure of expressed emotion has implications for interpreting published studies on physiological responses to music and future work exploring the listening experience. Traditional experimental paradigms may have limited the expressivity of participants by presenting music they are unfamiliar with, implicitly encouraging some acceptable range of expressive response, or presenting music to which people rarely practice expressive behaviour. By making explicit factors effecting expressive behaviour, we can make better use of these tools to investigate the experience of listening to music.

Finn Upham is PhD Candidate in Music Technology at New York University, working under the supervision of Mary Farbood in the Cognition wing of the Music and Audio Research Labs at the Stienhardt School of Culture, Education, and Human Development. She previously completed her MA (Music Technology), BSc (Mathematics), and BMus (Music Theory) at McGill University, where she worked in the Music Cognition and Perception Lab at the Schulich School of Music, under Stephen McAdams, focused on analysis of continuous ratings of emotion and physiological measures of emotional response to music. Her current research continues to investigate subjects' psychophysiological behaviour during music listening, in particular how listeners' respiratory cycle can show short term adaptation to synchronize with heard musical stimuli, the topic of her dissertation.

## Poster Session 1

### *The role of attention in the perception of music structure*

Jordan B. L. Smith, Marcus Pearce, & Elaine Chew; Queen Mary, University of London, UK

Existing models of the perception of musical structure mostly do not account for the fact that listeners' hearings are known to vary substantially: the same passage can be interpreted differently by different listeners, or by the same listener at different times. Attention—the deliberate or unconscious focus a listener may place on a particular aspect of the music, such as its melody or rhythm—seems to play a role in the perception of structure, but whether it is an important cause of grouping preferences or the product of them is unclear. We study the influence that paying attention to musical features (including harmony, melody, rhythm and timbre) has on grouping decisions. The experiments use composed musical stimuli exhibiting changes in particular features by design; some stimuli exhibit a single change, while others exhibit changes in different features at different times, leading to ambiguous segment boundaries and groupings.

We first tested whether our subjects were able to correctly associate changes with musical features, to establish that their understanding of the stimuli was multidimensional and not purely holistic. Second, we tested whether an explicit instruction to focus on a feature increased the salience of boundaries marked by a change in that feature. Finally, we tested whether focusing on a feature would make groupings according to that feature preferable. To do so, we asked subjects to perform a distractor pattern-detection task that directed their attention to a particular feature. They then heard ambiguous stimuli, which had structure AAB and ABB with respect to two different features, and indicated their preferred grouping.

The results showed that listeners were skilled at identifying changes, that correctly-directed attention boosted the salience of changes, and that focusing on a feature could indeed cause a listener to prefer one grouping over another. Whereas one's level of musical training greatly impacted how one responded on the first two experiments, its impact was not significant in the third task, suggesting that attention is a general mechanism in guiding grouping preferences.

Jordan B. L. Smith is a Ph.D. candidate at the Centre for Digital Music at Queen Mary University of London, studying with Prof. Elaine Chew. He received his M.Sc. in operations research engineering in 2012 at University of Southern California, his M.A. in music technology in 2010 at McGill University, and in 2006 his A.B. in music and physics at Harvard College. As a research assistant at McGill, he planned and implemented the collection of ground truth for the Structural Analysis of Large Amounts of Music Information (SALAMI) project. His current research, which focuses on differences among listeners in the perception of musical structure, has led to publications in IEEE Transactions on Multimedia and at the ACM Conference on Multimedia, and he has delivered talks on the subject at the Society for Music Perception and Cognition and at the Digital Music Research Network. Smith was awarded doctoral fellowships from both the Social Sciences and Humanities Research Council of Canada and the Fonds de recherche du Québec in 2012; both agencies also awarded him a master's fellowship in 2009.

*The perception and recognition of Wagnerian leitmotifs in multimodal conditions*  
Henning Albrecht; Universität Hamburg, Germany

**Introduction.** The leitmotifs in Richard Wagner's "Der Ring des Nibelungen" fulfill several musical, dramatic and semiotic functions. While many music-analytic and hermeneutic studies have been investigating Richard Wagner's use of leitmotifs as a compositional technique, the question, if it is possible to recognize leitmotifs in the context of the overall net of leitmotifs seems to be much unexplored yet.

**Aims.** The present study investigates the influence of several factors on the recognition and understanding of leitmotifs: First, the effect of inherent musical features of the leitmotifs themselves; second, the influence of listeners' musical background such as music theoretical knowledge, musical skills and specific Wagner-expertise; and third, the impact of presentation context, i.e., audio vs. audio-visual.

**Methods.** 45 subjects (musicians and non-musicians) were required to recognize four distinct leitmotifs ("Ring-Motiv", "Vertrags-Motiv", "Grübel-Motiv", "Nibelungen-Motiv") in a ten minute excerpt from "Siegfried". After providing socio-demographic, musical and Wagner-related background data, subjects had to memorize the four leitmotifs. The subjects could listen to the leitmotifs as many times as they wished. In order to analyse the influence of leitmotifs characteristics on the listener, subjects were also asked to note down spontaneous associations while listening to the leitmotifs. For the following leitmotif recognition test, the subjects were divided into two groups: The first group listened to an audio excerpt of the Siegfried scene, whereas the second group was presented with the full audio-visual sequence.

**Results.** While "Vertrags-Motiv" (72,2 %) and "Grübel-Motiv" (62,7 %) were recognized by the majority of subjects, the "Nibelungen-Motiv" (34,3 %) and the "Ring-Motiv" (22,6 %) were less frequently identified. Expertise regarding Wagner's music was a significant predictor for recognition rate, while the presentation mode hardly made any difference. Significantly higher recognition rates were found for the most salient motif ("Vertrags-Motiv"), and for the most clearly iconic motif ("Grübel-Motiv"). With regard to semantic content, the "Grübel-Motiv" and the "Vertrags-Motiv" were more likely to be associated with their standard meaning as the "Ring-Motiv" and the "Nibelungen-Motiv". In general, semiotic nature and salience of leitmotifs seem to be independent dimensions, and the consequences for the communication process will be discussed.

From 2006 to 2012 Henning Albrecht studied Systematic and Historical Musicology and German Literature at the University of Hamburg and graduated with a Master's degree. The title of his master's thesis is: "Perception of leitmotifs in Richard Wagner's Ring des Nibelungen - An empirical study of the recognition of selective leitmotifs from a music psychological and music semiotic perspective." (German title: „Wahrnehmung und Wirkung der Leitmotivik in Richard Wagners "Ring des Nibelungen" - Eine empirische Studie zur Wiedererkennung ausgewählter Leitmotivik aus musikpsychologischer und musiksemiotischer Perspektive.“)

In 2008 he participated in a music ethnological fieldwork in the UNESCO World Cultural Heritage Recônavo (Bahia), Brazil. Since 2010 he worked as a freelancer at the Hamburg State Opera and is, besides several musical activities, constantly writing program notes for diverse orchestras and cultural institutions. He was an employee at the Bayreuther Festspiele in 2013. Since 2014 Henning Albrecht is a PhD Student at the Institute for Systematic Musicology at the University of Hamburg. His main research interests are audio-visual effects of music, multimodal perception of musical leitmotifs and music and emotion.

*Fingerpicking/Fingerstyle: A Musicological Uncovering of a Neglected Guitar Technique*  
Anita Mellmer; University Mozarteum, Austria

Fingerpicking – or the synonymously used term ‘fingerstyle’ – is a way of playing the guitar that developed in the USA around 1900 and that imitates the piano ragtime. To date, there are hardly any systematic accounts of either the history or the instrumental realisation of fingerpicking. This absence of research on the topic is contrasted by a wealth of teaching material on fingerpicking, ranging from arranged classical pieces to popular guitar accompaniment. It is possible that the umbrella term ‘fingerpicking’ is a selling point when it comes to teaching material; however, the term is usually attributed without serious attention to the historical tradition of fingerpicking. This is one of the reasons for why it is desirable to conduct detailed research on the history and characteristics of this technique, which should lead to increasing the technical and artistic understanding of it among musicians.

In addition to a discussion of terminology and definitions, my paper will show when, where, how, and why fingerpicking came into being and where its musical roots are. Portraits of influential fingerpicking musicians provide the historical framework for this talk; furthermore, they serve to show regional differences in the practical uses of the technique. By looking at both theory and practice, I will elaborate on the genres in which fingerpicking is used and where it stands in relation to improvisation. Interviews with renowned national (i.e., Austrian) and international fingerpickers serve to illuminate the contemporary practice of fingerpicking as well as its history and its future from the viewpoint of practitioners.

My aim is to show that, fundamentally, fingerpicking is not regular guitar accompaniment as it is understood in popular music; rather, it is a sophisticated and often virtuoso guitar technique that spans many musical genres and styles. This paper strives to raise awareness of fingerpicking as a promising research field and to inspire musicologists to continue research in this field.

Anita Mellmer is an Austrian guitarist, guitar teacher, and musicologist. She holds an MA in Classical Guitar and an MA in Instrumental Teaching and is currently working on her PhD project in musicology at the University Mozarteum (Salzburg). Her special research interest is popular music and her articles have been published in Guitar journals (in German and English). Anita Mellmer received the Award for Academic Excellence for her MA studies. In addition to her academic work, she is involved in various artistic projects and she has also played at the Salzburg Festival (2008).

## *Leadership in string quartets: Paradox and possibility*

Nicola Pennill; Royal College of Music, UK

A survey of 106 conservatoire students and professional string players is reported in which information was gathered regarding practices and views on leadership in the string quartet. The questions were structured using Likert scales, focussing on respondents' background, experiences of string quartet playing, their experiences of leadership and their views on what works in their own ensembles. There were a number of open ended questions to capture additional comments. Measures of total playing time and identity suggest that string quartet playing is an important aspect of players' portfolio of activities. The concept of shared leadership is supported; overall, players strongly agreed with the statement, "in the quartet, leadership is equally shared between members". Self-assessment of leadership abilities were equal across all instruments. Views also suggest that the nature of leadership varies according to its purpose, which in this study were defined as musical, administrative or team leadership. Factors relating to leadership were considered important for long term success of the quartet. Differences emerged between violinists and non-violinists, particularly in relation to views on sharing musical leadership, and on leadership in rehearsal and performance. Non-violinists agreed more strongly than violinists with the statements, "musical leadership is important for the long term success of the quartet" ( $t(61)=-1.96, p<0.05$ ) and "sharing musical leadership is important to success" ( $t(61)=-2.51, p<0.05$ ). Differences also emerged in relation to leadership in rehearsal and performance, particularly the role of the first violin. The results are discussed in the light of previous research, and analysed in the context of a theoretical framework proposed by Smith and Lewis (2011) for categories of organisational tensions relating to paradox theory in organisations.

Nicola Pennill graduated from the University of Nottingham, and completed postgraduate diplomas in Management Studies and Marketing from DeMontfort University. A Licentiate of the Royal Schools of Music, she is a professional music teacher and regular performer on saxophone and oboe. Her professional activities have previously included management consultancy with a large international professional services organisation, where she worked on business improvement and change management programmes. Her research interests are in leadership and teamwork in music ensembles. Nicola has recently completed the MSc in Performance Science at the Centre for Performance Science at the Royal College of Music.

*Expert improvisers in Western classical music: Perceptions, learning pathways and creative processes*

Jean-Philippe Després; Faculté de Musique, Université Laval, Canada

**Aims.** The research question of the present study is: “What are Western classical music improvisers’ perceptions, learning pathways and creative processes?” To address this question, a threefold rationale has been developed: (1) describe how Western classical music expert improvisers perceive their practice; (2) map Western classical music improvisation learning pathways; and (3) identify and define the cognitive processes and strategies implemented by Western classical music experts, as well as the states they experience in the course of performance.

**Method.** Open-ended, semi-structured interviews have been conducted with (N=8) internationally recognized Western classical music expert improvisers. Expertise has been determined by peer recognition and professional performing/recording/teaching activity in Western classical music. After transcription, the interviews have been coded and analysed using NVivo 10 software, with a mixed category approach.

**Results.** The participants perceived improvisation as a spiritual experience, situated at the core of their musical practice, which is ideally created collaboratively and ex nihilo. Furthermore, even though improvisation, interpretation and composition are often intricate activities, distinctions are clearly drawn for the participants. Two different types of learning pathways have been identified: native improvisers and immigrant improvisers. While in the former pathway improvisation was introduced at the very beginning of instrumental learning, in the latter pathway improvisation was learned after developing high-level of instrumental proficiency. Both these learning pathways led the participants to develop improvisational expertise. Thus, we hypothesize that expertise can be attained even when improvisation is introduced in later phases of musical development, as long as know-how and know-what are sufficient. Moreover, beyond knowledge and skills, expertise is also built on risk-taking and acceptance of the unexpected. Finally, the strategies implemented by Western classical music improvisers can be grouped into six categories: motivic, pitch-oriented, real-time, rhythmical, structural and stylistic and, from a broader perspective, the improvisational cognitive processes and strategies identified are either transversal or language-specific. On the one hand transversal cognitive processes and strategies could be implemented in any improvisational context; on the other hand Western classical music-specific cognitive processes and strategies are linked to the peculiar constraints of this language.

Jean-Philippe Després is a Ph.D. student in Music Education at the Faculté de Musique of Université Laval (Québec, Canada). He is currently conducting a research project on Western classical music expert improvisers’ learning, strategies and cognitive processes. His Doctoral project has received distinguished scholarships (\$ 20,000, FRQ-SC, for the first year; \$ 105,000, SSHRC), for the three subsequent years. Jean-Philippe Després holds a Master’s degree in musical didactics (2011), for which he also received excellence scholarships (\$ 17,500, SSHRC; \$ 15,000, FRQ-SC).

Jean-Philippe studied classical guitar with Michel Caron (Canada), Sebastián Guigui (Mexico), Alejandro Mora (Mexico), Rémi Boucher (Canada), Massimo Gatta (Italy) and Isabelle Héroux (Canada), among others. In addition, he has studied jazz guitar with Francois Leveillé (Canada) and Gabriel Hamel (Canada). He has also been playing in experimental and world music ensembles for over 15 years. He is particularly interested in classical guitar teaching and learning, musical creativity and expertise, improvisation, music-related ITCs, and qualitative research.



## *The auditory temporal attending theory revisited*

Anna-Katharina R. Bauer, Manuela Hagen, Jeremy D. Thorne, & Stefan Debener;  
Carl von Ossietzky University, Germany

**Background.** The temporal attending theory predicts that tone sequences presented at a regular rhythm entrain attentional oscillations and thereby facilitate the processing of sounds presented in phase with this rhythm (Jones et al., 2002). During the past decade the theory of auditory temporal attending has become widely popular (140 ISI citations by July 2014) and has inspired both music psychology as well as neuroscience research. The aim of the current study was to replicate the findings of Jones et al. (2002).

**Method.** The original paradigm is a pitch comparison task in which two tones an initial standard tone and the last tone of a longer series, named comparison tone have to be compared. In between the two, distractor tones with variable pitch are presented at a regular sequence. A comparison tone presented in phase with the entrained rhythm is hypothesized to lead to better behavioral performance compared to comparison tones presented at unexpected early or late intervals. Four different variations of the original paradigm were created and 106 participants tested in total. Except for the first experiment, the Goldsmiths Musical Sophistication Index (Gold-MSI) was included to test the influence of musicality on task performance.

**Results and Conclusion.** Over all four experiments only 38 of the 106 participants showed the desired pattern of an inverted u-shaped profile in task accuracy, and in none of the four variations did the group average effects replicate the pattern reported by Jones et al., (2002). However, evidence for a relationship between musicality and overall behavioral performance was found, indicating that non-musicians, compared to musicians, benefit more from rhythmic distractors. Our results question the validity of the pitch comparison task for the study of auditory temporal attending.

Anna-Katharina Bauer earned her first degree in Psychology from the University of Salzburg (Austria), followed by an MSc in Neurocognitive Psychology from the University of Oldenburg (Germany). She is currently pursuing a PhD at the University of Oldenburg exploring attentional entrainment in human auditory cortex under the supervision of Stefan Debener. Her research aims to investigate the relationship between brain rhythms and related sensory rhythms, specifically how temporal expectancies, as they occur in musical rhythms, are related to neural entrainment. Further research interests include beat and rhythm perception and their relation to movement as well as motor cortex activity.

*Capturing the speed of music in our heads: Developing methods for measuring the tempo of musical imagery*

Kelly Jakubowski, Nicolas Farrugia, & Lauren Stewart; Goldsmiths, University of London, UK

The experience of imagining music is a common phenomenon. Musicians use mental rehearsal to help them memorize and prepare for performances, and even non-musicians regularly experience “earworms”, i.e., having a tune stuck in one’s head on repeat. Voluntarily imagined music is highly accurate in terms of pitch, rhythm, and timbre (Hubbard, 2010) and recruits brain regions that are remarkably similar to those recruited in perceiving music (Zatorre & Halpern, 2005).

In terms of tempo, Levitin and Cook (1996) found that participants could sing familiar pop songs very close to the original recorded tempo. This implies that the tempo of imagery is quite accurate, as participants must generate an image of a song before singing it aloud. However, this has not been previously tested in such a way that the imagery remains purely imagined, without becoming a sound production task. As such, the first aim of the present study is to test accuracy of the tempo of purely imagined songs. The second aim is to explore the influence of individual differences on these tempo judgments, including previous musical training, musical engagement, general auditory imagery abilities, and familiarity with the stimuli.

We utilize three methods of measuring each participant’s memory for the tempo of 12 familiar pop songs: 1) tapping to the beat of each song whilst imagining the song, 2) adjusting the speed of a click track to the beat of each song, again whilst imagining, and 3) adjusting the speed of each song whilst hearing the actual songs aloud. It is hypothesized that participants will be able to imagine songs at very similar tempi to their judgments in the perceived music task (task 3).

The results of the study will help to inform us as to precisely how accurately tempo is preserved within musical imagery, and how this is modulated by other factors such as musical training, familiarity, and auditory imagery abilities. The findings will have implications within the domain of mental music rehearsal.

Kelly Jakubowski earned a Bachelor of Music degree in Violin Performance/Music Theory from Baldwin Wallace Conservatory of Music (USA). She went on to pursue graduate studies in Violin and Music Theory at the Ohio State University (USA), earning MM and MA degrees, and in Music Psychology at Goldsmiths, University of London, earning an MSc (with distinction) in Music, Mind and Brain. She is currently pursuing a PhD in Psychology at Goldsmiths, funded by a Leverhulme grant. Her research aims to combine behavioural, computational and neuroscientific approaches to study the phenomenon of involuntary musical imagery, or ‘earworms.’ Other research interests include absolute pitch, melodic memory, and music and emotion. Her research has been published in *Psychonomic Bulletin & Review*, the *Quarterly Journal of Experimental Psychology*, and *Musicae Scientiae*.

*Decrypt the groove: Audio features of groove and their importance for auditory-motor interactions*

Jan Stupacher; University of Graz, Austria

When we listen to music we often experience a state that can be described as 'in the groove'. This state is characterized by the wish or even the urge to move our body to the musical pulse (Janata et al., 2012; Madison, 2006). We have shown that high-groove music modulates the excitability of the motor system, whereas no effect of low-groove music was found (Stupacher et al., 2013). But which musical qualities contribute to the feeling of groove? To answer this question, we extracted audio features of 80 song clips with similar instrumentation and correlated them with subjective groove ratings. Song clips and groove ratings of 19 participants were taken from Janata et al. (2012). The following features were extracted with Matlab's MIR toolbox (Lartillot & Toiviainen, 2007): RMS energy, spectral flux, sub-band flux, pulse clarity ('MaxAutocor' and 'Attack'), and event density. Additionally we used the Genesis Loudness toolbox to compute measures of loudness using the loudness model of Glasberg and Moore (2002).

Results showed that groove ratings correlated positively (all  $ps < .01$ ) with following audio features: RMS energy ( $r = .37$ ), pulse clarity 'attack' ( $r = .38$ ), spectral flux ( $r = .34$ ), sub-band flux of band 1 (0- 50 Hz,  $r = .29$ ), and band 2 (50-100 Hz,  $r = .29$ ). Additionally, groove ratings correlated positively (all  $ps < .05$ ) with band 3 (100-200 Hz,  $r = .23$ ), band 5 (400-800 Hz,  $r = .23$ ), and band 6 (800-1600 Hz,  $r = .24$ ). The mean loudness of song clips did not affect groove ratings.

Since energy in low frequency bands (Burger et al., 2012; Van Dyck et al., 2013), percussiveness (similar to pulse clarity 'attack'), and spectral flux (Burger et al., 2012) have previously been shown to affect motor movements, our results indicate that the experience of groove is a phenomenon predominantly based on auditory-motor interactions (cf. Janata et al., 2012; Stupacher et al., 2012).

Jan Stupacher studied psychology at the Eberhard Karls University Tübingen (Germany) and the Music Cognition and Action research group at the Max Planck Institute for Human Cognitive and Brain Sciences in Leipzig (Germany). In October 2013 he started his PhD project at the Department of Psychology, Section Neuropsychology, University of Graz (Austria). His research combines methods from cognitive psychology, neuroscience, social psychology and systematic musicology to investigate cognitive aspects of entrainment and musical groove.

*Apprehending works of computer music through a representation of the code*

Maxence Larrieu; Université Paris-Est, France

At the end of the 20th century Jean-Claude Risset highlighted a novel aspect of computer music composition: sound production through calculation (Risset 1999). Pursuing this line of thought, I view composition as a process that defines the different calculations needed to produce music. To be effective, these calculations are implemented in one – possibly several - programming languages. Therefore I use the term ‘code’ in my research to designate all the calculations needed to produce sounds. Since the code permits the creation of the work and its actualization over time - I also consider reconstruction and migration (see Bullock 2005, Dahan 2007) - I suggest that the study of the code can be useful in analysing music.

This approach already exists in musical research (e.g. Meneghini 2007) but is not yet widespread. I am interested in examining how useful the code can be in musical analysis, and how a more systematic use of the code can be integrated in such analysis. I present the essential criteria of the code before examining the main difficulties of using it in musical analysis. I then propose a solution to these problems, arguing that a dynamic representation of the code during the work is helpful for the analysis. Next, I describe how I designed - both theoretically and then technically - this kind of representation, ending with a demonstration of its application to an extract of a piece. What I aim to show is that the identification of the most salient elements of the code and the representation of their evolution during the work, constitutes another way of apprehending electroacoustic and computer music works.

Maxence Larrieu, PhD student in musicology, Université Paris-Est, laboratory LISAA (EA 4120)

Started in 2012, my research are in the fields of computer music and musical analysis. We study how the code present in computer music works can be helpful for the analysis.

*Stochastic Modeling of Expressiveness: Representing the Temporal Evolution of the Descriptors Using HMM*

Gabriel Pereira Pezzini, Thiago A. M. Campolina, & Maurício Alves Loureiro; Federal University of the Minas Gerais state (UFMG), Brazil

Different interpreters do not play identically during a music performance, introducing their own expressive features. Although these features are perceptually recurrent for each musician, the deterministic modeling is a difficult task, making it more interesting modeling them by stochastic patterns approach. This paper aims to model the temporal evolution of the acoustic features using HMM (Hidden Markov Model) note-by-note, intrinsically related to the expressive intent of the artist performing the musical fragments. Descriptors related to changes in dynamics, tempo, attack and release have been implemented and tested. Dynamics was described by the RMS (Root Mean Square) energy changes for each note in comparison with the previous. Tempo was described by the IOI (Inter Onset Interval) deviation normalized by the note duration according to the score. Finally, the attack and release were described by the logarithm of their duration time. The methodology is divided into two parts: first the optimal number of states for each HMM is determined by taking the maximum of the curve between number of states and recognition rate. In the second, the recognition achieved by optimal number of hidden states is analyzed together with the structure of the probabilities of transitions between the states matrix. The training and testing data used in recognition test were executions of the same fragment for clarinet of the fourth movement of Mozart's Quintet. Five musicians performing six times each were recorded. The results indicated better recognition rate using tempo, dynamics and attack time descriptors, reaching 60 hitting percent, with two, six and five hidden states respectively.

Gabriel Pezzini is an undergraduate student of Physics at the Federal University of the Minas Gerais State (UFMG) in Brazil. Since 2011, Pezzini works under an undergraduate researcher for the Center for the Study of Musical Gesture and Expressiveness (CEGeME) at the same university.

*Adapting computational music similarity models to  
geographic user groups*

Daniel Wolff & Tillman Weyde; City University London, UK

We present first results of experiments using music similarity ratings from human participants for group-specific similarity prediction. Music similarity is a key topic of research in music psychology and ethnomusicology. Computational models of music similarity have many applications such as music recommendation and indexing of music databases.

This study evaluates the feasibility of adapting similarity models to location-specific subsets of similarity ratings. To this end we use information on the country where the data was provided. Apart from directly training similarity models to the localised data, we perform a gradual adaptation of a previously trained general similarity model to the location-specific data. This allows us to compare the general and localised similarity models, providing a comparative analysis of the importance of acoustic features (e.g. loudness, timbre, tempo, chroma, key) for modelling similarity judgement across user groups. In future work, such groups could be selected to yield culturally determined models.

Our results show that localised models can be trained, but in comparison to general models this task proves more difficult due to the relatively small amount of training data available from each country. We found that the performance for some localised models can be increased using a general model as a basis for training. In one case this allows for the analysis of relevance of individual features for the specific data.

The similarity ratings used in our experiments were collected in the online Game With A Purpose “Spot The Odd Song Out”. The mostly popular music presented in the game is based on the openly available MagnaTagATune and Million Song datasets, two large music datasets that come with acoustic descriptors for the music. Additionally to the similarity data being collected via triad questions, the modular game architecture allows for the collection of other human annotations, such as timbre and rhythm data. We also describe the extensible game with a discussion of further possibilities of its application.

Daniel is currently finishing his PhD on “Music Similarity Model Adaptation and Analysis using Relative Human Ratings”, which he started in 2010 at City University London. His main research interests lie in computational musicology, particularly in modelling similarity ratings, user studies and bioacoustics including computational classification of birdsong. As a research fellow in the AHRC Project “Digital Music Lab”, Daniel is working on infrastructures and methods enabling musicological research with big data methods on large music datasets.

## Poster Session 2

### *Does rhythmic entrainment induce pleasure?*

Julian Cespedes-Guevara<sup>1</sup>, Nicola Dibben<sup>1</sup>, Maria Witek<sup>2</sup>

<sup>1</sup>University of Sheffield, UK

<sup>2</sup>Aarhus University, Denmark

Although several authors have speculated that rhythmic entrainment induces positive affect (e.g. Juslin & Vastfjäll, 2008; Clayton et al. 2004), so far there is no direct experimental evidence to support this claim. Therefore, the experiment hereby reported aimed to test the hypothesis that moving in time with music induces pleasure. Six short rhythmic musical stimuli with three different levels of syncopation (low, medium, high), were presented to 77 participants, who were divided into two groups: the first was asked to move along with the pulse of the music (by tapping with one foot), and the second was asked to listen without moving. The changes in the affect level of the participants were measured using an indirect technique and standard self-report scales of pleasantness and arousal. Although the data obtained using the indirect technique were not reliable, the data from self-reports indicate that participants in the 'tapping' condition did not experience more positive affect than the participants in the 'stationary' condition; and that participants experienced slightly higher levels of positive affect when tapping to stimuli with a medium level of syncopation. These findings suggest that effect of musical entrainment on the induction of pleasure is primarily the result of the expectations aroused by syncopated rhythms, not by the movements made by the listener.

My main research interest is the Psychology of Music, particularly the processes of construction and communication of musical meaning, and the perception and induction of musical emotions. The general objective of my doctoral research is to offer an original account of musical emotions using a constructionist approach. Specifically, my proposed research addresses the following question: How do the structures of music materials, cultural discourses and the psychological and bodily dynamic of a person interact to produce emotional experiences with music? In order to answer this question, based on Lisa Feldman Barrett's Conceptual Act Theory, I propose that a person has a musical emotion when the changes induced by the music in her core affect (i.e. her arousal and affective levels) are implicitly "categorized" by the information she has at hand about the about emotions (e.g. the emotional vocabulary of her culture), about music (e.g. lyrics, ideologies about the "right" listening attitude), personal factors (e.g. episodic memories), and the context (i.e. the meaning of the present situation where the listening takes place). I have worked as a full time lecturer- researcher in the Department of Psychological Studies, at ICESI University, in Cali Colombia. I also worked as the director of the undergraduate studies in Psychology of the same university for almost two years. I have taught modules on Perception, Cognition, the Epistemology of Psychology, Motivation, Emotion, Personality, on The History of Rock Music, and Psychology of Music. I am also a music practitioner myself. I write songs, sing and have played guitar and sung in several rock bands.

*Exploring Positive and Negative Empathic Behavior in Beginner Violin-group Players*  
Annamaria Minafra; Institute of Education, University of London, UK

This paper reports a case study exploring the effect of musical movement games and kinaesthesia on empathic behaviour with young beginner violin-group players in an Italian state primary school. The aim is to explore how movement games develop empathic behavior during violin-group session with beginners. The interest in this topic comes from the fact that most learning occurs in social contexts and empathy has an important role in this learning process. Empathy is defined as the skill to share and understand others' emotions by also involving cognitive ability. In the Husserlian phenomenology and social neuroscience, imitation and embodied simulation are considered fundamental in developing empathy. Moreover, empathy could underlie motivation in carrying out group activities. The participants were 24 children, all from fourth-year Italian primary state school. Due to the little room and few violins, they were divided into two groups. Both groups, imitating the violin teacher, learned the same songs through movement by memory and then played them on the violin. The monitored variables were movement and children's behavior. Qualitative methods were adopted including observation, focus group interviews, questionnaires, audio-visual material, and children's drawings. All the sessions were video-recorded. In focus group interviews, the phenomenological approach was employed to let children verbalize their impressions after engaging in musical activities through movements. Results showed that all the children imitated and simulated both teacher and companions' movements. It was observed that one group was influenced by a child who appeared to be the leader and contributed to developing negative empathic behavior in most of the sessions. The children from this group negatively assessed the violin course, expressing their opinions in the questionnaires and during the verbalization process they had in the 12th session. However, after the last session when all the children performed the learned songs on the violin in front of their parents and their companions, most of these children changed their minds, expressing a wish to continue the course. Possible tutor implication of this study could investigate the correlation between empathy and movement activities in developing motivation when learning musical instruments in a group.

Annamaria Minafra is Italian and she is at the 3rd year of her PhD at IoE-University of London, Department of Lifelong and Comparative Education (supervisor prof. Susan Hallam). She graduated both in viola in 1993, and in Philosophy of Education in 2010. For ten years, she directed the private music school "Doron Association" in Florence-Italy, developing also teaching experience. She was member of the Pedagogic Committee of Italian Association of Music School (AidSM) as editor of four national Italian meetings (2006-2010). In the last three years she had presented various papers related to her research at international conferences such as ISME, EAS, BPS, IoE.



*Emotion Recognition of Faces and Music in Asperger Syndrome: A Crossmodal Priming Study*

Katharina Killy; University of Vienna, Austria

Although autistic individuals are said by the general public to have impairments with emotion perception in social interactions, recent findings do not fully support this claim (Erbas et al., 2013). A study by Charbonneau et al. (2013) has shown that discrimination between two types of affective vocalizations and facial expressions, presented in isolation or in combination, was impaired in autistic individuals. However, controls and autistic individuals benefited from a bimodal presentation of the stimuli. Research on musical emotions has indicated that autistic individuals are not impaired in decoding musical emotions (e.g., Heaton, Hermelin, & Pring, 1999; Quintin et al., 2011). Furthermore, musical emotions have been shown to influence affective face processing in healthy individuals (Logeswaran & Bhattacharya, 2009; Marin et al., in prep). Motivated by the results of Charbonneau et al. (2013), we thus aim to systematically investigate the possible influence of musical emotions on emotion decoding of facial expressions in a crossmodal priming paradigm. Our sample comprises 20 high-functioning autistic individuals and 20 healthy controls matched for age, gender and IQ. Primes are excerpts of four types of musical emotions (happy, sad, scary and neutral). Targets are pictures of facial expressions (happy, sad, scary and neutral) taken from the Radboud Faces Database (Langner et al., 2010). In a two-alternative forced choice task, primes and targets of two types of emotions are paired in six combinations (happy-sad, sad-scary, happy-scary, neutral-scary, neutral-sad and neutral-happy), and are either congruent or incongruent in terms of valence and/or arousal. This experimental design enables us to disentangle arousal from valence effects (Marin et al., 2012). The same discrimination task, collecting reaction time and accuracy data, will be performed for all stimuli in isolation in a separate session. We hypothesize that healthy controls will outperform autistic individuals on all tasks except for the musical emotion task. We hope to be able to demonstrate a crossmodal priming effect in healthy controls, but more importantly, also the presence of a reduced priming effect in autistic individuals. Our results may lead to further intervention studies in which listening to music may help to train autistic individuals to discriminate between facial expressions of emotion.

Katharina Killy was born in Austria. After completing high school, including an education for kindergarten pedagogy, she moved to Vienna to study psychology at the She is set to graduate in 2015 and plans to begin a postgraduate education in clinical psychology afterwards. Besides studying, Katharina works as a group-leading kindergarten teacher. She also works with groups of autistic people in an Autism-Helping-Centre in Vienna.

Katharina has a special interest in musicology and autism spectrum disorder. Her diploma thesis project tries to combine these interests. Katharina enjoys singing in an a-cappella band, playing the flute in an orchestra, travelling and outdoor activities.

## *Comparison between music perceived emotions and facial expressions*

Diana Kayser; University of Oslo, Norway

As several studies already have shown, different emotions are associated with music and in several studies it is suggested that music and speech share the same acoustical features to induce and/or evoke emotions. Most of the studies rely on self-report and therefore solely subjective data. Other studies also include objective measurements as for example skin-conductance to complement and support the subjective data.

Especially for cross-cultural studies these methods can become difficult when it comes to self-report because there are different concepts for emotions and cultural differences in adequacy to show these emotions. In addition are the words used to describe emotions (even when carefully translated) arbitrary because of cultural and perhaps also individual differences.

Because there is also high evidence that facial expressions regarding emotions are universal in different cultures, I would suggest a new approach to study emotions in music with help of the Facial Action Coding system developed by Ekman and Friesen (1978). The idea is, that music communicates emotions to the listener and that these emotions can be seen in the face of the listeners. With the help of the Facial Action Coding System (FACS) and the different muscles (action units) that are activated when a certain emotion is shown, this could be a way to decode the emotion perceived when listening to music. Even if there won't be a visible emotion, there is a chance to detect microexpressions (Ekman, 1992) in the face of the participants with help of slow-motion technique.

This project will in some part contribute to my master's thesis and is still in development. Anyhow, a first step is done by conducting a sort of pilot-study as a group project at the ISSSM 2014 in Genova/Italy where it was found out that participants basically show disgust-faces in reaction to violation of music expectancies.

The goal of this project will be to find out, if mimic expressions arise together with perceived emotions through music and to discuss if some kind of empathy can be seen as one of the mechanisms that let us understand emotions in music.

My name is Diana Kayser and I am from Berlin, Germany. In 2013 I received my Bachelor's degree in Musicology from the University of Cologne, having also spent one semester at the University of Ghent, Belgium. My Bachelor's thesis was a theoretical paper about understanding music through empathy. In the years 2012 and 2014 I attended the International Summerschool in Systematic Musicology (ISSSM) in Hamburg, Germany and Genova, Italy. In August 2014 I start my Master's in Musicology at the University of Oslo, where my Master's thesis will be "Studying Music Perceived Emotions Through Facial Expressions."

*Why do people seek and appreciate sadness in music?*  
Liila Taruffi & Stefan Koelsch; Freie Universität, Berlin, Germany

This study deals with the supposed paradox of why people engage with sad music if sadness is inherently a negative emotion usually avoided in everyday life. Using an online survey, we obtained comprehensive responses from a large multi-ethnic sample of participants (N = 772). The survey investigates the rewarding aspects of music-evoked sadness, as well as the relative contribution of listener characteristics and situational factors to the appreciation of sad music. The survey also examines the different principles through which sadness is evoked by music, and their interaction with personality traits. Four reward dimensions resulting from listening to sad music were identified: reward of imagination (i.e., pleasure derived from engaging imaginative processes), emotion regulation (i.e., pleasure derived from the achievement of different self-regulatory goals), empathy (i.e., pleasure associated with sharing the sadness portrayed by the music as an expression of another's emotion), and no "real-life" implications (i.e., pleasure that lacks any extra-musical or contextual implications). Moreover, appreciation of sad music increases in a sad mood compared to a positive mood and is greater among individuals with high empathy and low emotional stability. Surprisingly, nostalgia rather than sadness is the emotion listeners most frequently experience in response to sad music. Correspondingly, memory-related processes appear to be highly important in eliciting sadness. Finally, the trait empathy contributes to the evocation of sadness via contagion, appraisal, and by engaging social functions. The present findings indicate that emotional responses to sad music are multifaceted, are modulated by empathy and are linked with a multidimensional experience of pleasure. These results were corroborated by a follow-up survey on happy music, which further showed that beneficial emotional effects such as regulation of negative emotion and mood as well as consolation are likely to be unique features of sad music compared to happy music. Such beneficial emotional effects constitute the prime motivations for engaging with sad music and may have important implications for the field of music therapy. Potential implications include the development of music interventions designed to improve health and well-being in healthy subjects as well as in the treatment of psychiatric disorders.

I am a PhD candidate at the Cluster "Languages of Emotion" (Department of Psychology) of the Freie Universität in Berlin, Germany. I have been pursuing an interdisciplinary career from the start: in 2006, I received a BA at the University of Florence in Theoretical Philosophy, followed in 2009 by an MA in Aesthetics with a dissertation on the subject of Philosophy of Music. I then decided to study at the Goldsmiths University of London, where I obtained in 2011 an MSc in Music, Mind and Brain.

*The Relax in Pregnancy Project*  
Chineze Nwebube; Goldsmiths, University of London, UK

## **BACKGROUND**

Many women feel anxious or stressed during pregnancy. Stress, anxiety, and depression faced by a women, increase the risk of both behavioural and biological problems for the baby. These can include, lower birth weight, Attention Deficit Hyperactivity Disorder (ADHD), and potential for depression later in life. This has been suggested to be due to the stress marker cortisol, and it's interference with brain development. Since medication such as antidepressants can cross the placenta and directly harm the child, these methods should be avoided, and non-pharmalogical methods should be used. Studies have shown that music is an effective therapy for reducing stress in patients before surgical treatments A study conducted by Ventura and associates found that stressed pregnant women exposed to music experienced the greatest reduction in cortisol levels alone as compared to the relaxation and the control groups. Based on these studies, it can be hypothesized that music will have the greatest effect in reducing stress in pregnant women.

## **AIM**

This study aims to determine whether listening to lullabies for about 20 minutes a day, can reduce stress and anxiety levels in pregnant women, long term. Women 18 and over, that are 19-33 weeks pregnant are eligible to participate.

## **METHOD**

Women will first take online surveys assessing basic information, and mood. Women will be assigned to one of two relaxation groups. One group will listen to lullabies for about 20 minutes a day, while the other group will relax doing deep breathing exercises for the same amount of time. Surveys will be taken once a month, the amount of time spent doing exercises will be recorded, and their mood will periodically be assessed. For the women within the UK agreeing to have saliva collected, cortisol will be collected on one occurrence.

## **RESULTS**

Data collection is ongoing but will be completed by August 2014, well before the conference date.

## **POSSIBLE APPLICATIONS OR IMPLICATIONS**

This project will aid in finding an alternative to the pharmalogical approaches used to reduce stress and anxiety in pregnant women. This can reduce the risk of behavioural and biological problems in the developing baby.

My name is Chineze Nwebube, and I am a Music Mind and Brain student (within the psychology department) here at Goldsmiths, College. I am interested in determining the role of music on neuroplasticity within the clinical field, specifically the effect of music in rehabilitation and development. My final thesis in my first degree involved electro-physiological analysis of muscarinic receptors in the medial Prefrontal cortex. I am currently supervised by Dr. Lauren Stewart, and working on The Relax in Pregnancy Project, where the effect of music to reduce stress and anxiety in pregnant women is being explored.

*Effects of music and alpha-wave frequencies on meditation*  
Florian Eckl & Richard Parncutt; University of Graz, Austria

Meditation and music are usually performed together. In many cases music is the background of meditation. Thus, the question arises whether music has a positive effect on meditation. This master thesis deals with the assumptions that music 1) enables more rapid entry into a meditative state, 2) makes it easier to enter a meditative state and 3) makes the perception of a meditative state more intense. Alpha waves (8-12Hz) are representative for a meditative and relaxed state. As a consequence, we will test whether alpha frequencies (8-12Hz) played via headphones are triggering a meditative state. The assumption is that frequencies in the range of alpha waves are able to provoke or strengthen the production of alpha waves in the brain and therefore a meditative and relaxed state. In the first exploratory part of this study, results will be obtained in a within-subject design based on rating scales. The second part of this study depends on the first part and will be based on electroencephalography (EEG)-, heart rate variability (HRV)- and respiratory rate (RR)- measurements. The first part of this study will comprise four conditions: 1) no music, 2) stressful music, 3) (relaxing) meditation music and 4) frequencies in the range of 8-12 Hz. In every condition the participants will have to meditate while listening to music (or no music) via headphones. Participants will be divided into two groups: 1) experienced meditating persons and 2) non-experienced meditating persons. After every condition they will have to rate on a rating scale from 1 to 7: 1) how fast they think they experienced a meditative state 2) how easy it was to experience a meditative state, and 3) how intense they perceived a meditative state. Statistical analyses will consist of analysis of variance (ANOVA) of these dependent variables. In case it is possible to induce the production of alpha waves or relaxation, this will be of great benefit for science and medicine, because on the one hand it would be easier to have totally relaxed participants in EEG- studies and on the other hand people would be able to relax whenever and wherever.

Florian Eckl was born in Salzburg, Austria. After school he moved to Graz where he first studied Molecular Biology and made his Bachelor of Arts in Musicology. At the moment he is writing his Masters thesis on the effects of music and alpha-wave frequencies on meditation in Musicology and is in parallel studying Psychology. He is working as a student assistant at the Centre of Systematic Musicology at the University of Graz. Besides he is producing electronic music and hip hop and is engaged in a social music project in India.

*Motivational qualities of music in exercise*  
Dietmar Tscherne; University of Graz, Austria

Music can enhance athletic performance in different ways, depending on whether it is synchronous (movements are in time with rhythm; Terry et al., 2006), asynchronous (no conscious synchronization between movement and music tempo; Terry et al., 2006), or pre-task (to regulate arousal level prior to performance; Karageorghis et al., 2012). Benefits of music include more positive mood, reduced pain/fatigue, reduced subjective exertion, improved performance (e.g. in treadmill running, cycling, on grip strength, etc.), faster acquisition of motor skills, and increased likelihood of flow states (Karageorghis et al., 2001). Motivational qualities of a piece of music depend on the response to rhythm, pitch/harmony, identification with cultural groups, and non-musical associations (Karageorghis, et al., 1999; Terry et al., 2011). Tempo is the most important determinant of response to music (Karageorghis et al., 1999) and an average of 130 bpm was reported to be most suitable for workout settings (Felstead et al, 2006) and for workouts with low to moderate intensity (Karageorghis et al., 2006). This mixed-methods project focuses on the motivational qualities of music, extending Priest's findings (2003). Which music enhances motivation during a workout? Is music particularly designed for workouts more likely to motivate than other music? A total of 24 well-known sound samples with a tempo close to 130 bpm will be cut to a length of ten seconds and assigned to eight different musical styles, making them three samples for each style. Four styles will reflect workout-music (taken from Spotify workout playlists), and four will be non-workout music including Jazz, Classical, Pop/Rock, and Electronic music. Regular gym-goers will be asked to listen to each sample in a random order and to answer the question, how much they would like to listen to that music during a workout, using a questionnaire after each sample. Participants are requested to rate each sample on a seven-point-scale and briefly comment on it. In a second run, subjects will be asked about their musical preferences in general and to rate the samples' musical styles on a seven-point-scale accordingly. Gathered data from both inquiries will be analyzed.

Dietmar Tscherne was born in Deutschlandsberg, Austria on December 18th, 1987 and grew up in Graz, Austria. In his childhood and youth, Tscherne underwent musical training in guitar and voice for several years. Since 2008, he has been studying Musicology and Media Studies at both the University of Graz and the University of Music and Performing Arts Graz. Within the Musicology curriculum, he is focusing on the Music Psychology and Acoustics stream. In 2013, Tscherne took a course studying voice at university level, and received his BA degree in Musicology. In 2014, he obtained his certificate in Media Studies. Moreover, Tscherne is particularly interested in sports and foreign languages. In his Bachelor's thesis, Tscherne asked how musical creativity can be enhanced in music education, and recommended a series of specific learning strategies. A literature review suggested that internal and external factors are about equally important. For more details, please go to the following link: [http://www.uni-graz.at/~parncutt/fk\\_arbeiten/TscherneBachelorThesis2013.pdf](http://www.uni-graz.at/~parncutt/fk_arbeiten/TscherneBachelorThesis2013.pdf)

Being a group fitness instructor, for his Master's thesis Tscherne is especially interested in why music enhances motivation during a workout. Thus, he wants to answer questions related to this topic by examining music typically used for workouts and non-workout music, as well as gym-goers' motives for listening to music while exercising. Professor Richard Parncutt will be co-author and supervisors for this thesis (for more information, please go to this link: <http://www.uni-graz.at/richard.parncutt/>).

*Brain and body percussion: The relationship between motor and cognitive functions*  
Riikka Ahokas, Birgitta Burger, Tiina Parviainen, Anu Penttinen, Juho Strömmer, Marc  
Thompson, & Jan Wikgren; University of Jyväskylä, Finland

Body Percussion is a motor, rhythmic learning method within music education used to teach rhythmic structures. This activity is also used in common classrooms to improve students' concentration and attention. Although the intervention is applied to enhance cognitive functions, effects of this method haven't ever been studied neuroscientifically before. This study investigates embodied motor rhythmic exercises' (e.g. Body Percussions) ability to enhance cognitive functions (attention and planning). As the method has been applied successfully in music education for decades, results of this study were hypothesized to be positive.

The long- term effects of Body Percussion on planning skills were studied with pre- and post-measures of executive functions test (computed neuropsychological test Tower of London). Training period lasted 2,5 months, and consisted of 10-20 minutes of weekly body percussion training sessions. The participants were 5th graders (average age: 11 years, N=24) in normal elementary school. Experiment group performed significantly better after the training period ( $p=0.0492$ ) compared to the control group ( $p=0.4$ ).

The short-term effects of Body Percussion on attention were measured with EEG (Electroencephalography). An auditory oddball- paradigm for EEG was designed and piloted with one adult participant. MMN (mismatch negativity) amplitude = the response to deviant stimuli, was stronger after the 30-40 min body percussion training. Both, long- and short-term effect studies were supportive for further research.

(Jenni) Riikka Ahokas (born 9th of April 1978) is a Music educator from Finland currently working with ASD (Autism Spectrum Disorder) populations. She is aiming to reinforce the common ground between music education and music therapy. She has studied the benefits of the use of rhythm exercises with ASD-populations (Ahokas 2012), and is presenting her newest neuroscientific research results on body percussion and healthy populations (Brain and Body Percussion) in this conference.

## *Western tonal knowledge in 3- and 4-year-old children*

Nina Politimou; Middlesex University, London, UK

Implicit knowledge of the rules governing music structure in any given culture is acquired through exposure to a particular music system and seems to follow a developmental trajectory from infancy to early adolescence. The course of acquisition of this knowledge in preschool children has been understudied and existing findings are somewhat inconsistent, largely depending on the use of either explicit or implicit tasks. Even though 2.5 to 5-year-old children have been shown to possess knowledge of harmonic rules when tested with implicit measures such as electroencephalography (EEG; Corrigall & Trainor, 2013; Jentschke, Friederici, & Koelsch, 2014) and a harmonic priming paradigm (Marin, 2009) they did not seem to perform above chance level in an explicit task which requested them to make judgments about the “goodness” of melodies (Corrigall & Trainor, 2013). In this study we presented 4-year-old children with simple and engaging explicit tasks. We compared their performance to that of 3-year old children, an age group which has not yet been behaviorally tested with respect to the understanding of Western tonal structure. An implicit task is also being developed (harmonic priming paradigm; Shellenberg, Bigand, Poulin-Charronnat, Garnier, & Stevens, 2005) to be administered to the same age groups. This investigation sheds light on the developmental acquisition of Western tonal knowledge and discusses methodological considerations in the assessment of preschool children.

Nina Politimou is a PhD candidate at Middlesex University London. Nina Politimou completed her BSc in Psychology in the National and Kapodistrian University of Athens in Greece, and graduated with a diploma in harmony and theory of music from the Raymonde Conservatory in Athens. She continued her MSc studies in Cognitive Psychology and Neuropsychology at the Aristotle University of Thessaloniki, Greece, where she participated in a number of research projects examining various aspects of neurocognitive processing in healthy and clinical populations. Her current research at Middlesex University explores the perception of Western musical structure in preschool children and its relationship to linguistic abilities and working memory. Another aim of this project is to use a longitudinal design to investigate the effect of musical training on linguistic abilities, as well as the inverse effect of linguistic training on musical abilities in the same age group.



# *An Acoustic Analysis of Ban and Zil Singing by Azerbaijan Female Mugham Singers Using the LTAS*

Alexandria Sultan von Bruseldorff, Westminster Choir College of Rider University, USA

Azerbaijani mugham reflects the innermost creative music identity of the Azerbaijani heritage through one of the most complex forms of communication, the voice. Traditional performances of vocal mugham require improvisatory skills, possession of an extraordinary vocal range, and the ability to recite extensive poetry (ghazal), which are set on specific melodic modes. This paper explores the acoustic features of mugham, and is a part of an ongoing research that investigates vocal production, performance practice, and the cognitive perception of Azerbaijani vocal mugham. It originated as part of a master thesis, and hypothesizes that the singer's formant is present in the sound of ban (low register singing) and zil (high register singing), in vocal mugham. It uses the Long-Term-Average-Spectrum (LTAS) to investigate acoustic parameters, looking for common factors in the distribution of energy across frequency spectrums. It analyses the sound produced by five professional female Azerbaijani Mugham singers between the ages of thirty and fifty. Each singer performed the same piece, entitled "Mirza Huseyn Segahi." Excerpts were spliced. Duration was relatively similar for each singer in ban and zil. Minor differences in duration were the result of different improvisatory elements used by the singers. The data gathered from each recording were analyzed using the Multi Speech Voice Analysis program (Kay -Pentax, Lincoln Park, NJ) in order to investigate the contour of the acoustic spectrum. The analysis was performed on each singer's ban and zil singing samples, observing changes, or the lack of change, in the LTAS data. The LTAS data showed prominent peaks and valleys in five instances of ban for all five singers. It was possible to identify a singer's formant for all samples. Despite the abundance of scholarly material focusing on mugham, little is known about the acoustic and physiologic properties of Azerbaijani vocal mugham, specifically how ban and zil are produced. This research fills the gap in understanding the vocal production, acoustic and physiologic aspects of this Ancient art form of vocal expression.

Hailed for her "beautiful and versatile" concert debut in December of 2010, at the Azerbaijan State Philharmonic Hall with The State Symphonic Orchestra of Azerbaijan named after Uzeyir Hajibeyov, and at the International Mugham Center of Azerbaijan with the State Chamber Orchestra named after Gara Garayev, American based soprano Alexandria Sultan von Bruseldorff (Sultanzade) is an emerging classically trained artist who was born in Baku, Azerbaijan, the historical crossroads of a unique social, political, economical, cultural, and musical coalescence of East and West, into the family of the "legendary Azerbaijani Mugham virtuoso Kor-Akhad Aliyev".

Alexandria had a pleasure of singing under the batons of Francesco Carotenuto, Rui Zhang, Gerardo Edelstein, Charles West, Ismail Hajiyev, Teimur Goychaev, and Rauf Abdullaev. She has participated in master classes with Maestro Peter Mark, Virginia Opera, Richmond, VA, USA; Maestro Dan Sounders, Virginia Opera, Richmond, VA, USA; and Dalton Baldwin, American collaborative pianist, Westminster Choir College, Princeton, NJ, USA.

Ms. Sultan von Bruseldorff also has appeared in leading roles, concerts, and solo recitals, including The John F. Kennedy Center, with Silk Road Chamber Orchestra, Washington, D.C.; The Juilliard Opera Workshop Series, New York, New York; Evening of Azeri Music with Legendary Azerbaijani Pianist, People Artists of Azerbaijan, Chingiz Sadikhov, Markham Theatre for the Performing Arts, Canada; The Opera Theatre of VCU with Richmond Symphony; Niagara International Chamber Music Festival with Gould String Quartet and Silk Road Chamber Orchestra, Canada; Palazzo Sant'Ivo alla Sapienza with International Chamber Ensemble under the auspices of Accademia Filarmonica, Rome, Italy. In 2013 Ms. Sultan von Bruseldorff earned her Master of Music degree in Vocal Performance and Pedagogy at Westminster Choir College of Rider University in Princeton, United States, under the tutelage of renowned soprano, Margaret Cusack. Her pedagogical studies and Master dissertation was based on a comparative research of human voice acoustics, under the advisory of Dr. Scott McCoy, DMA. During the course of her academic studies, Mrs. Sultan von Bruseldorff was a member of the prestigious Westminster Symphonic Choir. While at Westminster she has collaborated in various opera performances and scholarly research mediums, including Independent Research Studies Project under the tutelage of musicologist, Dr. Eric Hung presenting at the international musicological conferences such as The First Pax Turcica Conference in 2009, which was co-hosted by the prestigious School of International and Public Affairs (SIPA) at Shapiro Center, Columbia University, NY; and International Musicological Conference, Russian and Soviet Music; Reappraisal and Rediscovery, presented by the Music Department of University of Durham, England.

Apart from performing, Ms. Sultan von Bruseldorff is interested in the subjects of voice science and pedagogy, music perception, and historical aspects of opera development including origin and synthesis of Mugham and its late influence on Azerbaijani Opera. Ms. Sultan von Bruseldorff is a member of US-Azerbaijan Chamber of Commerce, representing Uzeyir Hajibeyov Caspian Mugham Opera Federation of America Inc. The mission of which is to promote cross-cultural dialogue between the United States of America and Democratic Republic of Azerbaijan through music, education and the art of singing.

*Perceived spaciousness in music presented through headphones,  
loudspeakers and wavefield synthesis*

Claudia Stirnat; University of Hamburg, Germany

The perception of spaciousness has found increased interest in fields of acoustics in the last years because its importance for its influence on perceiving sounds has been revealed. People rather listen with headphones than with loudspeakers, e.g. in listening studies (Kallinen and Ravaja, 2007). One possibility to avoid this issue could be to conduct studies with the wave field synthesis as a virtual headphone which Laumann, Theile and Fastl (2008) have designed. The motivation of conducting this study is the result of a former study in which participants were asked to evaluate spaciousness while listening with loudspeakers. The participants heard music of five different musical genres with 30 excerpts for each genre. The study displayed the fact that the investigated genres allow classifications to certain spatial features such as “big”, “wide” and “open” (Stirnat, 2012), this study will deepen this research field. In contrast to the former study, it will use stereo loudspeakers, headphones and a wave field synthesis conducting another hearing test in which participants undergo all three technical conditions. Also participants will listen to only 30 excerpts of mixed genres and instruments.

This study will concentrate on answering these questions: Firstly, how do we perceive spaciousness in music itself with the different technical devices? Secondly, what are the differences in the perceived spaciousness when participants listen with loudspeakers, headphones and wave field synthesis? Thirdly, is it possible to replace headphones with a wave field synthesis? With the gathered results, conclusions can be made on what pros and contras, concerning the use of the different technical equipment, are. One hypothesis is that there will occur technology specific attributes for the perceived spaciousness in music. Another hypothesis is that there will be music specific attributes for the perceived spaciousness. The methodology used for this study will consist of a hearing test including twelve pictures showing spatial attributes that will be rated on a numeric scale as well as dummy head recordings for an objective comparison.

Before I started studying Systematic Musicology at the Institute of Musicology in Hamburg in the winter term 2008, I had spent a year as an Au Pair in Detroit, Michigan, USA. During my Bachelor studies, having Media and Communication Science as a minor, I developed my research interests in Room Acoustics, Music Psychology and Psychoacoustics. I became very fascinated by the field of Room Acoustics in which I decided to write my Bachelorthesis in. In this thesis I analyzed data of a psychoacoustical test that investigated the perceived spaciousness in different musical genres. In my Masterstudies I have further focused on room acoustical research in which I am currently writing my Masterthesis. It is similar to my Bachelorthesis using three different conditions with headphones, loudspeakers and the wave field synthesis. The project is described in my abstract and supervised by Prof. Rolf Bader. In addition, I have enlarged my research interests to music perception including audiovisual topics. Last year I did an Erasmus-year at the University of Jyväskylä, Finland, where I attended the international Masters' program “Music, Mind, and Technology”, focusing on Music Perception, Music Psychology and Sound Processing. At the end of that year my class had a Music Processing concert in which we presented the newest technology regarding music. I performed the flute with a classmate on the piano demonstrating the possibilities with the room acoustical program “Odeon”. In March I participated in the International Summer School of Systematic Musicology (ISSSM2014) in Genua, Italy, where I presented my research idea of my thesis. So far, I have been a tutor in Methodology, Music Psychology and have practiced statistical methods as well as presentations with the students. This semester I am a tutor for the practical Music Psychology, helping the students with their group projects in which they conduct studies themselves. Furthermore, I worked in the administration office for the Natural Science department where I mostly supported the nomination office.

*Loudness War & Hypercompression: Quantifying the perception of compression effects*  
Andreas Juwan; University of Graz, Austria

The Loudness Wars have been fought since several decades on various fronts. The term generally indicates the efforts by the music industry to release records with a steadily increasing loudness to the market. Besides radio broadcasting, movies and television the audio recordings in popular music are one of the most contested fronts. At the beginning a few historical facts, some terms and conditions for the emerging Loudness Wars will be clarified.

My research has its main focus on (digitally produced) popular music productions and their post-processing (audio mastering). At this stage of production compressors and digital limiters are used to make the final production sound louder. Since the Audio-CD hit the market in 1982 and thereby the establishment of digital audio productions the average RMS-Level of Audio-CDs has increased heavily. In many cases, the tendency towards “hypercompression” has led to a decreasing overall sound quality in the sense of a measurable loss of dynamic range or even audible musical clutter.

The empirical study for my masters thesis examines the main question if and when compression effects and artefacts are perceivable. The listening test is currently in the planning phase and will use methodics of systematic musicology/music psychology. Randomized A/B-comparisons of self created soundsamples should be rated by a pool of expert listeners in order to collect quantitative data. The aim is to quantize the perception of compression effects on a scientific base and thereby to contribute to possible de-escalation strategies for the ending of the Loudness Wars. But also not directly perceivable compression effects like a potential listening fatigue will be discussed in a meta-theoretical way. Due to the lack of scientific studies on this topic, the attempt to quantize the perception of “hypercompression” can somehow be considered as a pioneering and shall have modeling character for further research in this area.

My name is Andreas Juwan, and I am currently attending the Masters Programme in Musicology with the emphasis on Music Psychology and Acoustics. My current research addresses the perception of compression effects and is the main topic of my masters thesis, which will be finished by November 2014. I achieved my A-Level degree in Mechanical Engineering in 2005 and since 2011 I hold the BA in Musicology. For the last several years I was also part of the AAP (Advanced Audio Processing) Expert Listening Panel located at the IEM/University of Music and Performing Arts in Graz/AT. I am also a performing musician and run a small recording studio.

*Ontological description of vocal production in world's music cultures – a physiological approach*

Polina Proutskova; Goldsmiths, University of London, UK

We present our investigative study into vocal production ontology intended for comparative cross-cultural analysis of singing style. Such an ontology should provide a baseline vocabulary to explicitly define and compare vocal production, helping to formalise the discourse on vocal quality and singing style within and across disciplines, including ethnomusicology, voice science, singing education and music informatics. Our study examines the viability of using physiological and functional descriptors for modelling of vocal production. Vocal quality is usually described in subjective, perceptual terms such as bright or dark sound, metallic, heavy, brassy, lyrical, round, etc. These descriptions are not only tradition specific, but more often than not they are highly subjective. While many disciplines have approached vocal production (Johan Sundberg in voice science, Jo Estill in singing education, Alan Lomax in ethnomusicology), these approaches still have limited, discipline specific applications and some of them display methodological weaknesses.

Our study is based on interviews with 13 world-class experts in vocal physiology - otolaryngologists, speech language therapists, singing teachers. They performed perceptual and physiological analysis of 19 singing fragments from 11 cultures. Physiological analysis was conducted using our preliminary ontology of vocal production based on state of the art concepts in voice science and singing education. The aim of our study is to verify the consistency of experts' ratings and the inter-rater agreement, a strong agreement indicating a general validity of physiological approach.

Our study design combines quantitative and qualitative research methods. We present the results obtained through a detailed statistical analysis of inter-participant agreement, triangulated via qualitative analysis of the interviews. We also examine the relationship between experts' perceptual and physiological ratings. We discuss the implications of our results for further ontological work in the field of vocal production.

I am a PhD student in computer science at Goldsmiths, Geraint Wiggins, Christophe Rhodes, Tim Crawford are my supervisors. I have conducted research in Music Information Retrieval, voice science and in ethnomusicology. I also perform as a singer, teach singing, lead vocal ensembles and lecture in singing and in Russian village traditions.

*A Comprehensive Approach in Music and Audio Analysis: Similarities in Helmut Lachenmann's Music Compositions*

Ivan Eiji Simurra; University of Campinas, Brazil

The recent paradigms related to the History of Modern Western Music may stratify an evolutionary path on the noise-like sound usages in instrumental or acoustic music compositions. It can be traced primarily from the Italian futurist Luigi Russolo, the French-Italian composer Edgard Varèse, the American composer John Cage and particularly with the music compositions of Helmut Lachenmann. The German composer is rightly associated with the concept of 'instrumental musique concrète', a notion and a set of techniques that regard sound not as an abstract vehicle for musical ideas in the traditional sense of motivic development, but as the by-product of physical work, of the tension and release of human effort.

The original approach of the 'musique concrète', as developed by Pierre Schaeffer and Pierre Henry, extracts its compositional materials from the noises and sounds mainly of the daily life. In following, they were recorded and put together by collage. Lachenmann tries to apply this procedure not with prerecorded sounds, but with the instrumental music potentialities.

From a chronological point of view, the music production of Lachenmann can expose a natural maturing in aesthetic, philosophical and musical positions. Contemporary Western Music can diverge from repetition patterns both for formal structure or compositional materials, acoustic similarities. This can be highlighted by analysis based on low-level acoustic features, which give objective evidence towards the existence of sound correspondences within a piece.

The objective of the research is to stress and to pinpoint the most substantial aspects on the music of Lachenmann for large ensembles from a myriad of sound constructions, spectral features, aesthetical and compositional procedures extracted from his early works for solo instruments. In our analysis process, we calculated statistics (mean, variance and skewness) from low-level, framewise acoustic features estimated throughout recordings. It could be observed that semantically coherent excerpts were related to features that could be organized according to simple rules. This indicates that these features may be used both as objective evidence of the similarities between two excerpts, but also that they may be used to automatically extrapolate the one's perception, enhancing the analyst's capability of finding similar musical excerpts.

IVAN EIJI SIMURRA (PhD Student)

Composer, researcher, performs electronic manipulations in Pop Music. BA in Music Composition and Master in Creative Processes at University of Campinas (Brazil). Currently, he is a PhD candidate at University of Campinas, with the FAPESP funding. He teaches Harmony, Theory and Composition. Also he develops projects relating instrumental music composition, music analysis and systematic musicology. Participated in several Festivals, Master Classes, Workshops and Music Conferences like the International Society for Music Information Retrieval (ISMIR) and The Sound and Music Computing (SMC). His works are being performed in Brazil, Argentina, Chile, Israel, Russia and United States.





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