

Music & Science Festival

GCME 2012

Geneva Colloquium on Music and Emotion

Evolution, history, and neurobiology

November 14 - 17, 2012

Grand Théâtre de Genève

Place Neuve, Genève

Wednesday, November 14

THE EMOTIONAL ROOTS OF MUSIC EVOLUTION

Speculations on the evolution of music abound in the literature across the centuries, often generating heated debates. This symposium attempts to reexamine the issue from a perspective that highlights the role of emotion in this process. The speakers approach the issue by presenting theory and evidence from many different disciplines, including the affective sciences, music cognition, and cognitive biology. A common issue of the discussion is the role of emotional expression in the evolutionary development of musical traditions and the further development into the direction of aesthetic emotions.

Chair: Bernardino Fantini

09:00-10:00 - **Klaus Scherer** (University of Geneva)

Vocal emotion expression and the evolution of music

There is a surprisingly large overlap between the acoustic features of vocal emotion expression in many species and the structural and acoustic features of many kinds of music. Also, music has often been considered as the "language of emotion". I explore the possibility that primitive multimodal affect bursts may have been a major precursor of the evolution of music (and speech). In evaluating this hypothesis I selectively review pertinent evidence from paleontology, neuroscience, ethology, psychology, and musicology.

10:00-11:00 - **David Huron** (Ohio State University)

On the Cognitive and Social Functions of Sadness and Grief: Lessons from Music and Ethology

Physiologically, sadness resembles hibernation, whereas crying resembles an allergic response. When mourning, periods of active crying typically alternate with periods of quiescent sadness. What accounts for the physiological and psychological differences between sadness and grief? Drawing on the ethological distinction between signals and cues, I argue that sadness and grief serve different cognitive and social functions and that these behaviors have followed separate but complementary evolutionary paths. Finally, I illustrate how sadness and grief are echoed in different forms of musical expression.

11:00-11:15 - Coffee break

11:15-12:15 - **Tecumseh Fitch** (University of Vienna)

What is music, that it moves us?

I will address this question in two guises: abstract and concrete. At an abstract level, musical form carries us through an "aesthetic trajectory", reminiscent of Aristotle's narrative arc, involving recognition, cognitive dissonance and resolution (and often repeated multiple times and at multiple scales). Such a trajectory is what makes music breathe, and can be analogically mapped onto multiple other domains including, but not limited to, the emotional. At a concrete level I will consider movement, and ask why humans (and very few other species) not only CAN but LIKE to move their bodies to a rhythm. I suggest that seeing human dance as a central (if only covert) component of music allows us to understand otherwise puzzling phenomena such as strong syncopation in African and Latin music. Finally, I suggest that a central component of musical rhythm -- isochrony -- can be explained as a necessary reaction to group synchronization.

12:15-13:00 - Podium discussion

13:00 14:00 - Lunch

COGNITION-EMOTION INTERACTION IN LISTENER REACTIONS TO MUSIC

Music is generally expected to produce a strong emotional impact on the listener and a constantly growing body of literature attests to that effect. However, the nature of the mechanisms that are involved remains elusive. The speakers in this symposium present a number of different approaches aiming at a better understanding of these processes, providing new insights and data from different disciplines, including the neurosciences, psychology and musicology, and examining the role of different types of music in historical perspective.

Chair: Georges Starobinski

14:00- 15:00 – **Didier Grandjean** (University of Geneva)

The dyadic waves of emotion: music wavelets and brain oscillations

How are emotions inferred from music? How is the human central nervous system able to decode and build up acoustical objects based on air waves produced by musicians? The brain's auditory pathways and more anterior brain areas allow humans not only to perceive basic sounds but also to attribute and feel emotions during music listening. Both musical structure parameters and acoustical features contribute to the perceived and felt emotions in music. One critical musical structure characteristic is the perceived tempo and metrics in music inducing entrainment phenomena which can be studied at several levels including brain waves, peripheral physiological rhythms such as respiration, action tendencies and actual motor behaviors. Here we propose to discuss how, from primary auditory regions, the information flow related to rhythms can be spread out to other brain regions such as basal ganglia, insula, and supplementary motor and motor areas contributing to the emotional impact of music.

15:00-16:00 - **Emmanuel Bigand** (University of Dijon)

Are we moved by contemporary music as we are by classical music?

Emotional responses to music raise numerous questions: is there a consistency between listeners (musically trained and untrained)? How can we characterize emotional experience with music? Which processes govern these responses? Does contemporary music induce similar emotion? How many milliseconds are necessary to start to be emotionally engaged with music? I will review all of these questions by presenting a set of experience run with musically trained and untrained listeners, with musical pieces from the baroque, classical, romantic, modern and contemporary periods.

16:00-16:15 - Coffee break

16:15-17:15 - **Michael Spitzer** (University of Liverpool)

Analysing Emotion in Art Music: Between History and Psychology

To analyse musical emotion in an extended art-music composition, we need to negotiate the historicity both of musical material and emotional values, the particularities of aesthetic emotion (its transcendence, wonder, and power), and its mimesis of human action and expression. Psychologically-oriented approaches have hitherto shied away from analysing substantial masterworks of the Western tradition. In this talk, I look at the four movements of Bach's Sonata for Unaccompanied Violin No. 1 in G minor as expressions of four distinct emotional categories, in terms of multiple inflections of a single contrapuntal model. I relate perspectives from modern emotion theory to historical concepts of the passions and affections.

17:15-18:00 - Podium discussion

Thursday, November 15

HISTOIRE DE L'INTERACTION MUSIQUE-ÉMOTION

ON THE HISTORY OF MUSIC-EMOTION INTERACTION

Symposium in French without translation

Venue: Auditorium Espace Ardit, 1 avenue du Mail

Durant toutes les périodes historiques la musique a été caractérisée par son pouvoir émotionnel. A travers des communications présentées par des spécialistes et une discussion libre avec le public, ce colloque se propose d'aborder des moments significatifs de la relation entre musique et émotions, à l'aide d'exemples musicaux tirés de la musique savante et populaire, de la Renaissance à l'époque contemporaine.

Chair: Klaus Scherer

09h30-09h55 - Laurence Wuidar (Université libre de Bruxelles)

Émotions contemplatives, émotions sensibles : la musique au cœur du corps chrétien

Transporté, élevé, abaissé ; transporté hors de soi, transporté au-delà de soi, au-delà de sa volonté, au-delà de son intellect, envolé au troisième ciel, volé à sa propre raison ; transporté en-deça de sa conscience, attiré dans les profondeurs des sens et l'opacité du corps : tel est l'être face à la musique, l'être dans la musique, l'être à la fois plongé et emporté dans et par la musique comme le conçoit et le perçoit saint Augustin. L'être dans son ensemble – corps, raison, volonté, mémoire – est à la fois élevé vers les plus hautes sphères de la contemplation grâce à la musique qui semble sortie tout droit de la bouche de Dieu – telle est la représentation de certains Commentaires aux psaumes – et abaissé jusqu'aux tréfonds de ses sens ; là l'être n'est plus que corps, la musique lui ayant enlevé toute faculté de raisonner, il n'est plus qu'affect sensitif pris dans le filet sensuel de la musique – c'est le trauma pécheur raconté dans les Confessions. Augustin constitue une des racines historiques essentielles des rapports entre musique et émotion non seulement car il a expérimenté cette nature ambivalente de la musique et en témoigne à la première personne, mais parce que son autorité va marquer des siècles de culture occidentale.

09h55-10h20 - Jean-Christoph Aubert (Université de Lausanne)

L'à Dieu, mis en musique

La mort, le silence et l'absence, se situent au cœur même de la condition humaine. Moment d'interrogation intense où l'être humain, contrairement à toute autre espèce vivante, regarde son congénère, l'enterre et esquisse quelques signes. Ces comportements primitifs se sont transformés peu à peu en cérémonies, en monuments et en Requiem. Le propos de cette intervention n'est pas d'étudier l'évolution du regard de l'homme face à la mort, ni de décrire l'importance de la formation du souvenir (trace, forme ou message), mais d'entrevoir, par quelques arrêts sur images (écoutes), la richesse de ce dialogue musical avec l'indicible.

10h20-10h45 – Gino Leonardo Di Mitri (Université de Lecce)

La musique, les émotions, la transe. Le cas historique du tarentisme

*Le tarentisme est un rituel de possession très ancien, présent en Italie du sud jusqu'au siècle dernier. Il consistait à traiter les personnes qui avaient été piquées par la *Lycosa tarantula* par des modes musicaux spécifiques. Selon cette idée, la forme de la maladie dépendait de l'espèce d'araignée, chacune d'entre elles étant responsable de l'inoculation d'un venin particulier. Le choix des airs joués par les musiciens lors du traitement correspondait à un diagnostic primitif fondé sur l'association entre les émotions éprouvées par les malades, les passions et les états d'âme précédant la piquûre. Trois auteurs du XVIIIe siècle (Giorgio Baglivi, Harald Vallerius et Jean-Jacques Rousseau) ont particulièrement discuté la question des tempéraments musicaux appliqués à ce complexe phénomène biologique et anthropologique.*

10h45-11h15 – - Pause café

11h15-11h40 - **Andrea Garavaglia et Luca Zoppelli** (Université de Fribourg)

"Les passions font durer les pensées": notes sur la structure temporelle des émotions dans la musique vocale baroque

Lieu dramaturgique et musical qui structure l'expression subjective des personnages, l'air baroque simule, à travers son étendue chronométrique, l'illusion du développement temporel de l'âme. Notre recherche se fonde sur une lecture croisée de différentes catégories de sources de l'époque : théorie musicale, esthétique de l'opéra d'un côté ; réflexion philosophique, physiologique et rhétorique sur les passions et sur leur rôle dans la formation de l'individu de l'autre côté. L'articulation structurelle croissante de l'air, les répétitions et la prolifération des vocalises prolongent de manière remarquable l'étendue temporelle de l'air, à cheval sur les XVIIe et XVIIIe siècles.. Cette stratégie suggère l'existence d'un modèle opératif de l'esprit selon lequel les mouvements émotionnels stimulent et agissent sur la durée des processus cognitifs, processus dont la pensée de l'époque souligne, de manière croissante, la complexité et l'amplitude.

11h40-12h05 - **Bernardino Fantini** (Université de Genève)

La musique comme métaphore des émotions dans la pensée musicale du 18e au 20e siècle

A partir du 18e siècle, les anciennes théories établissant un lien direct entre la structure musicale et les passions de l'âme sont remplacées par une théorie qui explique le pouvoir émotionnel de la musique par la correspondance ou l'analogie entre les figures musicales et les mouvements du corps et de l'âme produits par les émotions, entre notamment le contour des lignes mélodiques et la physionomie de la vie émotionnelle. La musique devient une métaphore dans laquelle une figure, une image, un symbole établissent des liens forts entre le signifiant (les phénomènes musicaux) et le signifié (les composants de la vie émotionnelle, au niveau du corps, de l'imagination et de l'intellect). Étant donné que les émotions elles-mêmes, selon la leçon darwinienne, sont aussi une forme d'expression, de communication, la musique devient une puissante métaphore de la vie émotionnelle. La structure complexe du phénomène musical (les sons, les figures et la forme) se pose comme parallèle à la structure complexe, à la fois corporelle et cognitive, de l'émotion.

12h00-12h30 - **Georges Starobinski** (Université de Lausanne)

L'émancipation de l'auditeur dans l'esthétique musicale

Autour de 1700, l'esthétique musicale commence à accorder une attention nouvelle à la manière dont la musique est perçue par l'auditeur. Théorisés dès l'Antiquité, les effets de la musique sont repensés de manière plus empirique à la faveur des bouleversements sociaux que connaît le 18e siècle. Aux affects typés de la rhétorique musicale on oppose après 1750 les sentiments individuels qui ne se laissent plus réduire à des explications rationnelles. Ceci a des conséquences sur l'écoute et l'interprétation des œuvres. Tandis que les affects baroques étaient «représentés», les sentiments sont « exprimés » par le compositeur. Cette « esthétique du sentiment » qui échappe à toute justification rationnelle a ses prolongations dans la pensée romantique et jusque dans les théories expressionnistes des années 1910. Elle est aussi à l'origine de simplifications abusives au 19e siècle qui ont appelé des réactions « formalistes » mais n'en survivent pas moins jusque dans la littérature de vulgarisation récente. Il semble donc utile d'en comprendre l'origine dans les discours qui ont accompagné l'émancipation de l'auditeur au 18e siècle.

12h30-13h00 - Table ronde finale et discussion générale.

Friday, November 16

NEUROPSYCHOLOGICAL RESEARCH ON EMOTIONAL REACTIONS TO MUSIC

This symposium is dedicated to the study of the neuropsychological mechanisms related to the processing of musical emotions. The organization of auditory perception and the neural processing of complex acoustic signals will be discussed in an interdisciplinary perspective. The brain mechanisms related to the perception of emotions conveyed through music and how feelings induced by music are organized both at psychological and neuronal levels will be discussed in several scientific contributions.

Chair: Clara James

9h30-10h00 - Didier Grandjean & Kim Torres-Eliard (University of Geneva)

The dynamics of musical emotions

The emotions expressed through music have often been investigated by asking listeners to fill questionnaires at the end of a given musical performance or an excerpt; only few studies have been dedicated to the understanding of the dynamics of emotions expressed by music in laboratory or in social contexts. Based on a specific model of emotions related to music, the Geneva Emotion Music Scale (GEMS), we tested to what extent such dynamic judgments are reliable and might be a promising avenue to better understand how listeners are able to attribute different kinds of emotions expressed through music and how the social contexts might influence such judgments. The results indicate a high reliability between listeners for different musical excerpts and for different contexts of listening including concerts, i.e. a social context, and laboratory experiments. During this session we will discuss how the brain dynamics underlies the unfolding of music perception and the related emotions.

10h00-10h30 - Patrik Vuilleumier (University of Geneva)

Neuroimaging of emotion and music perception

Producing and perceiving music both appear ancient and elementary abilities of the human brain, and yet constitute one of the most sophisticated activities of the mind, bringing together and relying on virtually all other cognitive skills – from fine auditory analysis through to highly complex motor skills to memory, attention, language, imagination, and a rich palette of emotional feelings. However, the cerebral bases of musical abilities and emotions evoked by music are just beginning to be elucidated. This presentation will provide an overview of current knowledge in neuroscience, as obtained in particular with the advent of neuroimaging techniques over the last two decades. It will focus on the neural substrates involved in music-evoked emotions, their similarities and differences with respect to other emotional experiences, but also the neurological or developmental disorders selectively affecting musical abilities, and the potential therapeutic applications of music in certain brain diseases.

10h30-11h00 - Eduardo Coutinho (University of Geneva)

Psychoacoustic cues to emotion in speech prosody and music

There is strong evidence of shared acoustic profiles common to the expression of emotions in music and speech, yet relatively limited understanding of the specific psychoacoustic features involved. I will present a study that combines a controlled experiment and computational modelling to investigate the perceptual codes associated with the expression of emotion in the acoustic domain. The empirical stage of the study provided continuous human ratings of emotions perceived in excerpts of film music and natural speech samples. The computational stage created a computer model that retrieves the relevant information from the acoustic stimuli and makes predictions about the emotional expressiveness of speech and music close to the responses of human subjects. I will show that a

significant part of the listeners' second-by-second reported emotions to music and speech prosody can be predicted from a set of seven psychoacoustic features: loudness, tempo/speech rate, melody/prosody contour, spectral centroid, spectral flux, sharpness, and roughness. The implications of these results are discussed in the context of cross-modal similarities in the communication of emotion in the acoustic domain.

11h00-11h30 – Coffee break

11h30-12h00 - **Sascha Frühholz** (University of Geneva)

The emotional melody of speech and singing: insights from brain imaging

The affective states of individuals can considerably influence the way of how they speak and sing. Especially, these affective states can influence the tone of voice during vocal expressions and this is most evident in changes in speech melody and the expressivity of a singing voice. The human brain seems to incorporate specific mechanisms underlying these vocal expressions in speech and singing, and different brain areas seem to regulate the different components involved in these vocal utterances. This presentation will specifically outline the neural basis during angry vocal expressions and during the imitation of voices of other singers.

12h00-12h30 - **Wiebke Trost** (University of Geneva)

Rhythmic entrainment as emotion induction mechanism in music

Music is a form of art that evolves in time. Emotional reactions to the music also represent dynamic processes and it is thought that they are strongly influenced by the temporal structure of the music. As most music is based on a metrical structure, it is suggested that the different rhythms in the brain and the body resonate to the music and eventually tune these internal rhythms into the external rhythms presented in the musical structure. I will present in this talk this notion of 'rhythmic entrainment' and its role as a possible emotion induction mechanism in music listening. The underlying brain processes of musical rhythm processing will be described and it will be discussed how these processes may interact with the production of emotions.

EMOTIONAL INTERPRETATION AND THE SINGING VOICE

Workshop in French without translation

14h15-16h45 – HEM / Conservatoire de Genève, Centre musical Robert Dunand, rue du Marché 9, Carouge – salle de concert

Johan Sundberg (KTH Stockholm, physiology and acoustics of the singing voice), **Brigitte Ravenel** (Nyon, mezzosoprano), **Claude Darbellay** (Genève, baryton-basse), Klaus Scherer (Université de Genève, psychology)

Emotion in the singing voice / L'émotion dans la voix chantée

Demonstration of basic physiological mechanisms of the singing voice using hands-on examples of the role of different acoustic and music structural parameters in different types of emotional interpretation (including examples on singing synthesis). Presentation by a leading expert on the singing voice and interaction with two professional singers and a psychologist working on music and emotion.

Saturday, November 17

THE SINGER'S PARADOX – EMOTIONAL INTERPRETATION IN OPERA

Round table in French without translation

9h30-13h00 – Round Table

Michel Plasson (Toulouse, chef d'orchestre), **Thüring Bräm** (Bâle, compositeur), **Pierre-André Gamba** (Genève, metteur en scène), **Klaus Scherer** (Genève, psychologue), **Jonas Pulver** (Genève, critique Le Temps), **Sophie Graf** (soprano) et d'autres chanteurs/chanteuses surprise.

Modération: **Philippe Zibung** (Genève, producteur RTS Espace 2)

Podium discussion with participation of the audience on the issue of authenticity and experienced emotions on the stage in the wake of Diderot's paradox on the actor, Stanislavski's method approach, and other traditions. The essential question is how the singer should portray emotions in singing opera arias, religious music, or Lieder -- using consciously chosen expressive means (voice quality, tempo, melodic variations) or, rather, attempting to get into an appropriate emotional state and interpreting the piece in an intuitive fashion. The discussion will be illustrated by video presentations of famous role interpretations.