- **Title**
  Clinical Neuromusicology: The Neuroscience of Music from Perception to Clinical Practice

- **Chair:**
  Professor Edward A. Roth, MM NMT, MT-BC

- **List of presenters with credentials** (listed in alphabetical order)

  - Dr. John Iversen, Ph.D. (The Neurosciences Institute, La Jolla, CA)
  - Dr. Petr Janata, Ph. D. (University of California – Davis, Davis, CA)
  - Dr. Istvan Molnar-Szakacs (University of California – Los Angeles, CA)
  - Professor Corene Thaut, M.M. (Colorado State University, Ft. Collins, CO)
  - Dr. Michael Thaut, Ph.D. (Colorado State University, Ft. Collins, CO)

- **Description:**
  - This institute will provide music therapists and music therapy students with the opportunity of experiencing some of the world's most prominent researchers in the neurosciences and music. These neuromusicologists will present state of the art brain research regarding the interaction between music and attention, learning, memory, speech/language, motor functioning, emotion, and spirituality. Participants will have the opportunity to present therapeutic challenges faced in clinical or educational settings to the neuroscientists and discuss appropriate research designs that test for, and contribute to the development of, effective treatment methodologies. One broad objective of the institute is to create an opportunity for communication between the neuroscientific and music therapy communities toward the long-term goal of establishing productive clinical research collaborations.

- **Learner objectives related to the CBMT Scope of Practice**.
  - Participants will be provided an overview of neuroanatomy/neurophysiology and will be able to identify major brain structures and their related functional domains. (CBMT Scope of Practice III.A.2.a. & c.)

  - Participants will be able to identify the underlying neural mechanisms involved with music perception and production and relate them to non-musical areas of experience and behavior. (CBMT Scope of Practice III.A.2.b.)

  - Participants will be able to identify primary neuroimaging technologies and related processes. (CBMT Scope of Practice V.A.5.)

  - Participants will be made aware of foundational and state of the art research related to neuroscience and music (CBMT Scope of Practice V.A.2.)

  - Participants will develop an awareness of effective research designs for testing working mechanisms in music experiences that are useful toward therapeutic or educational outcomes. (CBMT Scope of Practice V.A.2.)

  - Participants will be able to identify effective therapeutic music interventions for speech/language, cognition, psychosocial, and motor development/rehabilitation. (CBMT Scope of Practice III.A.f.2., 3., 7.)

Presentation Titles and Bios of Presenters:

Rhythms in Music, Language, and the Brain

Dr. John Iversen, Ph.D. studies brain mechanisms of rhythm perception and production in language and music, combining a background in physics and neuroscience and a life-long interest in playing the drums. After undergraduate studies at Harvard, John received graduate degrees in Philosophy of Science and in Neuroscience at Cambridge and MIT. He is now an Associate Fellow in Theoretical Neurobiology at The Neurosciences Institute in San Diego.

Description

Rhythm is an essential feature of music, language and the brain. This presentation will present recent research on understanding neural mechanisms underlying rhythm perception in music and language, and on the links between music and language. The research will be presented in a form intended to convey not only results, but give insight into the planning and methodology that underlies it in order to open avenues for discussion of future research projects.

Music, Memories, and the Brain

Dr. Petr Janata, Ph.D. is a cognitive neuroscientist who uses music and an array of behavioral, computational, and neuroimaging tools as a means of understanding how the brain organizes complex human behaviors. He is currently an Associate Professor of Psychology and director of the Center for Mind and Brain at University of California, Davis.

Description

Music-evoked autobiographical memories and associated emotions are poignant examples of how music engages the brain. Janata binds music theory, cognitive psychology, and computational modeling to generate intuitive animations of music moving about in tonal space (the system of major and minor keys). The unique tonal movements of individual excerpts of popular music are used in conjunction with neuroimaging experiments to identify brain networks that support the experiencing of memories and emotions evoked by the music.

Music Perception and the Human Mirror Neuron System: Implications for Studies and Therapeutic Interventions in Autism Spectrum Disorder

Dr. Istvan Molnar-Szakacs, Ph.D. is a Research Neuroscientist at the Tennenbaum Center for the Biology of Creativity at the UCLA Semel Institute for Neuroscience and Human Behavior and member of the FPR-UCLA Center for Culture, Brain and Development. He received a Bachelor of Science with Honors from Dalhousie University, Canada, earned his Ph.D. in Neuroscience from UCLA and spent time as a post-doctoral fellow at the École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland. His research uses behavioral and neuroimaging methods to study a variety of higher level cognitive functions including imitation, gesture perception, self-perception, emotion understanding, music perception and creativity. Dr. Molnar-Szakacs is also a certified yoga teacher.

Description

It is a common human experience to feel emotionally moved by a piece of music, but the process by which such complex, abstract patterns of sound can communicate affective information remains somewhat mysterious. We propose that the human mirror neuron system may play a central role in this phenomenon. The term “mirror neurons” refers to neurons found to discharge during both the execution of an action and the observation or auditory perception of that action by another. This neural system allows an individual to understand the meaning and intention of a communicative motor act, by evoking a representation of that action in their own brain.

Considering this evidence, we have developed the Shared Affective Motion Experience (SAME) model of music perception (Molnar-Szakacs & Overy 2006, Overy & Molnar-Szakacs, 2009), which holds that musical sound is perceived not only in terms of the auditory signal, but also in terms of the temporally synchronous, highly intentional, hierarchically organized sequences of expressive motor acts behind the signal. Features of this *motion* information are processed by the human mirror neuron system, while the limbic system allows incoming information to be evaluated in relation to one's own autonomic and emotional state, leading to a complex *emotional* response to music.

Within the framework of the SAME model, we propose that music's potential to create shared, affective experiences - by jointly attending through imitation, synchronization, and shared experience - may be the key aspect of musical experience for therapeutic and educational intervention activities for individuals with ASD. It is known that children with ASD are particularly drawn to abstract patterns, and the repetitive, predictable nature of musical sounds may fulfill such a role. Fundamentally, this is evident in the simple, repetitive pulse that underlies most musical behaviors, making them highly predictable and leading to the spontaneous feeling of 'being together' that humans find so enjoyable (e.g. group clapping, dancing).

Rhythm, Music, and the Brain: An Evidence Based Scientific Framework for Neurologic Music Therapy

Dr. Michael H Thaut, Ph.D. MT-BC is a Professor of Music and a Professor of Neuroscience and serves as Director/Dean of the School of the Arts since 2001 at Colorado State University. Dr. Thaut's internationally recognized research focuses on brain function in music, especially temporal information processing in the brain related to rhythmicity and biomedical applications of music to neurologic rehabilitation of cognitive and motor function. He was elected in 2007 as President of the International Society for Clinical Neuromusicology.

Neurologic Music Therapy: Science, Theory, and Practice

Professor Corene P. Thaut, MM, NMT, MT-BC is an assistant professor of music therapy at Colorado State University. She has been on the teaching faculty of the Robert F. Unkefer Academy for neurologic music therapy since it was founded in 1999, and a research associate at The Center for Biomedical Research in Music since 1997. She worked as a neurologic music therapist from 112-2000. Her clinical experience has included work with stroke, Parkinson's Disease, traumatic brain injury, multiple sclerosis, Alzheimer's disease, and autism.

Description

The purpose of this presentation is to provide a brief overview of the therapeutic application of music from to patients diagnosed with various neurologic disorders within the scientific and theoretical framework of Neurologic Music Therapy (NMT). Neurologic Music Therapy (NMT) is based on a neuroscience model of music perception and production as they relate to the therapeutic application of music to cognitive, speech, sensory, and motor functions.

- **Format:**
  - Lecture and discussion
- **Prerequisites:**
  - None

Proposed Schedule

- 3:30-3:45 - Welcome and Opening Remarks (Ed Roth)
- 3:45-4:45 - Rhythms in Music, Language and the Brain (John Iversen)
- 4:55-5:55 - Music, Memories, and the Brain (Petr Janata)
- 6:05-7:05 – Dinner Break
- 7:05-8:05 - Music Perception and the Human Mirror Neuron System: Implications for Studies and Therapeutic Interventions in Autism Spectrum Disorder (Istvan Molnar-Szakacs)
- 8:15-9:15 - Rhythm, Music, and the Brain: An Evidence Based Scientific Framework for Neurologic Music Therapy (Michael Thaut)
- 9:25-10:25 - Neurologic Music Therapy: Science, Theory, and Practice (Corene Thaut)
- Concluding Comments (Ed Roth)

Register for the institute and conference here:

http://www.musictherapy.org/conference/confindex.html