



2024 HCN Segil Symposium

Exploring the Intersection of Brain, Sound, and Music

AGENDA

- 8:30 **Breakfast + Registration**
- 9:00 **Opening Remarks**
- 9:10 **Neural Investigations of Links Between Timing, Rhythm, and Movement**
Dr. Jessica Grahn
- 10:00 **Musical Mental Imagery: Perception in Action**
Dr. Petr Janata
- 10:45 **Coffee Break**
- 11:00 **Music Appreciation After Cochlear Implantation**
Dr. Ray Goldsworthy
- 11:45 **Lunch**
- 12:45 **Music Interlude**
Musicians from Delirium Musicum
- 1:10 **Music and language: what *are* the connections?**
Dr. Bob Slevc
- 2:00 **Hearing Things, Mixing Cues, and Making Sense**
Dr. Takako Fujioka
- 2:45 **Coffee Break**
- 3:00 **New Musical Experiences and Their Connections to Cognitive and Brain Health**
Dr. Psyche Loui
- 3:45 **Closing Remarks**



Jessica Grahn, Ph.D

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NEURAL INVESTIGATIONS OF LINKS BETWEEN TIMING, RHYTHM, AND MOVEMENT

Moving to musical rhythm is an instinctive, often involuntary activity, but how does the brain produce this behaviour? In this talk I will describe how perception of musical rhythms activates motor brain areas even when no overt movement is made. I will discuss brain stimulation studies that attempt to tease apart the role of different motor areas, such as the supplementary motor area and premotor cortex, in rhythm perception. I will also consider applications of music to movement disorders, particularly Parkinson's disease.



Petr Janata, Ph.D

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MUSICAL MENTAL IMAGERY: PERCEPTION IN ACTION

Although the commonly heard phrase, "listening to music", implies a fairly passive perceptual process by which music registers in the mind, most of the experiences with music that we enjoy are active and participatory, even if only covertly. In this talk I examine the idea that musical mental images can be thought of as representations within a perception/action cycle that is distributed across sensory and motor areas of the brain. I will also briefly touch on the role that spontaneous musical mental imagery appears to play in memory consolidation.



Raymond Goldsworthy, Ph.D

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MUSIC APPRECIATION AFTER COCHLEAR IMPLANTATION

Cochlear implants are medical devices that have helped more than a million people around the world to hear. Cochlear implants are miraculous in that people with profound hearing loss, after receiving one, usually hear well enough to understand spoken speech in quiet situations. Despite this great success, recipients struggle with music appreciation. This presentation introduces psychological aspects of this struggle then dives into perception including pitch, harmony, polyphony, and tonality.



Robert Slevc, Ph.D

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MUSIC AND LANGUAGE: WHAT *ARE* THE CONNECTIONS?

Our impressive abilities to process complex sound and structure may be most evident in music and language. A variety of links between these domains have been proposed: shared syntactic resources, shared perceptual/phonological abilities, and shared ways of expressing emotion to name a few. But evidence for deep connections between music and language has largely been balanced by evidence for domain-specific processing. Here, I suggest that this is, in part, because many of us have been asking the wrong questions: That is, a search for deep cognitive/neural relationships between music and language may be doomed because music and language aren't "cognitively real" categories. Instead, I argue we can better understand music/language relationships by investigating how particular musical and linguistic processes impose similar demands on more basic underlying systems. By taking this kind of reductionist approach, we may better understand the emergent complexity of musical and linguistic processing.



Takako Fujioka, Ph.D

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HEARING THINGS, MIXING CUES, AND MAKING SENSE

Our brain always tries to make sense of various scenarios for perceptual decision-making and learns anything helpful or meaningful for future reference. In this talk, I present our studies about multi-cue integration, multisensory association, and speech-music combination. First, I will start with spatial hearing. Besides the dominant sound localization cues such as interaural level/time difference, how does our brain integrate them with information of auditory scenes like room acoustics? Do we have a perceptual catalog of spaces combining general impressions of acoustic reverberation and visual information? Second, I will talk about how such multisensory association plays a role in learning audio-tactile rhythmic cue integration and helping cochlear implant users improve their pitch perception. Lastly, I will introduce how speech processing could co-exist with musical rhythms when expert rap artists understand auditory rhymes.



Psyche Loui, Ph.D

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NEW MUSICAL EXPERIENCES AND THEIR CONNECTIONS TO COGNITIVE AND BRAIN HEALTH

When conducting studies at the intersection of basic science and applied science, researchers are often confronted with a tension between generalizability and ecological validity. This is especially true in the realm of music research: on one hand, fundamental research questions in music science may pertain to how musical knowledge is represented in the mind, a question that requires generalizable observations across different individuals. On the other hand, applied research questions may be posed about how best to design music-based interventions for targeted populations with specificity, requiring sensitivity to ecologically valid settings. I argue that new musical experiences, including non-standard musical scale structures but also augmented sensory experiences that build on pre-existing music, offers a useful approach to bridge the basic-to-applied gap. Drawing on evidence from neuroimaging (EEG and fMRI as well as DTI), neuropsychology in special populations (musical anhedonia, Parkinson's Disease, Alzheimer's disease), and behavioral studies investigating musical creativity and imagination using informatics and natural language processing, I will review the evidence for, and present some new data on, new musical experiences that are beneficial for cognitive and brain health.

**With a special performance
by musicians from:**



DeliriumMusicum

Delirium Musicum is a self-conducted chamber orchestra that pulses with ferocious passion and infuses L.A.'s crackling energy into every performance, disrupting expectations and redefining “classical” music as the new red-hot concert experience. A 21st-century musical phenomenon, Delirium Musicum breathes fire into masterworks from the Baroque to the music of tomorrow, delivering a concert experience that radiates with fierce and unapologetic creative fervor. Led by violinist and Artistic Director Etienne Gara, Delirium Musicum performances grab hold of concert-goers' emotions and don't let go. Expect an incandescent, visceral experience as you enjoy Delirium Musicum's eclectic artists making their musical magic.

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HCN Hearing & Communication Neuroscience Program 

**Thank you to our collaborators
for their support in organizing
today's event!**

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for your
participation
and support!**

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The Center for Music, Brain, and Society at USC's Dornsife College of Letters, Arts, and Sciences is dedicated to serving as a collaborative nucleus for USC faculty deeply committed to exploring music on both neurobiological and societal levels.

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