

# Music as Medicine

The Science and Clinical Practice



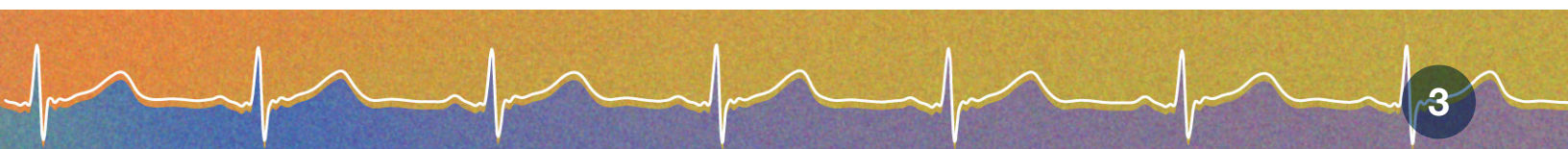
December 14–15, 2023





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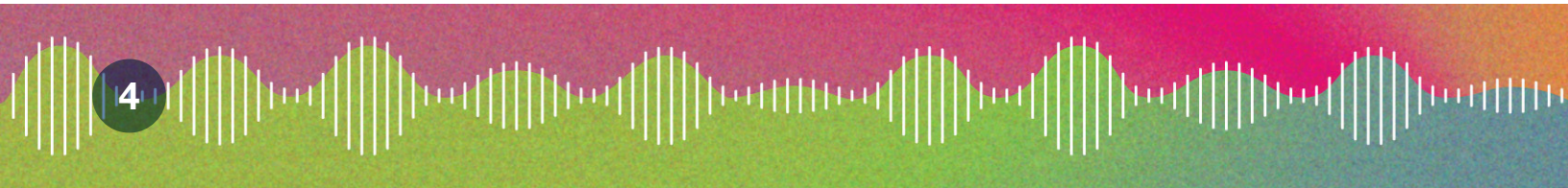
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# Agenda

THURSDAY, DECEMBER 14, 2023

## Day One—What Has the Field Accomplished?

### 9:00–9:10 a.m. | Opening Remarks

Maria Rosario Jackson, Ph.D., NEA Chair

Helene Langevin, M.D., National Center for Complementary and Integrative Health (NCCIH) Director

### 9:10–9:40 a.m. | Keynote

Francis Collins, M.D., Ph.D., NHGRI NIH Distinguished Investigator and Former NIH Director. *NIH's Music and Health Research—What Have We Accomplished So Far?*

### 9:40–9:45 a.m. | Special Remarks

Bruce Tromberg, Ph.D., National Institute of Biomedical Imaging and Bioengineering (NIBIB) Director

### 9:45 a.m.– noon | Session One: Research on the Science of Music

#### Co-Chairs:

Robert Riddle, Ph.D. (National Institute of Neurological Disorders and Stroke [NINDS])

David Leitman, Ph.D. (National Institute of Mental Health [NIMH])

Daniel Levitin, Ph.D. (Minerva University/McGill University)

**Illustrative Performance:** Shelly Berg, M.M. (University of Miami School of Music)

#### Speakers:

Daniel Levitin, Ph.D. (Minerva University/McGill University). *Medicine's Melodies: Music, the Brain, Health, and Wellness*

Mimi Kao, Ph.D. (Tufts University). *Investigating Auditory-Motor Interactions During Rhythm Perception in a Small Animal Model*

Malinda McPherson, Ph.D. (University of California, San Diego). *Diversity in Pitch Perception*

Amy Belfi, Ph.D. (Missouri University of Science and Technology). *Music Cognition, Memory, and Aesthetics*

Edward Chang, M.D. (University of California, San Francisco [UCSF]). *Encoding of Melody in the Human Auditory Cortex*

#### Panelists:

Victor Wooten (Bela Fleck and the Flecktones). *The Spirit of Music*

Elizabeth Margulis, Ph.D. (Princeton University). *The Psychology of Music*

Petr Janata, Ph.D. (University of California, Davis). *Linking the Structure of Music to the Structure of Memories*

Frank Russo, Ph.D. (Toronto Metropolitan University). *Motor Synchrony in Music-Based Interventions*

Tonya Bergeson, Ph.D. (Butler University/Indiana University School of Medicine). *Music Listening on Affective Domain Across the Lifespan*



Vern Falby, Ph.D. (Emeritus, Johns Hopkins University Peabody Conservatory of Music). *Emotional Cues in Music Composition*

## Questions and Answers and General Discussion

Noon–1:00 p.m. | Lunch Break

1:00–1:05 p.m. | Special Remarks

Joshua Gordon, M.D., Ph.D. NIMH Director

1:05–3:05 p.m. | Session Two: Research on Music Therapy and Music Medicine

### Co-Chairs:

Lisa Onken, Ph.D. (National Institute on Aging [NIA])

Maria Nurminskaya, Ph.D. (*Eunice Kennedy Shriver* National Institute of Child Health and Human Development [NICHD])

Marisol Norris, Ph.D., MT-BC (Drexel University)

**Illustrative Performance:** Jeralyn Glass (Crystal Cadence)

### Speakers:

Marisol Norris, Ph.D., MT-BC (Drexel University). *Overview on Music Therapy and Music Medicine*

Teresa Lesiuk, Ph.D. (University of Miami). *eHealth Supported Mindfulness-Based Music Therapy Intervention for Allogeneic Stem Cell Transplant Patients*

Joanne Loewy, D.A. L.C.A.T., MT-BC (Mount Sinai Health System). *Culturally Based Live Music Intervention on Metabolites and Metabolic Pathways, Chronic Stress, and the Risk of Preterm Birth in Black Women*

Gammon Earhart, Ph.D., P.T. (Washington University in St. Louis). *Sing for Your Saunter: Enhancing Walking for People with Parkinson's Using Self-Generated Rhythmic Cues*

Carlene Brown, Ph.D., MT-BC (Seattle Pacific University). *The Body Tambura as a Music-Based Treatment for Chronic Pain*

### Panelists:

Melita Belgrave, Ph.D., MT-BC (Arizona State University). *Integrative Music-Based Community Approaches in Aging Populations*

Concetta “Connie” Tomaino, D.A. (Institute for Music and Neurologic Function). *Neurologic Rehabilitation*

Michael Stanley, M.D. (Brigham and Women's Hospital). *Neurology and Music Therapy—The Role of Clinical Observations in Music Therapy Research*

Maria Gonsalves Schimpf, M.A., MT-BC (Denver Health RESTORE). *Psychodynamic and Analytical Approaches of Music-Based Interventions for Trauma and Resilience in Medical Settings*

Panagis Galiatsatos, M.D. (Johns Hopkins University). *Music-Based Interventions on Pulmonary Function*

Lori Gooding, Ph.D., MT-BC (Florida State University). *American Music Therapy Association (AMTA)*

## Questions and Answers and General Discussion

3:05–3:20 p.m. | Break

3:20–3:25 p.m. | Special Remarks

Theresa Cruz, Ph.D., NICHD/National Center for Medical Rehabilitation Research (NCMRR) Director

## 3:25–5:25 p.m. | Session Three: Research on Music Education and Health

### Co-Chairs:

Sunil Iyengar, B.A. (NEA)

Dana Schloesser, Ph.D. (NIH/Office of Behavioral and Social Sciences Research [OBSSR])

Anthony Brandt, Ph.D. (Rice University)

**Illustrative Performance:** Lisa Wong, M.D. (Harvard Medical School)

### Speakers:

Miriam Lense, Ph.D. (Vanderbilt University Medical Center). *Social Development in Early Childhood*

Steven Holochwost, Ph.D. (Lehman College and City University of New York). *School Readiness and Early School Success*

Assal Habibi, Ph.D. (University of Southern California). *Self-Regulation and Executive Functioning in Childhood*

John Iversen, Ph.D. (McMaster University). *Child and Adolescent Brain and Cognitive Development*

Jennifer Bugos, Ph.D. (University of South Florida). *Music Education on Cognitive Abilities in Older Adults*

### Panelists:

Indre Viskontas, Ph.D. (Sound Health Network). *Beyond the Mozart Effect: How Music Can Impact Education*

Thalia Goldstein, Ph.D. (George Mason University). *Music Across Educational Contexts: Social and Emotional Outcomes*

Maud Hickey, Ph.D. (Northwestern University, emeritus). *Arts and Music Programs for Education in Detention Centers (AMPED)*

Tarrell Davis, M.Ed. (Settlement Music School). *Community Impact—“Kaleidoscope” Head Start Preschool Program*

Victor Mincez, Ph.D. (University of California, San Diego). *Playing Together. Gamelan Project and Sound Exploration*

Kenneth Elpus, Ph.D. (University of Maryland). *Music in Secondary Schools: Access, Uptake, and Achievement*

## Questions and Answers and General Discussion

### 5:25–5:30 p.m. | Day One Closing Remarks

Julie Gerberding, M.D., M.P.H., Foundation for the NIH (FNIH) Chief Executive Officer

## FRIDAY, DECEMBER 15, 2023

## Day Two—The Future of the Sound Health Initiative

### 8:30–8:40 a.m. | Opening Remarks

Richard Hodes, M.D., NIA Director

Deborah Rutter, M.B.A., President, John F. Kennedy Center for the Performing Arts

### 8:40–9:10 a.m. | Keynote

Renée Fleming, M.M., Artistic Advisor, John F. Kennedy Center for the Performing Arts. *Looking Forward—Arts and Health in Science and Society*

## 9:10–9:15 a.m. | Special Remarks

Amy Adams, Ph.D., NINDS Acting Deputy Director

## 9:15 a.m.– 11:30 a.m. | Session Four: Future Research Directions

### Co-Chairs:

Wen Chen, M.MSc., Ph.D. (NCCIH)

Robert Finkelstein, Ph.D. (NINDS)

Theodore Zanto, Ph.D. (UCSF)

**Illustrative Performance:** Grace Leslie, Ph.D. (University of Colorado, Boulder)

### Speakers:

Yuanyuan (Kevin) Liu, Ph.D. (National Institute of Dental and Craniofacial Research [NIDCR]/NCCIH). *Sound Induces Analgesia Through Corticothalamic Circuits*

Reyna Gordon, Ph.D. (Vanderbilt University). *Genomic Influences on Sensorimotor Synchronization and New Links With Health*

Theodore Zanto, Ph.D. (UCSF). *Mechanisms of Cognitive Change Following Digital Rhythm Training*

Jacquelyn Kulinski, M.D. (Medical College of Wisconsin). *Applied Research: Singing for Cardiovascular Health*

Christina Hugenschmidt, Ph.D. (Wake Forest University). *Understanding the Mechanisms of Dance for Brain/Body Wellness in Aging*

### Panelists:

Maria Geffen, Ph.D. (University of Pennsylvania). *Understanding the Role of Inhibition in Pattern Perception*

Shihab Shamma, Ph.D. (University of Maryland, College Park). *Music and the Mind*

Lee Lindquist, M.D., M.P.H., M.B.A. (Northwestern University). *Improvise To Improve Aging Outcomes*

Tod Machover, M.M. (Massachusetts Institute of Technology [MIT] Media Lab). *New Technologies for Music Creation, Performance, and Participation*

Luana Colloca, M.D., Ph.D. (University of Maryland, Baltimore). *Virtual Reality, Music, and Pain*

Juliet King, Ph.D.(c), ATR-BC, LPC, LMHC (The George Washington University). *Advancing Research: Neuroaesthetics and Creative Arts Therapies*

## Questions and Answers and General Discussion

## 11:30 a.m.–12:30 p.m. | Lunch Break

## 12:30–2:30 p.m. | Session Five: Networks and Capacity Building of an Integrative Health Research Community

### Co-Chairs:

Laura Thomas, Ph.D. (NIMH)

Caroline Sferrazza, M.S. (NIA)

Susan Magsamen, M.A.S. (Johns Hopkins University)

### Speakers:

Charles Limb, M.D. (UCSF). *Sound Health Network: A New Opportunity for Collaboration*

Joke Bradt, Ph.D., MT-BC (Drexel University). *Music4Pain Network*



**Jeffrey Dusek, Ph.D.** (Case Western Reserve University). *Effective Network to advance Scientific Evidence related to Mechanisms of Music-Based Interventions for Pain and Support CoLLaborative Efforts (ENSEMBLE)*

**Debra Burns, Ph.D.** (Indiana University–Purdue University Indianapolis). *Novel Technologies To Explore Mechanisms and Optimize Music-Based Intervention Pain Research*

**Julene Johnson, Ph.D., B.M.** (UCSF). *Research Network To Accelerate Mechanistic Studies of Music for Dementia (RNMusD)*

#### Panelists:

**AZA Allsop, M.D., Ph.D.** (Yale University, Howard University). *Music, Neuroscience, and Psychiatry*

**Christopher Bailey, M.L.I.S.** (World Health Organization). *The Virtuous Triangle*

**Nick Skinner, B.Mus.** (Baltimore Symphony Orchestra). *Music Education in Local School Communities and Across the Country*

**Lora Robinson, M.M.T., MT-BC** (Howard University). *Music Therapy Program at Howard University*

**Kristin Sakoda, J.D.** (Los Angeles County Department of Arts and Culture). *Building Cross-Sector Collaboration for Arts and Health Throughout Los Angeles County*

**Ruth Katz, J.D., M.P.H.** (Aspen Institute). *Health Policy Perspectives for Music and Other Arts-Based Interventions*

#### Questions and Answers and General Discussion

**Illustrative Performance:** Fred Johnson (David A. Straz Center for the Performing Arts)

#### 2:30–2:45 p.m. | Special Remarks

**Debara Tucci, M.D., M.S., M.B.A.**, National Institute on Deafness and Other Communication Disorders (NIDCD) Director

**Rick Woychik, Ph.D.**, National Institute of Environmental Health Sciences (NIEHS) Director

**Nora Volkow, M.D.**, National Institute on Drug Abuse Director

#### 2:45–3:00 p.m. | Break

#### 3:00–5:00 p.m. | Session Six: Integration of Music-Based Interventions Into Health Care Systems

##### Co-Chairs:

**Emmeline Edwards, Ph.D.** (NCCIH)

**Coryse St. Hillaire-Clarke, Ph.D.** (NIA)

**Sheri Robb, Ph.D., MT-BC** (Indiana University)

**Illustrative Performance:** Raul Midón

##### Speakers:

**Emmeline Edwards, Ph.D.** (NCCIH). *The NIH Toolkit for Music-Based Interventions: A Path to Strengthening Evidence-Based Research*

**Sheri Robb, Ph.D., MT-BC** (Indiana University). *Reporting Guidelines for Music-Based Interventions: Improving Quality and Consistency*

**Richard Gershon, Ph.D.** (Northwestern University). *Lessons Learned from Other Tools Developed by NIH*

**Leslie Katzel, M.D., Ph.D.** (University of Maryland School of Medicine and Baltimore Geriatrics Research Education and Clinical Center). *Integration of a Behavioral Intervention Into the Veterans Health Administration Health Care System*

David Chambers, Ph.D. (National Cancer Institute). *A Brief Introduction to Dissemination and Implementation Research for Music-Based Interventions*

**Panelists:**

Debora Kuchka-Craig, M.H.A., F.H.F.M.A. (MedStar Health). *Payer/Provider's Perspectives*

Kimberly Sena Moore, Ph.D., MT-BC (Florida Gulf Coast University). *Public Advocate Perspectives*

Judy Simpson, MT-BC (American Music Therapy Association). *Practitioner Perspectives*

Sarah Lock, J.D. (AARP). *Policy Perspectives*

Wendy Weber, N.D., Ph.D., M.P.H. (NCCIH). *Designing Trials To Be Informative to Payers Including Centers for Medicare & Medicaid Services (CMS)*

Jill Sonke, Ph.D. (University of Florida). *Social Prescribing Perspectives*

**Questions and Answers and General Discussion**

**5:00–5:45 p.m. | Day Two Closing Session**

**Co-Chairs:**

Francis Collins, M.D., Ph.D., NHGRI NIH Distinguished Investigator and Former NIH Director

Renée Fleming, M.M., Artistic Advisor, John F. Kennedy Center for the Performing Arts



# Day One: What Has the Field Accomplished?

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## OPENING REMARKS



**Maria Rosario Jackson, Ph.D.,** National Endowment for the Arts

In January 2022, Dr. Jackson became the thirteenth chair of the National Endowment for the Arts (NEA). Her appointment by President Biden is historic as she is the agency's first African American and Mexican American woman to serve as NEA chair. Dr. Jackson's career has focused on understanding and elevating arts, culture, and design as crucial elements of healthy and equitable communities. A planner, researcher, and academic, Dr. Jackson is a tenured professor on leave from Arizona State University, where she led the Studio for Creativity, Place, and Equitable Communities. For almost 10 years, she served as a senior advisor on arts and culture and strategic learning, research, and evaluation at the Kresge Foundation; she has also advised other

foundations. For 18 years, Dr. Jackson worked at the Urban Institute in Washington, D.C., where she was the founding director of the Culture, Creativity, and Communities Program. Dr. Jackson was appointed to the National Council on the Arts in 2012, where she served until becoming chair of the NEA. A graduate of the University of California, Los Angeles with a doctorate in urban planning, Dr. Jackson holds a master of public administration degree from the University of Southern California.



**Helene M. Langevin, M.D.,** National Center for Complementary and Integrative Health

Dr. Langevin is director of the National Center for Complementary and Integrative Health at the National Institutes of Health (NIH). Prior to NIH, Dr. Langevin was the director of the Osher Center for Integrative Medicine, jointly based at Brigham and Women's Hospital and Harvard Medical School, Boston, and a professor-in-residence of medicine at Harvard Medical School. She previously served as professor of neurological sciences at the University of Vermont Larner College of Medicine, Burlington, Vermont. Dr. Langevin received an M.D. degree from McGill University in Montreal, followed by a postdoctoral research fellowship in neurochemistry at the MRC Neurochemical Pharmacology Unit in Cambridge, England, and a residency in internal medicine and fellowship in endocrinology and metabolism at The Johns Hopkins Hospital in Baltimore, Maryland.

# Keynote



**Francis S. Collins, M.D., Ph.D.**, National Human Genome Research Institute NIH Distinguished Investigator and Former National Institutes of Health Director

Dr. Collins currently serves as a National Institutes of Health (NIH) distinguished investigator in the intramural program of the National Human Genome Research Institute (NHGRI), pursuing genomics research on type 2 diabetes and a rare disorder of premature aging called progeria. Dr. Collins is a physician-geneticist noted for his landmark discoveries of disease genes and his previous leadership of the international Human Genome Project, which culminated in April 2003 with the completion of a finished sequence of the human DNA instruction book. He served as director of NHGRI from 1993 to

2008. He then served as the 16th director of NIH from 2009 to 2021, serving an unprecedented three administrations. After stepping down as NIH director, he served as acting science advisor to President Biden from February to October 2022. From November 2022 to May 2023 he continued his White House service as a special advisor to the president for special projects, leading the development of a bold program to eliminate hepatitis C in the United States. Dr. Collins is an elected member of both the National Academy of Medicine and the National Academy of Sciences, was awarded the Presidential Medal of Freedom in November 2007, and received the National Medal of Science in 2009.



# Special Remarks



**Bruce Tromberg, Ph.D.**, National Institute of Biomedical Imaging and Bioengineering

Dr. Tromberg is the director of the National Institute of Biomedical Imaging and Bioengineering (NIBIB) at the National Institutes of Health (NIH) and leads NIH's Rapid Acceleration of Diagnostics Technology (RADx Tech) innovation initiative. Prior to joining NIH in January 2019, he was a professor of biomedical engineering and surgery and director of the Beckman Laser Institute and Medical Clinic at the University of California, Irvine. Dr. Tromberg specializes in the development of optics and photonics technologies for biomedical sensing, imaging, and therapy. He has co-authored more than 450 publications and holds 25 patents in new technology development as well as bench-to-bedside

clinical translation, validation, and commercialization of devices.

# Session One:

## Research on the Science of Music

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**Co-Chair: Robert Riddle, Ph.D.,** National Institute of Neurological Disorders and Stroke

Dr. Riddle is a program director in the Neurogenetics Cluster of the National Institute of Neurological Disorders and Stroke (NINDS). His programmatic areas of interest are centered around early neural development and molecular genetics. Specifically, his fundamental neuroscience portfolio encompasses projects focused on understanding early brain pattern formation, epigenetics, and cortical and cerebellar development. Dr. Riddle is the NINDS representative for research on developmental disorders including Down Syndrome, Fragile X, and Joubert Syndrome. He is also a member of the trans-National Institutes of Health (NIH) Music and Health Working

Group. Prior to joining NIH in 2002, Dr. Riddle was a faculty member in the Department of Cell and Developmental Biology at the University of Pennsylvania where he researched vertebrate brain pattern formation. Before that, he was a postdoctoral fellow at Harvard Medical School where he studied limb development. Dr. Riddle received his Ph.D. in molecular biology from Northwestern University. Dr. Riddle is an avid music fan and amateur musician.



**Co-Chair: David Leitman, Ph.D.,** National Institute of Mental Health

Dr. Leitman, a cognitive neuroscientist, is the program chief of the Social Neuroscience and Communication in Adult Psychopathology Program at the National Institute of Mental Health (NIMH). Dr. Leitman is interested in social communication, its development, and the auditory processing mechanisms in music and speech and has applied these interests to the study of neurodevelopmental and psychiatric illnesses. Most of Dr. Leitman's work has focused on vocal emotion as conveyed through intonation change (prosody) using psychophysics and multimodal neuroimaging (electroencephalogram [EEG], magnetoencephalography [MEG], and magnetic resonance imaging [MRI]). Dr. Leitman received his doctorate in cognitive neuroscience at the City University of New

York. Before joining NIMH, he was an assistant professor at the University of Pennsylvania and a visiting scientist at the Centre de Recherche en Neurosciences de Lyon (INSERM) in France. Dr. Leitman's program at NIMH supports interdisciplinary research on the biological and behavioral underpinnings of social processes and their abnormalities in psychiatric disorders. This program aims to characterize the mechanisms that cause impairment in social cognition, communication, and social functioning in mental disorders and to develop and test novel interventions for these impairments.





**Co-Chair: Daniel Levitin, Ph.D.,** [Minerva University/McGill University](#)

Dr. Levitin is James McGill Professor Emeritus of Psychology and Neuroscience at McGill University and Founding Dean of Minerva University in San Francisco. His research addresses fundamental questions in auditory memory, musical structure, and the neuroanatomy and neurochemistry of musical experience. He has published 75 peer-reviewed articles in journals such as *Science*, *Nature*, *PNAS*, *Neuron*, and *Cognition*. Dr. Levitin earned his B.A. from Stanford University and his Ph.D. in psychology from the University of Oregon. He completed postdoctoral training at Stanford University Medical School and University of California, Berkeley. In his spare time, Dr. Levitin writes about health, science, and medicine for *The New Yorker*, *The Atlantic*,

and *The New York Times*, and he appears regularly on National Public Radio. He is the author of five consecutive bestselling books: *This Is Your Brain On Music*, *The World in Six Songs*, *The Organized Mind*, *Successful Aging*, and *A Field Guide to Lies*. As a musician (saxophone, guitar, vocals, and bass), he has performed with Mel Tormé, Bobby McFerrin, Rosanne Cash, Sting, Renée Fleming, Victor Wooten, Neil Young, and David Byrne. Dr. Levitin has produced and consulted on albums by Stevie Wonder, Steely Dan, and Joni Mitchell, and he has been awarded 17 gold and platinum records.

## ILLUSTRATIVE PERFORMANCE



**Shelly Berg, M.M.,** [University of Miami School of Music](#)

Shelton “Shelly” Berg is dean and a professor of music at the Phillip and Patricia Frost School of Music at the University of Miami. A Steinway piano artist with five Grammy nominations, Mr. Berg has performed and collaborated with international artists ranging from Renée Fleming, Gloria Estefan, and Pharrell to jazz legends Dee Dee Bridgewater, Kurt Elling, and Arturo Sandoval. As a featured soloist, he performed and recorded the album *Gershwin Reimagined* with the Royal Philharmonic Orchestra in London, and he has released top-charting jazz albums. Mr. Berg is the artistic advisor for the JazzRoots series at the Adrienne Arsht Center for the Performing Arts of Miami–Dade County, and he serves as artistic director of The Jazz Cruise.

Mr. Berg is a co-producer of the Jazz Aspen Snowmass (JAS) Academy in collaboration with the Frost School of Music and JAS and is an advisor to the Frost School of Music at Festival Napa Valley, a summer classical chamber music academy. Mr. Berg was previously the McCoy/Sample Professor of jazz studies at the University of Southern California Thornton School of Music. His best-selling education publications include *The Goal Note Method*, *Essentials of Jazz Theory*, and the *Chop-Monster* jazz tutor series. In 2000, the *Los Angeles Times* named him one of three “Educators for the Millennium.”

## SPEAKERS

**Daniel Levitin, Ph.D.,** [Minerva University/McGill University](#) (see biography above)

### ***Medicine’s Melodies: Music, the Brain, Health, and Wellness***

The use of music for healing the mind, body, and spirit dates back to the Upper Paleolithic era, around 20,000 years ago. Current scientific evidence from neuromusicology helps to elucidate the underlying

mechanisms by which music as medicine can be effective. Dr. Levitin will review the main brain regions (computational hubs and circuits) responsible for music processing, and how they interact with one another. He will conclude by introducing current theories that account for what it is about music that makes it effective across a wide range of therapeutic outcomes.



**Mimi Kao, Ph.D., Tufts University**

Dr. Kao is an assistant professor in the Department of Biology at Tufts University. She earned her undergraduate degree in human biology at Stanford University and her Ph.D. in neuroscience at the University of California, San Francisco, where she worked with Allison Doupe and Michael Brainard. Her broad research goal is to understand the mechanisms by which experience shapes the nervous system and behavior. Dr. Kao's laboratory uses vocal learning songbirds as a model system to study the neural mechanisms of vocal learning, perception, and production. In collaboration with Dr. Aniruddh Patel at Tufts University, Dr. Kao is developing songbirds as an animal model to investigate auditory-motor interactions during rhythm perception.

### ***Investigating Auditory-Motor Interactions During Rhythm Perception in a Small Animal Model***

The ability to detect and predict periodic auditory rhythms is a core feature of music cognition. Humans readily recognize rhythmic patterns, such as that of a familiar song, independently of the tempo, indicating that perception of periodic auditory rhythms is flexible, relying on the relative timing of events rather than on specific absolute durations. This ability is central to music's positive effect on neurological disorders, including normalizing gait in Parkinson's disease and recovering language after stroke. The neural mechanisms underlying rhythm perception, however, are not well understood. Neuroimaging studies in humans have shown that perception of periodic auditory rhythms strongly engages the motor planning system, including the premotor cortex and basal ganglia, even when the listener is not moving or preparing to move. Dr. Kao will discuss ideas for the role of motor regions in rhythm perception and describe recent progress using vocal learning songbirds to understand whether specialized auditory-motor forebrain circuits that subserve vocal learning also confer advantages for flexible perception of periodic rhythms. Sex differences in auditory-motor circuitry and the ability to detect isochrony (equal timing between events) will also be considered. Establishing an animal model for rhythm perception will be transformative for music neuroscience, allowing detailed investigation of the neural mechanisms underlying rhythm perception and informing rhythm-based interventions to enhance function in normal and disease states.



**Malinda McPherson, Ph.D., University of California, San Diego**

Dr. McPherson studies auditory cognition. Her primary research interest is understanding how listeners perceive and remember complex sounds like speech and music. Her work also examines how differences in experience, training, and culture change auditory perception and musical preferences. Dr. McPherson is a postdoctoral associate and lecturer in the Department of Psychology at the University of California, San Diego. She has also been a postdoctoral associate in the Massachusetts Institute of Technology Department of Brain and Cognitive Sciences. Dr. McPherson earned her Ph.D. from the Harvard University Program in Speech and Hearing Bioscience and



Technology in 2022. She also holds an M.Phil. from the University of Cambridge Centre for Music and Science, where she was a Churchill Scholar, and earned an undergraduate degree in cognitive science and music from Johns Hopkins University. Dr. McPherson has been funded by a National Institutes of Health F31 grant and the National Science Foundation Graduate Research Fellowship Program. She also received the Weintraub Graduate Student Award from Fred Hutch and has been named to the 2022 Forbes “30 Under 30” list in science. In the summer of 2024, Dr. McPherson will join Purdue University’s Department of Speech, Language, and Hearing Sciences as an assistant professor.

### ***Diversity in Pitch Perception***

Pitch is a defining property of the most important sounds humans hear, including speech and music. Acoustically, sounds said to have pitch have a regular rate of repetition in time—a fundamental frequency or  $f_0$ —and contain overtones (harmonics) that are multiples of the  $f_0$ . Pitch is traditionally construed as the perceptual correlate of  $f_0$ , and a longstanding goal of hearing research has been to determine how listeners estimate  $f_0$  from harmonic sounds. However, recent work suggests that this classic view of pitch as  $f_0$  estimation is incomplete—at least two representations are involved, one of which does not involve  $f_0$ . In this talk, Dr. McPherson will present evidence demonstrating that listeners can often estimate pitch changes by tracking the frequency spectrum without estimating  $f_0$ . Nonetheless, representations of harmonic structure and the  $f_0$  appear to help listeners compress sounds into compact representations that aid memory. These compact representations may be critical for music perception, where remembering the pitches of notes across longer time spans is necessary. Dr. McPherson will discuss how these findings increase the understanding of how the brain encodes harmonic structure, how they indicate that representations of pitch are richer and more diverse than previously thought, and how they clarify the role of harmonic structure in musical pitch perception.



**Amy Belfi, Ph.D.**, [Missouri University of Science and Technology](#)

Dr. Belfi is an associate professor in the Department of Psychological Science at Missouri University of Science and Technology. She received her B.A. in psychology from St. Olaf College and her Ph.D. in neuroscience from the University of Iowa. She completed postdoctoral training at New York University. Dr. Belfi’s work covers a broad range of topics in the field of music cognition, including music and autobiographical memory, aesthetic judgments of music, and musical anhedonia. She is a recent recipient of the Rising Star award from the Association for Psychological Science and currently serves as editor of the journal *Psychology of Aesthetics, Creativity, and the Arts*.

### ***Music Cognition, Memory, and Aesthetics***

Listening to music can evoke both powerful emotions and vivid memories. For example, a strain of a favorite song from high school could prompt a memory of driving around one’s hometown on a hot summer night with friends, singing along to the radio with the windows open. An individual might experience nostalgia, a sense of pleasure, and feel ‘transported’ back to the sights, sounds, and feelings of that night. In this talk, Dr. Belfi will briefly present several lines of research focusing on music, autobiographical memory, and aesthetics. To begin, she will discuss prior work investigating how and why autobiographical memories evoked by music may differ from memories evoked by other sensory cues. Additionally, Dr. Belfi will discuss work focusing on how listeners make aesthetic judgments of music, and what musical and contextual features influence these judgments.



**Edward Chang, M.D.,** University of California, San Francisco

Dr. Chang is a neurosurgeon at the University of California, San Francisco (UCSF), specializing in the treatment of intractable epilepsy and brain tumors. His research focuses on the brain mechanisms for human speech, movement, and cognition. Dr. Chang is chair of the Department of Neurological Surgery. He also co-directs the Center for Neural Engineering and Prostheses, a collaborative enterprise of UCSF and the University of California, Berkeley. The center brings together experts in engineering, neurology, and neurosurgery to develop state-of-the-art biomedical technology to restore function for patients with neurological disabilities such as paralysis and speech disorders. Dr. Chang earned his medical degree at UCSF, where he

also completed a residency in neurosurgery. He was honored with the Blavatnik National Laureate for Life Sciences in 2015. In 2020, he was elected to the National Academy of Medicine, an honor that recognizes outstanding achievements and service in the fields of medical sciences, health care, and public health.

***Encoding of Melody in the Human Auditory Cortex***

Melody is a core component of music in which discrete pitches are serially arranged to convey emotion and meaning. Perception of melody varies along several pitch-based dimensions: (1) the absolute pitch of notes, (2) the difference in pitch between successive notes, and (3) the higher-order statistical expectation of each note conditioned on its prior context. While humans readily perceive melody, how these dimensions are collectively represented in the brain and whether their encoding is specialized for music remains unknown. Dr. Chang and his team recorded high-density neurophysiological activity directly from the surface of human auditory cortex while Western participants listened to Western musical phrases. Pitch, pitch-change, and expectation were selectively encoded at different cortical sites, indicating a spatial code for representing distinct dimensions of melody. The same participants listened to spoken English, and evoked responses to music and speech were compared. Cortical sites selective for music were systematically driven by the encoding of expectation. In contrast, sites that encoded pitch and pitch-change used the same neural code to represent equivalent properties of speech. These findings reveal the multidimensional nature of melody encoding, consisting of both music-specific and domain-general sound representations in auditory cortex.

**PANELISTS**



**Victor Wooten,** Bela Fleck and the Flecktones

Born the youngest of five boys, Mr. Wooten started performing as the bassist with his family band at age 5, and at age 6, was on tour with his brothers, opening shows for legendary soul artist Curtis Mayfield. Soon after, he was affectionately known as the 8-year-old Bass Ace, and before graduating from high school, he and his brothers had shared the stage with artists such as Stephanie Mills, War, Ramsey Lewis, Frankie Beverly and Maze, Dexter Wansel, and The Temptations. Mr. Wooten, now a five-time Grammy winner, hit the worldwide scene in 1990 as a founding member of the super-group Bela Fleck and the Flecktones. Continuing to blaze a musical trail with the band, Mr. Wooten has also



become widely known for his own Grammy-nominated solo recordings and tours. He has won every major award given to a bass guitarist, including being voted Bassist of the Year in the readers' poll in *Bass Player Magazine* three times. In 2011, *Rolling Stone Magazine* voted Mr. Wooten one of the Top Ten Bassists of All Time. He is also a published author and created Victor Wooten's Center for Music and Nature and currently leads six to eight camps at Wooten Woods each year.

### ***The Spirit of Music***

Mr. Wooten says he was lucky to be born into a band—literally. Being the youngest of five musical brothers, he has been witnessing the effects that music has on people since his birth. With modern civilization's current interest and acceptance of music as therapy, Mr. Wooten is excited to see how much further it can go. He believes that the surface is just being scratched in terms of rediscovering what our ancestors knew centuries ago. Music is magical, mysterious, and medicinal, and Mr. Wooten is honored to be a part of it.



### **Elizabeth Margulis, Ph.D., Princeton University**

Dr. Margulis is a professor of music, with affiliations in psychology and neuroscience, at Princeton University, and she directs Princeton's Music Cognition Lab. Dr. Margulis is the author of *On Repeat: How Music Plays the Mind*, which won awards from the Society for Music Theory and the American Society of Composers, Authors, and Publishers, and of *The Psychology of Music: A Very Short Introduction*, which has been translated into six languages. Her new co-edited volume, *The Science-Music Borderlands: Reckoning with the Past and Imagining the Future*, strives to pave the way for more productive collaborations between artists, musicologists, scientists, and others who think deeply about music. Dr. Margulis's lab has developed a

set of methods for studying the way music provokes vivid imaginings and is applying the methods to understand topics that range from social bonding to human creativity to the relationship between memory and the imagination. Her research has been featured in outlets extending from Netflix's *Music: Explained* and National Public Radio's *All Things Considered* to *The New York Times* and the BBC. She has served as president of the Society for Music Perception and Cognition and is committed to fostering interdisciplinary coalitions to study music.

### ***The Psychology of Music***

Dr. Margulis's current research explores how music can transport people to imagined worlds, like a memory from their past or a fictional story. She has used tools from natural language processing to analyze the free response descriptions people give of these imaginings. She has found that even though the experiences can feel quite idiosyncratic and personal, specific musical excerpts—even unfamiliar ones—can actually prompt highly similar imaginings. Dr. Margulis is studying the mechanisms that underlie this process and the consequences for how music connects and divides people. She also works to help people studying music from different disciplinary backgrounds understand each other and collaborate.





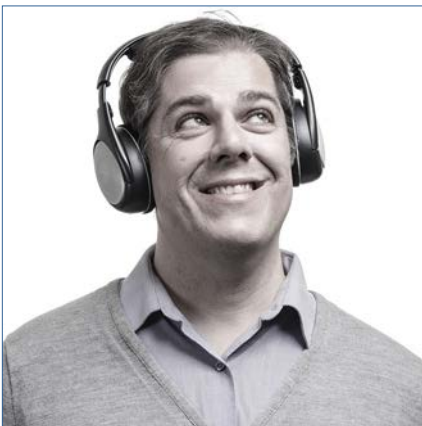
**Petr Janata, Ph.D.**, University of California, Davis

Dr. Janata is a professor in the Psychology Department and Center for Mind and Brain at the University of California, Davis. He received his B.A. from Reed College and his Ph.D. from the University of Oregon. After investigating song perception and song learning in songbirds as a postdoctoral fellow at the University of Chicago, Dr. Janata went to Dartmouth College and incorporated functional neuroimaging methods into his music perception research. His research on how the human brain engages with music has examined expectation, imagery, sensorimotor coupling, memory, and emotion in relation to tonality, rhythm, and timbre. Dr. Janata's work also emphasizes the use of models of musical structure to analyze behavioral and brain data. Dr.

Janata has pioneered psychological and brain research examining musical situations that elicit strong emotional experiences, such as music-evoked remembering or the state of "being in the groove." He is the recipient of two Fulbright research fellowships, a Guggenheim fellowship, a Templeton Advanced Research Program award from the Metanexus Institute, and grant funding from the National Science Foundation, National Institutes of Health, and the GRAMMY Foundation.

### ***Linking the Structure of Music to the Structure of Memories***

Dr. Janata's current primary research interests center on two main themes. First, his lab's research on the formation of music-associated memories has found that involuntary musical imagery, also known as "earworms" or "a song that stuck in your head," serves as a spontaneous rehearsal mechanism that helps to consolidate memory for information that has been associated with the music. Second, his lab examines the feeling of being in the groove in simple small-group musical settings, using an adaptive metronome paradigm in which a metronome adapts, either optimally or suboptimally, to reduce the timing discrepancies in sound-producing actions of the participants.



**Frank Russo, Ph.D.**, Toronto Metropolitan University

Dr. Russo is a full professor of psychology, NSERC-Sonova Senior Industrial Research Chair in Auditory Cognitive Neuroscience, and director of the SMART Lab at Toronto Metropolitan University. He serves as the chief science officer for LUCID, an AI-driven software-as-a-service company developing music-based digital therapeutics, and as scientific director of SingWell, an international research network with a mission to understand, inform, and inspire choirs for individuals living with communication challenges. Dr. Russo has published over 100 peer-reviewed papers and has received over \$8 million (Canadian dollars) in lifetime funding as a principal investigator. His research

investigates the neurocognitive, neuroaffective, and sociobiological aspects of music, speech, and hearing. Dr. Russo is a fellow of Massey College, the Canadian Society for Brain Behavior and Cognitive Science, and the Canadian Psychological Association. He presently serves as an associate editor at three academic journals: *Frontiers in Psychology* (Emotion Science), *Frontiers in Neuroscience* (Auditory Cognitive Neuroscience), and *Music Perception*.

### ***Motor Synchrony in Music-Based Interventions***

Dr. Russo's research spans the biological, cognitive, and social-emotional bases of music. He is currently interested in the translational potential of this research and ways in which music-based interventions may be scaled. His team has been investigating the role that motor synchrony in music production has on influencing psychosocial outcomes, including elevation in mood, social bonding, economic sharing, and resilience to pain. His team has been deepening our understanding of the biological underpinnings of these phenomena in the context of group singing. Through SingWell, an international consortium of researchers, practitioners, and support organizations, his team is also working to inform and inspire choirs designed to reap the psychosocial and communication benefits of choir singing.



**Tonya Bergeson, Ph.D.,** Butler University/Indiana University School of Medicine

Dr. Bergeson is an associate professor and chair in the Department of Speech, Language, and Hearing Sciences at Butler University. She earned undergraduate degrees in music theory and psychology at Northwestern University, Chicago, and graduate degrees in cognitive developmental psychology at the University of Toronto, Canada. She completed a National Institutes of Health (NIH) postdoctoral fellowship at the Indiana University School of Medicine, Department of Otolaryngology—Head and Neck Surgery, where she became a research professor. Dr. Bergeson has published research in four primary areas: speech and language development in infants and

children with hearing loss; audiovisual perception in infants, children, and adults with hearing loss; music perception and cognition in infants and children; and music intervention in adults with dementia. Dr. Bergeson has been awarded several grants for her work, including Federal research grants from NIH. Dr. Bergeson currently holds academic positions at Butler University (Speech, Language, and Hearing Sciences) and Indiana University School of Medicine (Otolaryngology—Head and Neck Surgery).

### ***Music Listening on Affective Domain Across the Lifespan***

Dr. Bergeson is interested in how music, auditory perception, language, and social communication are connected across the lifespan. Parents not only sing but also use musical speech when interacting with their infants, which is related to later language, social, and cognitive development in children. Dr. Bergeson also considers how this affects children who have hearing loss and use hearing aids or cochlear implants, both of which can adjust the sounds children perceive as speech or music. Finally, the music children hear becomes associated with social connections and memories, which still plays a role in adulthood even after dementia.



**Vern Falby, Ph.D.**, Emeritus, Johns Hopkins University Peabody Conservatory of Music

Dr. Falby served on the faculty of the Peabody Conservatory at Johns Hopkins University (1989 and 2020), teaching and advising undergraduate and graduate composers, performers, and conductors in music theory studies. At Peabody, Dr. Falby developed an approach to the study of musical pieces he calls “Thinking by Ear,” which emphasizes musicians being able to hear scores to become fluent in exploring the aural design of the music that moves their audiences. Since retiring from Peabody, Dr. Falby continues in private practice, teaching solfège and music analysis to individuals at all stages of their musical career, in the United States and abroad.

### ***Emotional Cues in Music Composition***

Dr. Falby analyzes the various aural processes that unfold in the design of musical pieces. He has taught this approach to talented musicians to develop their mastery of the art of moving audiences. He seeks scientific collaborators with expertise in measuring listener’s responses to musical processes. As Leonard Meyer hypothesized long ago, these processes imply specific modes of continuation. Listeners find these moving, salutary, and healing. Dr. Falby advocates testing and measuring the physiological and mirrored psychological effects of absolute music on listeners as they attend to the design processes of pieces. Tracking the effects of intertwined musical aspects in various pieces of music on listeners may allow for rigorously and reproducibly testing their potential effectiveness for desired medical interventions.



# Special Remarks



**Joshua Gordon, M.D., Ph.D.,** National Institute of Mental Health

Dr. Gordon received his M.D./Ph.D. degree at the University of California, San Francisco, and he completed his psychiatry residency and research fellowship at Columbia University. Dr. Gordon joined the Columbia University faculty in 2004 as an assistant professor in the Department of Psychiatry, where he conducted research, taught residents, and maintained a general psychiatry practice. In September of 2016, Dr. Gordon became the director of the National Institute of Mental Health (NIMH). Dr. Gordon's research focuses on the analysis of neural activity in mice carrying mutations of relevance to psychiatric disease. Dr. Gordon's work has been recognized by several prestigious awards, including the Brain and Behavior Research Foundation—

NARSAD Young Investigator Award, the Rising Star Award from the International Mental Health Research Organization, the A.E. Bennett Research Award from the Society of Biological Psychiatry, and the Daniel H. Efron Research Award from the American College of Neuropsychopharmacology.

# Session Two: Research on Music Therapy and Music Medicine

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**Co-Chair: Lisa Onken, Ph.D.,** National Institute on Aging

Dr. Onken directs the Behavior Change and Intervention program in the Division of Behavioral and Social Research at the National Institute on Aging (NIA) of the National Institutes of Health (NIH). Immediately prior to joining NIA, Dr. Onken served as the chief of the Behavioral and Integrative Treatment Branch and as the associate director for treatment at the National Institute on Drug Abuse, NIH. After receiving her Ph.D. in clinical psychology from Northwestern University, and before joining NIH, she held a variety of academic, clinical, and research scientist positions at Northwestern University, the University of Illinois Medical Center, and the Walter Reed Army Institute of Research. At NIA, Dr. Onken administers a broad program

of research on interventions to promote the health and well-being of individuals as they age, including research on behavioral, social, and music interventions to promote positive affect, reduce negative affect, foster sleep, and improve emotional well-being and quality of life. Within the context of the NIH Stage Model, a conceptual framework that integrates questions regarding mechanisms of behavior change within the intervention development process, Dr. Onken promotes the development and optimization of interventions that can be defined by their principles and are maximally potent and scalable.



**Co-Chair: Maria Nurminskaya, Ph.D.,** Eunice Kennedy Shriver National Institute of Child Health and Human Development

Dr. Nurminskaya is a program director at the National Center for Medical Rehabilitation Research (NCMRR) of the National Institutes of Health (NIH), where she manages the center's research programs on devices and technology development and on rehabilitation diagnostics and interventions. Her portfolio also includes the Small Business Innovation Research and Small Business Technology Transfer awards in medical rehabilitation. Before joining NCMRR, Dr. Nurminskaya served as a scientific review officer for the study section on musculoskeletal rehabilitation sciences at the NIH Center for Scientific Review. Prior to arriving at NIH, she was an associate professor at the University

of Maryland Medical School, supported with grant funding from NIH and private foundations. Trained in molecular and cell biology, Dr. Nurminskaya managed an independent research program focused on skeletal development, tissue bioengineering, and cardiovascular disease. Her current interests span technologies, devices, and approaches aimed at mitigating health disparities in people with disabilities.





**Co-Chair: Marisol Norris, Ph.D., MT-BC, Drexel University**

Dr. Norris is the founder and chief executive officer of the Black Music Therapy Network, Inc. and assistant clinical professor and director of the Music Therapy and Counseling Master's Program at Drexel University. A leading scholar-activist in music therapy whose work centers on musical placemaking within Black communities, Dr. Norris teaches internationally about the human need for wholeness and the liberatory function of artistic processes to deepen the capacity for relational whole-being. Her clinical and supervisory experience has spanned medical and community health settings and includes acute psychiatric care, trauma and loss, addictions, familial ruptures and repair, and organizational systems. Dr. Norris's work focuses on the agented portrayals of Black service recipients' health practices across chronic illness and mental health and emancipatory research that eliminates inequities within Black communities. Her current research and scholarship explore aesthetics as an embodied meaning-making process within Black life, centering on the effects of societal trauma on Black music and health service providers and Black service users across multiple domains, culturally sustaining practices within mono- and cross-cultural aesthetic processes, and the applied practice of radical healing frameworks evident through the discursive construction of race, gender, class, and sexuality within music and health spaces.

## ILLUSTRATIVE PERFORMANCE



**Jeralyn Glass, Crystal Cadence**

Ms. Glass is an internationally acclaimed singer, musician, and leader in the field of sound healing who offers a unique alchemical blend of music, meditation, and high vibrational sound. Merging quantum science, bioenergetics, and crystalline singing bowls, Ms. Glass helps people with the power of music and sacred frequencies that nourish our bodies, connect us with our hearts, and awaken our consciousness. She created The Sacred Science of Sound® educational platform. She personally curates singing bowl sets and offers her internationally acclaimed Sacred Science of Sound Crystal Alchemy Trainings®. Ms. Glass is the author of *Crystal Sound Healing Oracle*, and her much-anticipated book *Sacred Vibrations* releases in July 2024. Ms. Glass has been among the experts in *The Shift Network's Sound Healing Summit* for 5 years. The Sacred Science of Sound® has presented three powerful online series and a monthly membership that offers cutting-edge information on vibrational medicine, bioenergetics, and the healing power of sound and music. The eagerly awaited app of The Sacred Science of Sound®, *Source*, releases in January 2024. Ms. Glass's music is available on all streaming platforms, Insight Timer, Humanity's Stream+ Library, and the Crystal Cadence YouTube channel. Find out more about Ms. Glass at [www.CrystalCadence.com](http://www.CrystalCadence.com) and [www.jeralynnglass.com](http://www.jeralynnglass.com).



## SPEAKERS

**Marisol Norris, Ph.D., MT-BC**, Drexel University (see biography on page 25)

### **Overview on Music Therapy and Music Medicine**

This session explores the evolving landscape of music medicine and music therapy research, examining their distinct yet interconnected roles in promoting health and whole-being across clinical settings. Centering the developments of philosophical perspectives and therapeutic approaches, Dr. Norris will briefly introduce critical dimensions of music-based interventions and the influence of the broader national health discourse on research trajectories. The introduction will explore the theoretical frameworks underpinning music-based clinical research, emphasizing the physiological, psychological, and social mechanisms through which music exerts its therapeutic effects, drawing attention to the potential implications for clinical practice and health care interventions. Additionally, this introduction will explore the diverse applications of music-based interventions across various domains, encompassing mental health, rehabilitation, and educational settings, highlighting the versatility of musical modalities and the differential effects of individuals with distinct needs and preferences on musical engagement. Furthermore, Dr. Norris will discuss culturally sustaining approaches that center quality and access to care and increase emancipatory practices to reduce inequities within music-based clinical research for marginalized communities.



**Teresa Lesiuk, Ph.D.**, University of Miami

Dr. Lesiuk is the department chair and professor of music therapy at the Frost School of Music, University of Miami. She teaches music therapy courses, supervises music therapy placements, and advises theses and dissertations for master's and doctoral degree levels, respectively. Her main line of research examines cognitive and affective responses to music interventions. Dr. Lesiuk is co-principal investigator on the National Institutes of Health R61/R33 research study investigating mindfulness-based music therapy (MBMT) for patients with stem cell transplant. The study builds on her previous pilot research that examined the impact of MBMT on attention and symptom distress in women with breast cancer. She is also principal investigator for a

study funded by the Pearce Foundation that is examining functional magnetic resonance imaging brain connectivity of autobiographical music for adults with mild cognitive impairment and early Alzheimer's disease. Dr. Lesiuk's other research has examined music's impact on cognition in Parkinson's and in high-cognitive demand workplaces. She has published in top-tier journals in her field, such as *Journal of Music Therapy*, *Music Therapy Perspectives*, *Music and Medicine*, and *Psychology of Music*, and in some outside the music field, such as *Healthcare*, *Oncology Nursing Forum*, and *Information Resources Management Journal*. She is also an accomplished pianist.

### **eHealth Supported Mindfulness-Based Music Therapy Intervention for Allogeneic Stem Cell Transplant Patients**

Allogeneic stem cell transplantation (allo-SCT) is a challenging cancer treatment that includes high-dose chemotherapy and/or radiation, causing physical and psychosocial symptoms (e.g., fatigue, distress) in the peri-transplant period. These symptoms can persist for years, impacting quality of life (QOL). Integrative medicine interventions may reduce symptom burden, improve QOL, and ameliorate disease activity in allo-SCT. This study developed and refined an eHealth Mindfulness-Based Music Therapy

(eMBMT) intervention for patients undergoing allo-SCT. Board-certified music therapists, psycho-oncology trialists, and mindfulness experts developed an eight-session integrative medicine intervention that blends mindfulness and music therapy. Focus groups and usability/field-testing were conducted to refine and finalize the content and eHealth interface. Usability was assessed with the USE Questionnaire (30 items; *strongly disagree* = 1 to *strongly agree* = 8). Focus groups/field-testing were analyzed with rapid qualitative analysis. Participants (N = 11, M<sub>age</sub> = 43.6) were predominantly female (55 percent), White (82 percent), Hispanic (72 percent), and treated for acute myeloid leukemia. Five themes emerged: initial shock of the cancer diagnosis; hospitalization challenges and adjustments to life post-SCT (e.g., limited physical function); coping strategies (e.g., positive thinking) for living with cancer; usefulness of mindfulness/music therapy to cope; and intervention feedback (e.g., align sessions with treatment trajectory). Usability analysis indicated high user satisfaction (USE questionnaire M = 6.7). Field-testing analysis uncovered opportunities for improvement (e.g., condense content, include audio instructions). The eMBMT intervention for allo-SCT patients will be pilot-tested in a randomized controlled trial to examine its feasibility and preliminary effects on reducing symptom burden and improving QOL and psychosocial and physiological adaptation mechanisms.



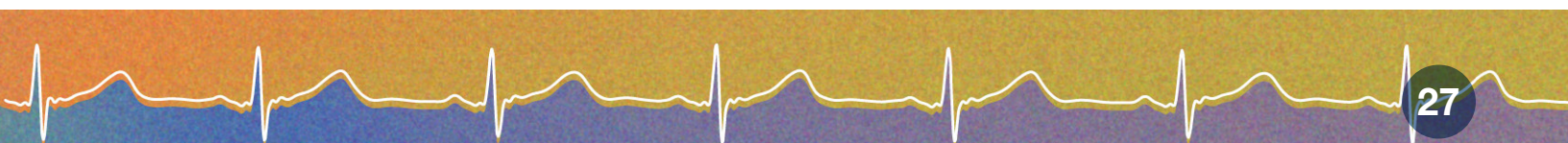
**Joanne Loewy, D.A., L.C.A.T., MT-BC, Mount Sinai Health System**

Dr. Loewy is director of the Louis Armstrong Center for Music and Medicine and Department of Music Therapy, and she is an associate professor at the Icahn School of Medicine, Mount Sinai Health System, New York City (NYC). Her research on the integration of music and medicine across a variety of inpatient and outpatient settings has provided evidence in various areas of disease subspecialties including pain, neurology, pulmonology, oncology, mental health, and intensive care unit environments throughout the lifespan. Her studies include doctors and nurses as co-investigators focusing on specific mechanisms of music and its influence on discreet aspects of functioning. Dr. Loewy is co-editor-in-chief of the international journal

*Music and Medicine*. Collaborations include NYC public schools and extending partnerships with Carnegie Hall Weill Music Institute, Lincoln Center, and Metropolitan Hospital. Multisite research has included Houston Methodist Hospital, Advocate Children’s Hospital, Tulane Hospital, Northwell Health, Columbia University, and Primary Children’s Hospital. Her federally funded research, an AMEND (Assessment of Music Experiences in Navigating Depression) lab, is supported by the National Endowment for the Arts. National Institutes of Health–supported studies include examining the impact of a culturally based live music intervention on metabolic pathways associated with chronic stress and the risk of preterm birth in Black women and an ENSEMBLE network addressing music’s role in pain management.

***Culturally Based Live Music Intervention on Metabolites and Metabolic Pathways, Chronic Stress, and the Risk of Preterm Birth in Black Women***

Preterm birth occurs at unacceptably high rates in the United States, with Black women disproportionately affected. A long-recognized risk factor for preterm birth is the relentless exposure to intersectional stress related to racial and sexual discrimination, poverty, and neighborhood disadvantage that Black women often experience from an early age. In this interdisciplinary study, the investigators bring together experts in preterm birth, music therapy, and metabolomics to address this health disparity by testing the efficacy of a live, culturally based music intervention in 142 healthy first trimester pregnant Black participants to reduce the production of metabolites and metabolic pathways associated with chronic stress and thereby improve birth outcomes. The Music Characterization System will delineate





distinct music mechanisms influenced by the intervention. Clinical metabolomics will test the hypotheses that among prenatal Black women, metabolic perturbations associate with stress and preterm birth and that music therapy can improve stress-associated metabolic perturbations. Metabolomic analyses employing bioinformatics with Mummichog and other tools will identify associations between measures of stress, metabolite profiles, and birth outcomes. The live music therapy intervention will be informed by Black cultural elements, and song of kin, aimed to inform and reduce the chronic stress and injustices experienced by this at-risk population and to identify the mechanisms by which it does so.



**Gammon Earhart, Ph.D., P.T.,** [Washington University in St. Louis](#)

Dr. Earhart is a physical therapist and movement scientist. She completed physical therapist training at Arcadia University, earned a Ph.D. in movement science from Washington University in St. Louis, and completed a postdoctoral research fellowship at Oregon Health & Science University. Her research focuses on movement control and rehabilitation in neurodegenerative conditions, with an emphasis on gait and balance in Parkinson's disease. Dr. Earhart currently serves as associate dean for Physical Therapy, director of the Program in Physical Therapy, and professor of physical therapy, neuroscience, and neurology at Washington University in St. Louis School of Medicine.

Dr. Gammon is a Catherine Worthingham Fellow of the American Physical Therapy Association.

### ***Sing for Your Saunter: Enhancing Walking for People With Parkinson's Using Self-Generated Rhythmic Cues***

People with Parkinson's disease often experience walking difficulties that negatively impact their daily function and quality of life. This project examines the impact of music and singing on walking performance, with the goal of understanding what types of rhythmic cues are most helpful to people with Parkinson's disease. Prior work suggested that imagined, mental singing while walking helps people walk faster with greater stability, whereas walking to music also helps people walk faster but with reduced stability. The present study extended this work by using personalized cues tailored to each person's walking performance and investigating the brain mechanisms underlying the enhancements in movement performance seen with mental singing or music listening. The results suggest that: (1) song selection and song tempo can be used to optimize performance, (2) the auditory cortex is more active during movement to music, and (3) regions of the basal ganglia and cerebellum are more active during movement to mental singing. These results informed the design of the ongoing training study, which compares 12 weeks of training with music to 12 weeks of training with singing. This work is among the first to focus on singing as an intervention to improve walking in Parkinson's disease and is innovative in its use of this novel, untapped, highly accessible, adaptable, and low-cost approach that has the potential to enhance walking, thereby improving everyday function and quality of life for people with Parkinson's disease.





**Carlene Brown, Ph.D., MT-BC, Seattle Pacific University**

Dr. Brown is a professor of music and chair of the Music Department at Seattle Pacific University. She is a musician, music educator, and music therapist and is involved in arts management. Dr. Brown is a board-certified music therapist and director of the Seattle Pacific University Music Therapy Program, the first and only program in the state of Washington and named one of the top 10 programs in the United States in 2018. Dr. Brown earned a Ph.D. in systematic musicology from the University of Washington. Her clinical and research interests are in the use of music for pain management. She was an invited keynote presenter for the 2017 International Symposium of Rural Health and Innovative Long-Term Care Services in Puli, Taiwan. She also lectured

on music and pain management at the National Taiwan University Medical School, Taipei, and the National Tsing Hua University, Hsinchu City, Taiwan. Dr. Brown received the 2018 Professional Practice Award from the American Music Therapy Association’s Western Region Chapter, has been recognized twice for her teaching, and received the 2021–2022 Senior Faculty Award from Seattle Pacific University. Dr. Brown recently joined the research team of Dr. Mark Jensen at the University of Washington to study the mechanisms underlying the benefits of music on low-back pain.

***The Body Tambura as a Music-Based Treatment for Chronic Pain***

An R21 research study is underway at the University of Washington to evaluate the feasibility of conducting a fully powered study of the mechanisms underlying the benefits of music therapy and music medicine for reducing clinical pain intensity in a sample of individuals with low-back pain. The study will evaluate the mediating effects of frontal midline theta oscillation power (primary mechanism variable) and other electromyography-assessed brain activity variables (exploratory mechanism variables) on the pain-reducing effects of music therapy and music medicine, relative to nonmusical sounds. The presentation will focus on the sound source used for this project—the Body Tambura—which is an instrument developed specifically for music therapy, currently used by many music therapists in Europe, and based on the Tanpura, a musical instrument from India. An introduction to the instrument, how it is used in the context of the feasibility study, and preliminary feedback from study participants will be presented. The presentation will conclude with a music therapist’s perspective on choosing music for clinical research.

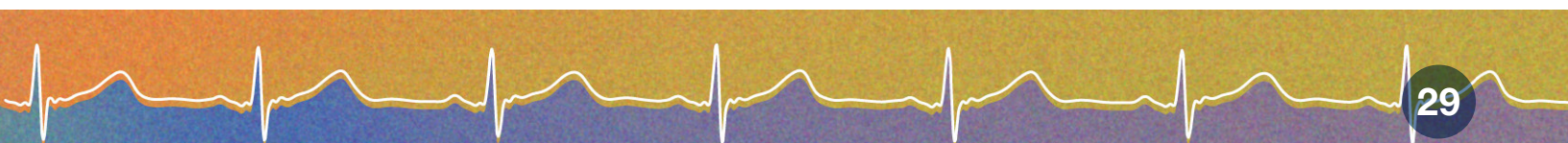
**PANELISTS**



**Melita Belgrave, Ph.D., MT-BC, Arizona State University**

Dr. Belgrave received her bachelor’s degree in music therapy from Michigan State University. She also earned her master’s degree in music therapy, a certification in aging studies, and a doctorate in music education with an emphasis in music therapy at Florida State University. Dr. Belgrave has worked as a music therapist in special education, mental health, rehabilitation, hospice, geriatric, and intergenerational settings. Her research interests are music therapy with older adults and intergenerational programming. She has been published in national and international journals including the *Journal of Music Therapy*, *Music Therapy Perspectives*, *Frontiers Medicine*, and *Journal of Music Teacher Education*. Dr. Belgrave co-authored the text “Music Therapy and

Geriatric Populations: A Handbook for Practicing Music Therapists.” At Arizona State University,



Dr. Belgrave currently teaches undergraduate and graduate music therapy courses, serves as the advisor for the music therapy student organization, and serves as the associate dean for Culture and Access for the Herberger Institute for Design and the Arts. Dr. Belgrave has also been appointed as a research affiliate at the Mayo Clinic in Arizona and conducts creative aging music groups in the community. In 2018, Dr. Belgrave was recognized by the Black Music Therapy Network, Inc. with the annual service award in recognition for her exemplary commitment to advanced knowledge and practice in the field of music therapy.

### ***Integrative Music-Based Community Approaches in Aging Populations***

Dr. Belgrave is excited to attend the Music as Medicine Workshop as a panelist and learner. The timing of this workshop is timely and serves as a connection point for many researchers addressing the same problems in health care and community spaces. As a music therapist and researcher who focuses on aging, Dr. Belgrave has found that collaborative spaces like this not only introduce various practitioners to each other but also provide connection points for future research and interdisciplinary study to truly understand the many benefits of music-based experiences for the people who are served. Dr. Belgrave looks forward to connecting with other panelists, speakers, and attendees and to finding intersections with others to further develop each other's work.



### **Concetta "Connie" Tomaino, D.A., Institute for Music and Neurologic Function**

Dr. Tomaino is the executive director and co-founder, with renowned author neurologist Oliver Sacks, of the Institute for Music and Neurologic Function. She is also an adjunct professor at Lehmann College of The City University of New York. Dr. Tomaino is internationally known for her 40 plus years of research in the clinical applications of music and neurologic rehabilitation. She lectures on music therapy throughout the world. Her work has been featured in national programs, documentaries, international programs (including the BBC), and books on health and healing. Dr. Sacks's book *Musicophilia* is dedicated to her. Dr. Tomaino was past president of the American Association for Music Therapy

and was vice president and founding board member of the International Association for Music and Medicine. Dr. Tomaino received the Award of Accomplishment from Music Therapists for Peace at the United Nations. In 2014, Dr. Tomaino received the Lifetime Achievement Award from the American Music Therapy Association. Dr. Tomaino's new book, *Music has Power® in Senior Wellness and Healthcare: Best Practices From Music Therapy* (Jessica Kingsley Publishers), was released in November 2023.

### ***Neurologic Rehabilitation***

As a clinician and researcher interested in the intersection of neuroscience and clinical music therapy, Dr. Tomaino is inspired by the growing opportunities for collaborative neuroscience/clinical research and funding to support these efforts. While clinical studies continue to show significant outcomes in use of music-based interventions in neurorehabilitation, especially in stroke, traumatic brain injuries, and movement disorders like Parkinson's disease (PD), there are few studies that demonstrate cost benefit of these interventions in areas of reduced inpatient hospital stays or the impact of music-based interventions in maintaining balance and mobility in the early stages of chronic diseases like PD and multiple sclerosis.





**Michael Stanley, M.D.,** Brigham and Women’s Hospital

Dr. Stanley is a neurologist at the Harvard-affiliated Brigham and Women’s Hospital, where he focuses on cognitive and behavioral neurology. He is a proud graduate of the Tufts University School of Medicine Maine Track Program, and he completed his residency at the Mass General Brigham Neurology program. During his time as a resident and fellow, Dr. Stanley participated in the Brigham and Women’s Performing Arts Clinic, developed by Dr. Michael Charness. This clinic focuses on the symptoms, ailments, and injuries that affect musicians, and it provides direction on their rehabilitation. Dr. Stanley’s scholarly work focuses on the medical humanities—including music and medicine. In addition to his academic responsibilities and various professional

societies’ appointments, he is a frequent contributor to the lay press on medical topics, writing for *The Wall Street Journal*, *The Boston Globe*, *Christian Science Monitor*, and WBUR/National Public Radio, amongst others.

**Neurology and Music Therapy—The Role of Clinical Observations in Music Therapy Research**

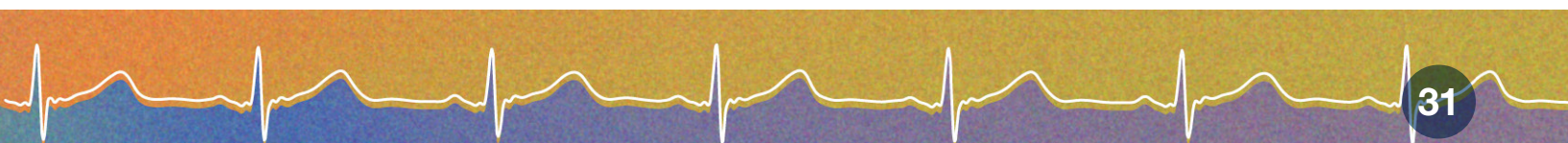
Neurologists see patients with cognitive, behavioral, and movement disorders. They often place referrals to physical, occupational, and speech therapists for these primary symptoms, but they do not consider how music therapy interventions can globally and synthetically address multiple symptoms as well as engage patients socially and emotionally. This can be from access issues, but equally from clinicians not understanding how to identify candidates for music therapy or investigate music therapy. Using clinical anecdotes of patient-collaborations on music interventions to address their symptoms, Dr. Stanley will highlight the role clinicians can play in discovering novel music therapy approaches for further investigation by researchers.



**Maria Gonsalves Schimpf, M.A., MT-BC,** Denver Health RESTORE

Ms. Gonsalves Schimpf is director of Denver Health RESTORE (Resilience and Equity through Support and Training) and is a board-certified music therapist and certified analytical music therapist. Following 20 years of clinical work in behavioral health, Ms. Gonsalves Schimpf established Denver Health and Hospital Authority’s first system-wide peer support program, providing emotional support to the health care workforce and becoming its first program director in 2020. She provided vision and program development through the COVID-19 pandemic, the movement for racial justice, local gun violence, and the aftermath of the pandemic. Under her leadership, the system’s peer support program increased its access points, services lines, and scope,

leading to the creation of a department known as Denver Health RESTORE, with a mission of promoting and sustaining well-being of health professionals and individual, collective, and system resilience. Ms. Gonsalves Schimpf also uplifted Denver Health’s Trauma- and Resilience-Informed Systems initiative, intended to support transformational systems change that improves health care services for individuals affected by trauma while addressing the impact of trauma on the workforce. Her research and work have focused on the impact of trauma both internationally and domestically. She has been dedicated to anti-racism and anti-oppression work within therapy and health care across the last decade.





## ***Psychodynamic and Analytical Approaches of Music-Based Interventions for Trauma and Resilience in Medical Settings***

Ms. Gonsalves Schimpf is a psychodynamic-oriented analytical music therapist who now directs a behavioral health department focused on promoting and sustaining the mental well-being of the health professional workforce. She is excited to be joining the extraordinary team of clinicians and researchers in this learning and in advocacy for future research. The multitude of reckonings within society across the last 4 years has impacted health professionals in unique ways. While seeking to understand the impact and outcomes of music-based interventions on those whom clinicians and researchers serve, Ms. Gonsalves Schimpf is especially interested in the ways in which music-based interventions can positively impact those who are designing the research and providing the care.



**Panagis Galiatsatos, M.D.**, Johns Hopkins University

Dr. Galiatsatos is an associate professor at the Johns Hopkins School of Medicine and a physician in the Division of Pulmonary and Critical Care Medicine. He is health equity faculty lead for the Office of Diversity, Inclusion, and Health Equity for the Johns Hopkins Health System. He is the co-director of Medicine for the Greater Good, an initiative aimed at teaching physicians the science of community engagement while training community health workers and lay health educators. Dr. Galiatsatos is also part of the Community Outreach and Engagement team at the Sidney Kimmel Comprehensive Cancer Center. He is the co-author of the book series *Building Health Communities through Medical-Religious Partnerships* and over 100

research articles on community engagement and its impact on health and health equity. Dr. Galiatsatos graduated from the University of Maryland School of Medicine, and he completed a residency in internal medicine at Johns Hopkins and a fellowship in pulmonary and critical care medicine at Johns Hopkins and the National Institutes of Health.

### ***Music-Based Interventions on Pulmonary Function***

With the current absence of preventive pulmonary medicine, pulmonology has been unable to truly persevere in a fashion similar to other medical fields, such as cardiology and oncology, whereby screening assists in disease prevention and health promotion. Therefore, a discussion in what is needed to create such a field, from screening to management, will be reviewed. How preventive pulmonary medicine may in and of itself transform health care overall will also be discussed.



**Lori Gooding, Ph.D., MT-BC**, Florida State University

Dr. Gooding is an associate professor of music therapy and co-coordinator of music education/music therapy at Florida State University. Dr. Gooding earned her B.M. in music education from the University of South Carolina and her M.M. in music therapy and Ph.D. in music education (music therapy emphasis) from Florida State University. She has presented nationally and internationally and published in journals like the *Journal of Music Therapy*, *Nordic Journal of Music Therapy*, and *Medical Problems of Performing Artists*. Dr. Gooding's clinical research, which has focused on the role of music therapy in biopsychosocial and patient-centered care, includes

projects on the impact of musical training on older adults' cognitive functioning, music therapy-based pain/anxiety management, and music therapy for military-connected populations. Additionally, Dr. Gooding researches music therapy education, including educators' work-life satisfaction, music therapy as a career path, and music majors and hearing loss. Her work has been funded by the University of Kentucky/National Institute on Aging, AARP, Florida Division of Cultural Affairs/National Endowment for the Arts, and others. She is a past president of the Southeastern Region of the American Music Therapy Association (SER-AMTA) and current president of AMTA. In 2020, Dr. Gooding was awarded a Fulbright grant to Malaysia, which she completed in 2022.

### ***American Music Therapy Association (AMTA)***

The American Music Therapy Association (AMTA) has long recognized the importance of research in advancing the science and practice of music therapy. Indeed, the first objective of the Association was to “encourage and report research.” Today, the Association promotes research through its journals, funding opportunities, continuing education activities, and collaborations with external partners. Looking forward, the Association is called to think critically about (a) research methodologies, (b) who engages in/accesses research, (c) research education/training, and (d) how responsive research is to the culture, values, and needs of service recipients. AMTA is committed to the continued discovery needed to promote access to quality music therapy services.

# Special Remarks



**Theresa Cruz, Ph.D.,** *Eunice Kennedy Shriver* National Institute of Child Health and Human Development/National Center for Medical Rehabilitation Research

Dr. Cruz, a biomedical engineer, is the director of the National Center for Medical Rehabilitation Research (NCMRR) at the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD). Through basic, translational, and clinical research, NCMRR fosters the development of scientific knowledge needed to enhance the health, productivity, independence, and quality-of-life of people with physical disabilities. As director of NCMRR, Dr. Cruz led the development of the 2021 National Institutes of Health (NIH) Research

Plan on Rehabilitation and planned the 2020 NIH-wide Rehabilitation Research Conference *Envisioning a Functional Future*. She represents NIH on various Federal committees, including the Interagency Committee on Disability Research. Dr. Cruz is the NICHD Coordinating Team member in the NIH Brain Research through Advancing Innovative Neurotechnologies® (BRAIN) Initiative, co-managing a grant portfolio in the areas of neurotechnology development, validation, and translation. Dr. Cruz joined NIH in 2009 as a program analyst. In 2015, Dr. Cruz performed a research detail at the Functional and Applied Biomechanics Laboratory in the Rehabilitation Medicine Department of the NIH Clinical Center. In late 2016, she returned fulltime to NCMRR in the role of program officer where she began an early career researcher program in rehabilitation. In 2020, Dr. Cruz was named the director of NCMRR.



# Session Three:

## Research on Music Education and Health

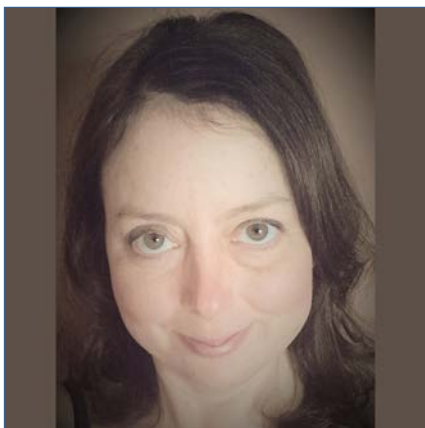
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**Co-Chair: Sunil Iyengar, B.A.,** National Endowment for the Arts (NEA)

Mr. Iyengar directs the Office of Research & Analysis at the National Endowment for the Arts (NEA). Under his leadership, the office has produced dozens of research reports, hosted events and webinars, and established research partnerships with the U.S. Census Bureau, the Bureau of Economic Analysis, the National Center for Education Statistics, and the National Science Foundation. His office leads agency strategic planning, program evaluations, and performance measurement. Mr. Iyengar and his team have designed and implemented three long-term research agendas, founded a national data repository for the arts, and launched two award programs for arts researchers, including the NEA Research Labs initiative. He chaired a

Federal Interagency Task Force on the Arts and Human Development from 2011 to 2023, and his office provides research support to Creative Forces: NEA Military Arts Healing Network. Mr. Iyengar oversees a research funding partnership with the National Institutes of Health as part of Sound Health, an initiative of the Kennedy Center and NIH in association with the Arts Endowment. Mr. Iyengar's office supports the Sound Health Network, in partnership with the University of California, San Francisco. Mr. Iyengar was formerly an editor and reporter covering biomedical research, medical devices, and pharmaceuticals.



**Co-Chair: Dana Schloesser, Ph.D.,** Office of Behavioral and Social Sciences Research, National Institutes of Health

Dr. Schloesser is a health scientist administrator at the National Institutes of Health (NIH) Office of Behavioral and Social Sciences Research (OBSSR), with a focus on the neurosciences across the NIH Institutes and Offices, particularly where they intersect with the behavioral and social sciences. She is currently involved in the Brain Research through Advancing Innovative Neurotechnologies® (BRAIN) Initiative, Blueprint for Neuroscience Research, the Sleep Research Coordinating Committee, the Music and Health Working Group, and the Adolescent Brain Cognitive Development Study. Dr. Schloesser came to OBSSR from the National Institute of Neurological Disorders

and Stroke (NINDS) in Channels, Synapses, and Neural Circuits, where she was involved in programmatic efforts involving chronic fatigue, and epilepsy, and the BRAIN Initiative. Prior to NINDS, Dr. Schloesser was an American Association for the Advancement of Science fellow (2014–2015) at OBSSR, with a focus on behavioral neurosciences. Dr. Schloesser has been engaged in various fields of biological research, including behavioral neuroscience and radiation neurobiology. In these fields, she has presented and published research, received awards for presentations, and developed a comprehensive understanding of these areas.



**Co-Chair: Anthony Brandt, Ph.D.,** [Rice University](#)

Dr. Brandt is a professor of composition and theory at Rice University's Shepherd School of Music and artistic director of the music ensemble Musiqa, winner of two national awards for adventurous programming. Dr. Brandt's catalogue includes three chamber operas, along with orchestral, chamber, vocal, theater, dance, and television scores. Recordings of his music are available on the PARMA Recordings, Albany Records, and Crystal Records labels. His recent projects include three collaborations with the University of Houston BRAIN Center involving mobile brain imaging: these combinations of artistic performance and scientific experiment are among the first of their kind. *The Runaway Species: How Human Creativity Remakes the World*,

which Dr. Brandt co-authored with neuroscientist David Eagleman, has been published in 14 countries. Dr. Brandt has contributed to books and journals on creativity and music cognition, and he is currently co-investigator in studies examining the effects of music on cognitive impairment in seniors, stroke recovery, surgeon stress, and intra and inter-brain synchrony. As Musiqa's artistic director, he has helped to present the works of over 225 living composers, including over 70 world premieres, and to provide free educational programming to over 60,000 public school students. Musiqa recently co-founded the Cross-Country Chamber Consortium, aimed at increasing diversity in modern chamber music repertoire.

## ILLUSTRATIVE PERFORMANCE



**Lisa Wong, M.D.,** [Harvard Medical School](#)

Dr. Wong grew up in Honolulu, Hawaii with a passion for music. As a child, she studied violin and piano and explored the guitar, ukulele, organ, and Hawaiian percussion. An assistant professor of pediatrics and associate director of the Arts and Humanities Initiative at Harvard Medical School, Dr. Wong teaches and works at the intersection of music, health, and education. For 21 years, she served as president of Boston's Longwood Symphony Orchestra (LSO), where she was the lead designer of LSO's Healing Art of Music Program, a collaboration with community-based health care organizations. The author of *Scales to Scalpels*, Dr. Wong speaks on the arts and health nationally and internationally. While maintaining her pediatric practice

during the COVID-19 pandemic, Dr. Wong helped create Boston Hope Music to provide music and music education to patients and frontline caregivers. She serves on the boards of Conservatory Lab Charter School, A Far Cry ensemble, and the Boston Public Schools Arts Expansion Initiative, and has previously served on the boards of New England Foundation for the Arts and Massachusetts Cultural Council. She is currently working with the Massachusetts Cultural Council on CultureRx, an innovative cultural social prescription model.



## SPEAKERS



### **Miriam Lense, Ph.D.,** Vanderbilt University Medical Center

Dr. Lense is an assistant professor and clinical psychologist at Vanderbilt University Medical Center, where she co-directs the Vanderbilt Music Cognition Lab. Her research program investigates mechanisms underlying individual differences in social and emotional functioning and corresponding clinical applications, with a particular focus on children with and without developmental differences and their families. Her multimethod approach uses experimental and applied paradigms that leverage the rhythm and timing of everyday social interactions and harness the science of music cognition as a meaningful, ecologically valid lens through which to study and impact social and affective processes. This research includes adapting and

creating music-based intervention programs, including music-enhanced reciprocal imitation training and Social and Rhythmic Engagement in Autism Spectrum Disorder (SeRENADe), a parent-child music class program. Her research is funded by the National Institutes of Health, the National Endowment for the Arts Research Labs program, and the Academy of Country Music's ACM Lifting Lives® foundation.

### ***Social Development in Early Childhood***

Music and rhythm are ubiquitous in early childhood. Caregivers engage their young children with infant-directed song, which serves to attract infants' attention, modulate their arousal, and strengthen the infant-caregiver bond. In this presentation, Dr. Lense will share experimental and community-involved research on the role of music and rhythm in supporting social engagement in early childhood. Using eye-tracking technology to assess children's moment-to-moment attention, Dr. Lense will reveal how the rhythm of infant-directed singing attunes the social attention of young children, entraining their attention to the eyes of a singing caregiver. Rhythm also structures caregivers' behaviors, highlighting their use of socially meaningful cues at important moments in time. Dr. Lense will then extend these findings to young children on the autism spectrum, indicating the essential role of predictability in supporting social engagement and demonstrating how music and song can reveal underlying mechanistic processes. To translate these basic science findings into practice, Dr. Lense considers the dimensions of musical experiences that support engagement in children with and without autism and their caregivers. Drawing upon data from parent-child music classes, Dr. Lense suggests that musical experiences can shape social-emotional interaction at the level of the individual, dyad, and community group. Given the essential role of the social environment in learning and development, musical experiences provide a rich and multifaceted context for supporting young children.



### **Steven Holochwost, Ph.D.,** Lehman College and City University of New York

Dr. Holochwost is a developmental psychologist who works with programs designed to improve the lives of vulnerable children and youth. His research in child development examines the effects of environment, and particularly poverty and parenting, on voluntary forms of self-regulation (e.g., executive functions) and the involuntary activity of neurophysiological systems that support self-regulatory abilities. This research is directly relevant to his applied work, which examines the efficacy of educational interventions for children in poverty. The



common thread running through both lines of work is the need to understand how poverty impacts child development, and how programs that expand educational opportunities for children can mitigate those effects. Dr. Holochwost is an associate professor in the Department of Psychology at Lehman College and the Graduate Center at the City University of New York, where he co-directs the Research on Equity via the Arts in Childhood (REACH) lab with Drs. Eleanor Brown (West Chester University) and Dennie Palmer Wolf (WolfBrown). He earned his Ph.D. in developmental psychology at the University of North Carolina at Chapel Hill, and a Ph.D. in music theory and composition from Rutgers University, completed under the tutelage of Charles Wuorinen.

### ***School Readiness and Early School Success***

In this presentation, we provide overviews of two studies that examine the effects of music education on young children's school readiness and early school success. The first study, Tuning the Heartstrings, is being conducted with young school-aged children attending Play on Philly, a community-based music education program. The study examines how participation in an intensive program of early music education may foster children's executive functions, a set of core cognitive abilities that are essential to school readiness and early school success, and whether program effects may be driven by changes in young children's parasympathetic nervous system activity, which relaxes the body after periods of stress and danger. The second study is being conducted in partnership with Settlement Music School's Kaleidoscope Preschool, which is an arts-integrated Head Start program, and builds on previous research conducted through this partnership on the effects of arts education on young children's school readiness and neurophysiological function. The current Settlement study is designed to identify key aspects of music education that may lower young children's hypothalamic pituitary adrenal (HPA) axis activity, a key indicator of stress, including music educators' behavior and the specific musical activities in which young children are engaged. Both Tuning the Heartstrings and the Settlement Kaleidoscope Preschool study are being led by members of the Research on Equity via the Arts in Childhood (REACH) Lab, which is supported by the National Endowment for the Arts.



### **Assal Habibi, Ph.D., University of Southern California**

Dr. Habibi is associate research professor of psychology at the Brain and Creativity Institute at the University of Southern California. Her research takes a broad perspective on understanding the influence of arts, specifically music, on health and development, focusing on how biological dispositions and learning experiences shape the brain and development of cognitive, emotional, and social abilities across the lifespan. An expert in the use of electrophysiological and neuroimaging methods to study human brain function, Dr. Habibi has used longitudinal and cross-sectional designs to investigate how music training programs impact learning and academic achievement in children. Her research program has been supported by Federal

agencies and private foundations including the National Institutes of Health, National Endowment for the Arts, and Annenberg Foundation, and her findings have been published in many peer-reviewed journals. She is the lead investigator of a multiyear study, in collaboration with the Los Angeles Philharmonic and Youth Orchestra, of the effects of early childhood music education on development of brain function and structure and cognitive, emotional, and social abilities. Dr. Habibi is a classically trained pianist and has many years of musical teaching experience with children, a longstanding personal passion.

## ***Self-Regulation and Executive Functioning in Childhood***

Executive function (EF) encompasses a range of cognitive processes vital for purposeful, goal-oriented action. Learning a musical instrument engages sensory, cognitive, and motor systems. Studies suggest that musically trained children demonstrate enhanced EF capabilities and distinct neural responses during related tasks. However, most findings come from observational studies, with little diversity in studied groups or exploration of the neural mechanisms linking music training to EF. Dr. Habibi will present a series of longitudinal and cross-sectional studies that employ behavioral and neuroimaging probes to assess the effects of music training on EF development, with an emphasis on inhibition control in children from underserved communities. Findings show musically trained children outperformed their non-musical peers in inhibition-related behavioral tests, demonstrated superior performance in a delayed gratification task compared to an age-matched control group, and displayed more pronounced bilateral neural activation in prefrontal regions (i.e., supplementary motor area, anterior cingulate, inferior frontal gyrus) during an inhibition-control Stroop task. Upon entering adolescence, some of these advantages diminished, suggesting a more pronounced benefit when music is introduced at an earlier stage of development. Our cross-sectional study of musical training in children aged 9 to 12 demonstrated better auditory oddball task performance, with distinct attention-evoked neural responses. These results highlight the potential of music training in supporting EF development and its neural mechanism. Dr. Habibi will discuss an ongoing randomized control trial assessing inhibitory control and music training, now in its second year, and challenges and solutions for randomized trials in community music programs.



**John Iversen, Ph.D.,** [McMaster University](#)

Dr. Iversen is a cognitive neuroscientist studying interactions between music and the brain. He recently joined McMaster University as associate professor in the Department of Psychology, Neuroscience & Behavior after a decade at the University of California, San Diego. Dr. Iversen directs several studies of the impact of music training on development in childhood and adolescence, including Early Academic Readiness and Learning Intervention (EARLI), part of a National Endowment for the Arts research laboratory. These studies examine the impact of music in a broader neurodevelopmental framework, where researchers chart ‘growth curves’ of developing brains to understand how brain development shapes individuals’ emerging skills. Dr. Iversen

has championed the idea of ‘nesting’ studies of music and arts within existing large-scale developmental studies such as the National Institutes of Health’s Adolescent Brain and Cognitive Development (ABCD) study. Dr. Iversen uses music to understand brain and body mechanisms underlying music perception and interpersonal cooperation, focusing on the role of the motor system in shaping perception. After undergraduate studies in physics at Harvard, he received an M.Phil. in history and philosophy of science at Cambridge and a Ph.D. in speech and hearing science from Massachusetts Institute of Technology.

## ***Child and Adolescent Brain and Cognitive Development***

It is an exciting time for developmental science, as large-scale studies are charting the growth curves of brain and behavioral development to describe how individual differences may relate to cognitive development and achievement. Complementary, targeted experimental intervention studies are attempting to discover the levers by which we can optimally influence development. Music is a powerful potential lever, and Dr. Iversen will discuss three ongoing studies to assess the impact of music on brain and cognitive development. Early Academic Readiness and Learning Intervention (EARLI) studies the impact of in-classroom singing lessons on academic performance in pre-kinder children. While many



academic skills correlate with sociodemographics, Dr. Iversen and his team found that singing abilities do not, which suggests that music may have potential as a lever. Two other projects, Studying the Influence Music Practice Has On Neurodevelopment in Youth (SIMPHONY) and Adolescent Brain and Cognitive Development + Music (ABCD+M), have enriched large-scale neurodevelopmental studies with music phenotypes. SIMPHONY, a longitudinal study of approximately 200 elementary-aged children, suggests children learning music have improved processing of language sounds mediated by rhythm skills, providing support for theories of music impact through auditory processing precision. Motor and premotor cortex structure predict individual differences in rhythmic perception and production, supporting theories of a motor role in perception. ABCD+M is an ongoing study of data from the longitudinal ABCD study of over 11,000 adolescents. Music training is highly represented in the study population, and Dr. Iversen and his team are exploring differences in cognitive scores and brain function between music training and other activities.



**Jennifer Bugos, Ph.D.,** University of South Florida

Dr. Bugos is a professor of music education at the University of South Florida, where she directs the Coordination and Cognition Across the Lifespan in Music (CALM) interdisciplinary research lab. The CALM lab uses standardized cognitive, physiological, and motor measures to examine the effects of music programs on health outcomes. After completing professional studies in music education (B.M., M.M., Ph.D.), Dr. Bugos completed postdoctoral work at the University of Florida Clinical-Cognitive Neuroscience Laboratory under the direction of Dr. William Perlstein. Her research interests include the neurological basis for music perception and cognition with regard to human development, lifelong learning, and cognitive transfer. Her interests have led to the

development of music education programs for healthy and clinical populations of children (Multimodal Music Training) and adults (Keys to Staying Sharp, Piano for Parkinson's). Her research has been funded by the National Endowment for the Arts, National Institutes of Health, and GRAMMY Foundation. In 2020, Bugos was a visiting scientist at the Rotman Research Institute and worked with Dr. Claude Alain. In 2023, she received a Fulbright Canada Research Chair Award in psychology to support collaborative research on neural pattern separation in adulthood with Dr. R. Shayna Rosenbaum at York University.

### ***Music Education on Cognitive Abilities in Older Adults***

Music education, the acquisition of explicit musical knowledge and skill development, has the capacity to enhance cognitive, sensory, motor, and social outcomes in aging. To date, research suggests that music education programs enhance musical development and executive functions, a broad array of goal-directed cognitive processes such as inhibition, working memory, processing speed, planning, and verbal fluency. This presentation will include a series of longitudinal studies and randomized controlled trials to demonstrate the effects of manualized music education interventions on executive functions. Manualized music education programs can be structured as cognitive training programs for older adults. Programs such as these contain the key ingredients for an effective cognitive intervention: task novelty, progressive difficulty, practice elements, social components, and ecological validity. Collectively, data in Dr. Bugos's lab suggest that musical learning experiences contribute to verbal fluency, processing speed, and inhibition in healthy aging adults. An overview of an ongoing randomized trial supported by the National Endowment for the Arts will be discussed as well as considerations for intervention development and refinement for aging adults.



## PANELISTS



**Indre Viskontas, Ph.D.**, Sound Health Network

Dr. Viskontas is a neuroscientist, musician, opera stage director, and science communicator. She is associate professor of psychology and director of the Creative Brain Lab at the University of San Francisco and is on the faculty at the San Francisco Conservatory of Music (SFCM). Dr. Viskontas earned a B.Sc. at the University of Toronto, an M.M. at SFCM, and a Ph.D. in cognitive neuroscience at University of California, Los Angeles. Her postdoctoral fellowship was at University of California, San Francisco. Dr. Viskontas has published over 50 scientific papers and chapters on the neural basis of memory and creativity. She is currently president-elect of the Society for the Neuroscience of Creativity and director of communications for the Sound Health

Network. She has written and filmed 98 lectures for *The Great Courses*, hosted several TV shows, and appeared on *The Oprah Winfrey Show*, *PBS NewsHour*, and major radio stations. She hosts the podcasts *Inquiring Minds*, with more than 14 million downloads, and *Cadence: What Music Tells Us About the Mind* and has collaborated with Audible and the Oliver Sacks Foundation to host and write *Radiant Minds: The World of Oliver Sacks*. Her book, *How Music Can Make You Better*, was published by Chronicle Books.

### ***Beyond the Mozart Effect: How Music Can Impact Education***

Music connects us, brings joy, and helps us navigate our emotions and those of others. Our brains tune into music even before birth, and music kick-starts the development of language, empathy, and attachment. It enhances executive functioning skills like paying attention, setting and meeting goals, inhibiting distractions, and delaying gratification. Music programs in schools motivate kids to attend and improve graduation rates, grade point averages, and behavior. Every child has a right to a musical education—to learn the multipurpose tool that we've been using since we've lived in social groups.



**Thalia Goldstein, Ph.D.**, George Mason University

Dr. Goldstein is associate professor and director of applied development psychology at George Mason University. She directs the Play, Learning, Arts, and Youth Lab and co-directs the Mason Arts Research Center (a National Endowment for the Arts lab). Her primary work focuses on the effects of pretend play, role play, and the arts on the development of children's and adolescents' social skills, emotion regulation abilities, creativity, and embodiment. Her secondary line of work focuses on how children and adults understand the fiction/reality border, particularly in cases of characters such as Santa Claus. Her work has been supported by the National Endowment for the Arts, John Templeton Foundation, Arts Connection, National Science Foundation,

American Psychological Foundation, and Department of Homeland Security. She is the current co-editor of the journal *Psychology of Aesthetics, Creativity, and the Arts* (American Psychological Association Division 10). Dr. Goldstein earned a B.A. in theatre and psychology from Cornell University and an M.A. and Ph.D. in developmental psychology from Boston College. She completed a postdoctoral fellowship at Yale University.

## **Music Across Educational Contexts: Social and Emotional Outcomes**

Children's and adolescents' engagement with music occurs across a variety of contexts, including schools, informal learning environments, and home. Each of these contexts provides different opportunities for engaging with emotions, social affiliation with others, and the development of peer networks. In many cases, musical activities are embodied behaviors (e.g., dancing, marching band and drum corps, opera, musical theatre performance), necessitating theory and experiments around the multimodal ways in which music fosters health and well-being. Current findings support engagement with music in embodied contexts during development to cultivate belonging, self-efficacy, and emotional understanding.



**Maud Hickey, Ph.D.**, Northwestern University, emeritus

Dr. Hickey is associate professor emeritus at Northwestern University in Evanston, Illinois. She has researched, written, and presented research on creative thinking in music in children. Her most recent research examined the feasibility and impact of creative thinking through music composition with youth in carceral settings. She spent 10 years facilitating and researching a music composition program for youth in the Chicago Cook County Juvenile Temporary Detention Center. Hickey's research has been published in the *Journal of Research in Music Education*, the *Bulletin of the Council of Research in Music Education*, and the *International Journal of Offender Therapy and Comparative Criminology*. Her book, *Music Outside the Lines: Ideas*

*for Composing in K-12 Music Classrooms* (Oxford University Press), provides rationale and classroom activities for creative music-making in music classrooms. She received a bachelor of music education from Indiana University, a master's degree in educational psychology from the University of Wisconsin, Madison, and a Ph.D. in music education from Northwestern University.

## **Arts and Music Programs for Education in Detention Centers (AMPED)**

Every human is born with the capability to create music—they simply need the freedom and tools to facilitate this expression. Unfortunately, schools of Western European art and music have, for too long, mystified the creative process and made it seem as only those with years of classical training are worthy of creating. All people can create music; the job of music educators is to provide spaces to stimulate creativity. The creation of music holds special power for humans who have experienced trauma or oppression. This potential is yet to be tapped.



**Tarrell Davis, M.Ed.**, Settlement Music School

Ms. Davis, executive director of early childhood programs (Kaleidoscope, Art Integrated Preschool) for Settlement Music School, started as a teacher in the field of early childhood education. She has continued to teach adults and advocate for children and families for the past 30 years. She worked as a director for non-profit and for-profit organizations in Philadelphia, Pennsylvania, and surrounding counties. Ms. Davis has served as a Delaware Valley Association for the Education of Young Children mentor, assisting Head Start programs with achieving National Association for the Education of Young Children (NAEYC) accreditation for their programs, with Settlement being one on the list. She is also director of Teacher Training Institute for the Arts, where she

has proposed and created arts-integrated training and workshops for children and teachers across the



state. Ms. Davis is also an arts integration consultant and curriculum advisor for various organizations including PBS Kids. She is an active member of NAEYC and Pennsylvania Child Care Association and is involved in various child advocacy groups as chair or co-chair. Ms. Davis acquired a bachelor of science degree in child development and family relations and a master's degree in education teaching K–8.

### **Community Impact—“Kaleidoscope” Head Start Preschool Program**

I have always had passion and motivation to be part of something that would impact the world. I believed I needed to empower people creatively and begin as early as possible. That led me to the field of early childhood education. My involvement in the Kaleidoscope program at Settlement Music School has shown me the importance of the arts for providing children a variety of ways to learn. Published research findings have shown powerful benefits of the arts for children's expression and learning. This motivates me to ensure all children have this opportunity.



**Victor Minces, Ph.D.,** University of California, San Diego

Dr. Minces studied fine arts and physics in Buenos Aires, Argentina, and obtained a Ph.D. in computational neuroscience at the University of California, San Diego, where he is a research scientist. He has researched the neural basis of perception of sound and light signals and the cognitive and neural basis of rhythm and music. Dr. Minces's work in researching music in schools led him to create Listening to Waves, a program that creates web applications and physical experiences to engage children in the science, technology, engineering, and mathematics of music through playful exploration and creation of sound. The applications developed by his team are being widely adopted throughout the world. Dr. Minces also brings the science of

music to society at large through sonic art installations and public performances.

### **Playing Together. Gamelan Project and Sound Exploration**

For many children, school is boring and oppressive, as it was for me. Although the arts can make school meaningful and help children develop cognitive skills and social bonds, they are marginalized in pursuit of domains regarded as more fundamental. My experience as an artist and scientist has shown me fascinating aspects of the science of sound and the connections between music and science, technology, engineering, and mathematics (STEM). My goal is to develop integrated curriculum and digital tools to bring these connections and fascination to poor children, improving their school lives and allowing them to enjoy both STEM and art.



**Kenneth Elpus, Ph.D.,** University of Maryland, College Park

Dr. Elpus is professor of music education and associate director of the School of Music at the University of Maryland, College Park, where he prepares preservice music educators to teach choral music in secondary schools, teaches graduate research methods, and conducts the University Treble Choir. He is principal investigator of the Music & Arts Education Data Lab (<https://madlab.umd.edu>), a National Endowment for the Arts research lab. He earned Ph.D. and master's degrees in music education at Northwestern University and a bachelor's degree and K–12 teaching credential at The College of New Jersey. His research interests include music in education



policy, demography and representation among music students and teachers, and social and academic consequents of music and arts education for K–12 students. This work has been funded by the U.S. Department of Education’s Institute of Education Sciences, the National Endowment for the Arts, and the International Baccalaureate Organization, and published in the *Journal of Research in Music Education*, *Music Education Research*, *Psychology of Music*, *Arts Education Policy Review*, and others. He co-authored, with Peter Miksza, the Oxford University Press book, *Design and Analysis of Quantitative Research in Music Education*. Recently, he became editor-in-chief of *Arts Education Policy Review*.

### ***Music in Secondary Schools: Access, Uptake, and Achievement***

My research is motivated by a single, overarching wonderment, borne of my time teaching high school: What systematic differences exist between students who do and do not elect music education in secondary school? I answer questions related to this curiosity by investigating three parts of the timeline of music enrollment: *before*, by researching antecedents or predictors of elective music enrollment; *during*, by researching the demographic profiles of music students and music teachers; and *after*, by researching the consequents of music study on other areas of life, using controls for systematic differences uncovered in other areas.

# Day One Closing Remarks



**Julie Gerberding, M.D., M.P.H.**, Foundation for the NIH Chief Executive Officer

Dr. Gerberding is the president and chief executive officer of the Foundation for the National Institutes of Health (FNIH), a non-profit organization that builds public-private research partnerships to support the mission of NIH. She co-chairs the Center for Strategic and International Studies (CSIS) Bipartisan Alliance on Global Health Security and is a member of the Commonwealth Fund Commission on a National Public Health System. Previously, Dr. Gerberding served as president of Merck Vaccines and as executive vice president and the chief patient officer at Merck & Co., Inc. From 2003 to 2009, Dr. Gerberding led the U.S. Centers for Disease Control and Prevention (CDC). She serves on the boards of HilleVax, Mayo Clinic, National Health Council, and Case Western Reserve University. Dr. Gerberding is a member of the National Academy of Medicine and the adjunct faculties of the University of California, San Francisco, and Case Western Reserve University.

# Day Two: The Future of the Sound Health Initiative

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## OPENING REMARKS



**Richard J. Hodes, M.D.**, National Institute on Aging

Dr. Hodes is the director of the National Institute on Aging (NIA) at the National Institutes of Health (NIH). Dr. Hodes, a leading researcher in the field of immunology, was named to head NIA in 1993. He has devoted his tenure to the development of a strong, diverse, balanced research program, focusing on the genetics and biology of aging, basic and clinical studies aimed at reducing disease and disability, age-related cognitive change, and investigations of the behavioral and social aspects of aging. Dr. Hodes also directs the Federal effort to find effective ways to treat or prevent Alzheimer's disease and improve care for those living with dementia. Cutting-edge research conducted and

supported by NIA, often in collaboration across Institutes at NIH, has helped to revolutionize the way we think about Alzheimer's disease and related dementias. Studies in genetics, basic mechanisms, imaging, and biomarkers have spurred the development of potential therapies aimed at a variety of targets and the testing of interventions at the earliest signs of disease. Dr. Hodes received his M.D. from Harvard Medical School. He completed training in internal medicine at Massachusetts General Hospital and in oncology at the National Cancer Institute.



**Deborah Rutter, M.B.A.**, John F. Kennedy Center for the Performing Arts

As president of the John F. Kennedy Center for the Performing Arts, Ms. Rutter is a leading voice in arts administration. As leader of the national cultural center, Ms. Rutter oversees programming across all genres. In 2019, she opened the REACH, an expansion of the center's campus designed to bring audiences into the artistic process. She has expanded programming to fully represent the diversity of art in America and introduced many programs across local, national, and international communities. Ms. Rutter has held executive leadership roles with the Chicago Symphony Orchestra Association, the Seattle Symphony, the Los Angeles Chamber Orchestra, and the Los Angeles Philharmonic.

She is a graduate of Stanford University and holds an M.B.A. from the University of Southern California.



# Keynote



**Renée Fleming, M.M.,** John F. Kennedy Center for the Performing Arts

Ms. Fleming is one of the most highly acclaimed singers of our time, performing on the stages of the world's great opera houses and concert halls and honored with five Grammy® awards and the U.S. National Medal of Arts. In May, she was named a Goodwill Ambassador For Arts and Health for the World Health Organization. Ms. Fleming is a leading advocate for research at the intersection of arts and health, partnering with leading organizations and presenting with scientists and practitioners around the world. As artistic advisor to the John F. Kennedy Center for the Performing Arts, she helped launch the ongoing Sound Health collaboration with the National Institutes of Health (NIH) and the National Endowment for the Arts. She is co-chair of the Johns

Hopkins/Aspen Institute NeuroArts Blueprint and founding advisor for the Sound Health Network at the University of California, San Francisco, and her foundation has supported projects including the NIH Music-Based Intervention Toolkit and the Renée Fleming NeuroArts Investigator Awards. Her advocacy work has earned her Research!America's Rosenfeld Award for Impact on Public Opinion and the World Economic Forum's Crystal Award. Her new anthology, *Music and Mind: Harnessing the Arts for Health and Wellness*, will be published by Viking Penguin in spring 2024.

# Special Remarks



**Amy Adams, Ph.D.**, National Institute of Neurological Disorders and Stroke

Dr. Adams is acting deputy director of the National Institute of Neurological Disorders and Stroke (NINDS) and deputy director of Scientific Management and Operations, NINDS. Using her scientific, organizational, policy, and communication expertise, she leads strategic efforts that optimize operational support for NINDS's scientific priorities. Dr. Adams began her National Institutes of Health (NIH) career as an American Association for the Advancement of Science science and technology policy fellow in the Office of the NIH Director, and she has served as a special assistant to the NIH director and director of the Office of Science Policy and Analysis, National Institute of Dental and

Craniofacial Research. In 2013, she joined NINDS, where she established and ran the Office of Scientific Liaison and later, established and served as director of NINDS's Office of Neuroscience Communications and Engagement (ONCE). In this role, she managed coordination and communication activities for several NIH-wide neuroscience initiatives, including the NIH Brain Research Through Advancing Innovative Neurotechnologies® (BRAIN) Initiative. In addition to her professional duties and engagements, Dr. Adams spends her time reading and raising three kind and curious humans.

# Session Four:

## Future Research Directions

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**Co-Chair: Wen Chen, M.MSc., Ph.D.,** National Center for Complementary and Integrative Health

Dr. Chen is branch chief of Basic and Mechanistic Research in the Division of Extramural Research, National Center for Complementary and Integrative Health (NCCIH), National Institutes of Health (NIH). She oversees fundamental science research, translational research, mechanistic clinical research, and methodology and technology development related to all complementary and integrative health approaches. Dr. Chen also chairs the NIH-wide Interoception Research Working Group, and she is the program lead for the Trans-NIH Music and Health Working Group. Dr. Chen received her master's degree from Harvard Medical School and a Ph.D. from Harvard University. She

completed postdoctoral training at Massachusetts Institute of Technology (MIT). Before joining NCCIH, she worked as a scientific editor at *Neuron*, program coordinator at the National Institute of Mental Health, and program director at the National Institute on Aging.



**Co-Chair: Robert Finkelstein, Ph.D.,** National Institute of Neurological Disorders and Stroke

Dr. Finkelstein has been the director of the National Institute of Neurological Disorders and Stroke (NINDS) Division of Extramural Activities since November 2004. His work encompasses planning and policy, coordinating scientific programs funded by NINDS, and overseeing extramural program scientific review, grants management, and administrative services. NINDS funds neuroscience research in areas ranging from single brain cell structure and function to research on neurological disorders and, most recently, translational research. The Institute's mission is to reduce the burden of neurological disease—a burden borne by every age group and segment of society

across the world. Dr. Finkelstein earned his Ph.D. in biology from Massachusetts Institute of Technology and did postdoctoral research at Harvard Medical School. Previously, he was a tenured associate professor in the Department of Neuroscience at the University of Pennsylvania School of Medicine. His research there focused on brain development in the fruitfly *Drosophila melanogaster*. Dr. Finkelstein joined the Extramural Division in 1999, as a program director in the Neurogenetics Cluster. In this role, he developed research initiatives and oversaw grants in areas including basic neurodevelopment, brain tumors, neurofibromatosis, and many disorders of the developing nervous system.





**Co-Chair: Theodore Zanto, Ph.D.,** University of California, San Francisco

Dr. Zanto earned B.S. degrees in physics and psychology from the University of Wisconsin, Whitewater and a Ph.D. in complex systems and brain sciences from Florida Atlantic University, where his research focused on identifying neural correlates of the musical beat. He completed postdoctoral training in cognitive neuroscience at the University of California, San Francisco (UCSF), where he is currently an associate professor of neurology and director of the Neuroscape Neuroscience Division. Dr. Zanto sits on numerous advisory boards, including for the International Conference on Music Perception and Cognition. He utilizes functional magnetic resonance imaging (fMRI),

electroencephalogram (EEG), and noninvasive neuromodulatory techniques to study neural mechanisms at the intersection of attention, perception, and memory. He is particularly interested in the role of neural entrainment in cognitive control and its use as a potential therapeutic, notably in the aging population. Dr. Zanto is assessing how neural entrainment via music production or oscillatory neuromodulation affects cognitive control functions in older adults with and without mild cognitive impairment. His long-term goals are to translate basic science research into interventions that help remediate or retain cognitive abilities throughout the lifespan and across clinical populations with cognitive control difficulties.

## ILLUSTRATIVE PERFORMANCE



**Grace Leslie, Ph.D.,** University of Colorado, Boulder

Dr. Leslie, director, Brain Music Lab, ATLAS Institute, University of Colorado, Boulder (CU Boulder), is a flutist, electronic musician, and scientist. She develops brain-body music interfaces that reveal aspects of her internal cognitive and affective state to an audience. She has performed in the United States, United Kingdom, Australia, Germany, Singapore, South Korea, China, and Japan, and released three brain-body music albums. She works with collaborators to develop brain-body music technologies as health and wellness interventions, which have been published in the human-computer interaction and medical (*Acta Neurologica Scandinavica*, *Scientific Reports*) communities. Her music and research have been featured nationally and internationally,

including by the BBC, National Public Radio's *Science Friday*, and the Kennedy Center. Dr. Leslie was recognized as one of *MIT Technology Review*'s Innovators under 35 for the Asia Pacific region. Her research at CU Boulder is supported by a National Science Foundation Faculty Early Career Development Program (CAREER) grant. She completed postdoctoral fellowships at the Neukom Institute for Interdisciplinary Computation at Dartmouth University and the Massachusetts Institute of Technology Media Lab. Her doctoral work was performed at the Department of Music and the Swartz Center for Computational Neuroscience at the University of California, San Diego.

## SPEAKERS



**Yuanyuan (Kevin) Liu, Ph.D.**, National Institute of Dental and Craniofacial Research/National Center for Complementary and Integrative Health

Dr. Liu earned his B.S. degree in biological pharmacy from Nanjing University, China. He pursued his Ph.D. at the State University of New York, where he delved into the role of RNA binding proteins in axon development and regeneration, using *Xenopus laevis* as a model. Dr. Liu completed postdoctoral training at Boston Children's Hospital, Harvard Medical School. During his postdoctoral career, he optimized an elegant, multistep viral-based intersectional targeting tool, which he used to dissect the role of corticospinal output in orchestrating fine motor control and tactile sensation. In 2020, Dr. Liu joined the National Institute of Dental and Craniofacial Research/National Center

for Complementary and Integrative Health as a Stadtman Tenure-Track Investigator. His current research focuses on unraveling the bidirectional communications between the mind (brain) and the body (spinal cord) that influence somatosensory perception, especially pain. His research will help explain how our mental states alter normal and pathological somatosensory perception in different contexts or mood states, offering hope in identifying innovative therapeutic targets for treating refractory pain.

### **Sound Induces Analgesia Through Corticothalamic Circuits**

Sound—including music and noise—can relieve pain in humans, but the underlying neural mechanisms remain unknown. Dr. Liu and his team discovered that in mice, analgesic effects of sound depend on a low (5-decibel) signal-to-noise ratio (SNR) relative to ambient noise. Viral tracing, microendoscopic calcium imaging, and multielectrode recordings in freely moving mice showed that low SNR sounds inhibit glutamatergic inputs from the auditory cortex ( $ACx^{Glu}$ ) to the thalamic posterior (PO) and ventral posterior (VP) nuclei. Optogenetic or chemogenetic inhibition of the  $ACx^{Glu} \rightarrow PO$  and  $ACx^{Glu} \rightarrow VP$  circuits mimic low SNR sound-induced analgesia in inflamed hindpaws and forepaws, respectively. Artificial activation of these two circuits abolishes the sound-induced analgesia. Dr. Liu and his team's study reveals the corticothalamic circuits underlying sound-promoted analgesia by deciphering the role of the auditory system in pain processing.



**Reyna Gordon, Ph.D.**, Vanderbilt University

Dr. Gordon is an integrative scientist interested in the brain mechanisms and genetic architecture of individual differences in musicality and how musicality relates to language, health, and social interaction. Her work is highly interdisciplinary and integrates approaches from the fields of psychology, neuroscience, medicine, human genetics, linguistics, music cognition, and communication disorders. She received a bachelor's degree in vocal arts from the University of Southern California, an M.S. in neuroscience from the University of Provence, and a Ph.D. in complex systems and brain sciences from Florida Atlantic University. As associate professor in the Department of Otolaryngology-Head & Neck Surgery at Vanderbilt University Medical Center, she co-directs

the Music Cognition Lab with Dr. Miriam Lense. Dr. Gordon has appointments at the Vanderbilt Genetics Institute, the Vanderbilt Brain Institute, the Vanderbilt Kennedy Center, the Blair School of Music at Vanderbilt, and the Vanderbilt Institute for Global Health. She has led several Federal grants, including a National Institutes of Health (NIH) Director's New Innovator Award and a National Institute on Deafness



and Other Communication Disorders R01. Dr. Gordon is co-founder and co-chair of the Musicality Genomics Consortium, an international network dedicated to large-scale population-based studies of human musical traits and health.

### ***Genomic Influences on Sensorimotor Synchronization and New Links With Health***

The ability to coordinate and synchronize with a musical beat is a fascinating feature of the human musical experience that has been studied extensively with behavioral and cognitive neuroscience methods. While we know from twin studies that rhythm (and other human musical traits) are moderately heritable, little has been known about the molecular genetic basis of musicality until very recently. In this talk, Dr. Gordon will convey how her team's recent research into the genetic architecture of individual differences in musical rhythm traits has brought about new knowledge about the biological basis of musicality and specific biological functions shared with other health traits. She will also discuss exciting new directions in the field that will bring about new understanding of the genetic basis of musicality and its relationship to brain and health through the integration of musicality phenotyping into large-scale population-based studies.

**Theodore Zanto, Ph.D.**, University of California, San Francisco (see biography on page 50)

### ***Mechanisms of Cognitive Change Following Digital Rhythm Training***

Playing a musical instrument engages numerous cognitive abilities, including sensory perception, attention, and memory. Mounting evidence indicates that engaging these cognitive functions during musical training improves performance of these same functions. Yet, it remains unclear the extent to which these benefits may extend to nonmusical tasks, which neural mechanisms may enable such transfer, and whether cognitive benefits occur following digital musical rhythm training. We conducted a preregistered randomized clinical trial in which non-musicians underwent 8 weeks of either digital rhythm training or word search as control. Only rhythm training placed demands on timing (temporal attention) ability and short-term memory. As such, only the rhythm training group exhibited improved exogenous timing performance. This improvement was associated with increased delta band (1-4Hz) activity within a sensorimotor network. However, endogenous timing abilities were not improved, likely because the training did not engage this form of timing. As hypothesized, rhythm training also improved short-term memory on a face recognition task, which was associated with enhanced neural activity in the right superior parietal lobule during memory encoding and retrieval. Together, these results provide important evidence that digital musical rhythm training can benefit performance in both musical (domain specific) and nonmusical (domain general) tasks. The observed transfer of benefits was limited to tasks that engaged shared cognitive functions with the training paradigm, resulting in neuroplastic changes within their associated neural networks.



**Jacquelyn Kulinski, M.D.**, Medical College of Wisconsin

Dr. Kulinski is director of the Preventive Cardiology Program and associate professor of medicine at the Medical College of Wisconsin with a secondary appointment in the Graduate School of Biomedical Sciences. She is a board-certified cardiologist with a strong interest in preventive cardiology and provides individualized and comprehensive cardiovascular risk assessment to patients. She is a fellow of the American Society of Preventive Cardiology. Dr. Kulinski earned her medical degree from the Medical College of Wisconsin. She completed a residency in internal medicine at the University of Washington in Seattle and a fellowship in cardiovascular medicine at the University of Texas



Southwestern Medical Center. She holds a certificate in clinical and translational science and has been a National Institutes of Health (NIH)-funded investigator since 2019. Much of her research has focused on the role of nonpharmacologic interventions to prevent heart disease. Dr. Kulinski has been collaborating with music professors and music therapy teams since 2017 to study the impact of singing on heart health. These multidisciplinary team collaborations led to the Evaluating the Impact of Singing Interventions on Markers of Cardiovascular Health in Older Patients with Cardiovascular Disease NIH grant.

### ***Applied Research: Singing for Cardiovascular Health***

Cardiovascular disease (CVD) claims more lives each year than cancer and chronic respiratory disease combined. Participation in cardiac rehabilitation (CR) reduces mortality and risk of major cardiovascular events in secondary prevention populations, including older adults. Older adults are less likely to participate in CR, as comorbidities (e.g., arthritis, chronic obstructive pulmonary disease) in this population make participation difficult. Singing is a physical activity that involves components of the vagal nerves manifested as changes in cardiac autonomic regulation. Unlike physical exercise, the effects of singing on cardiovascular health have not been well studied. Her team's hypothesis is that older patients with CVD will have favorable improvement in cardiovascular biomarkers including endothelial function and heart rate variability (HRV) after 30 minutes of singing. The randomized, single-blind, crossover, sham procedure-controlled study will have three arms. Sixty-five participants will each have three visits on three different occasions with the following interventions: (1) a 30-minute period of guided singing from an in-person music therapist, (2) a 30-minute period of singing along to an instructional video including a professor of voice and an inexperienced, older singing student, and (3) a 30-minute sham period during which they will undergo hearing testing. Knowledge gained from this proposal will improve our understanding of biologic mechanisms of singing behaviors relating to CVD. If our aims are achieved, singing, as an alternate or adjunctive form of cardiac rehabilitation, could transform the existing paradigm to reduce cardiovascular disease burden in our aging population.



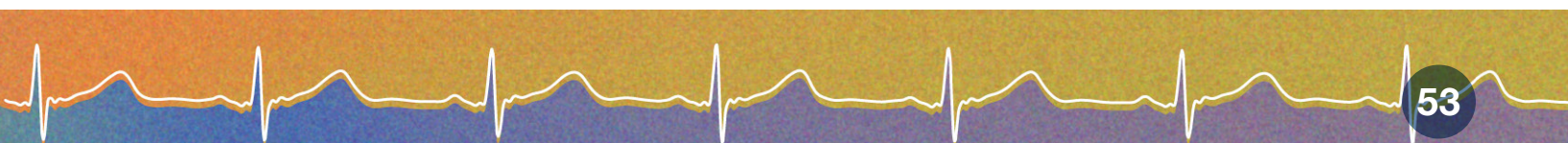
### **Christina Hugenschmidt, Ph.D., [Wake Forest University](#)**

Dr. Hugenschmidt is the Rebecca E. Shaw Professor and director of the Memory Counseling Program and associate professor of gerontology and geriatric medicine at Wake Forest University School of Medicine in the Sticht Center for Healthy Aging and Alzheimer's Prevention. She is a neuroscientist committed to research that maintains dignity and purpose for older adults across the range of physical and cognitive functions. Dr. Hugenschmidt explores the aging brain as a complex system that influences and is influenced by other body systems. She is principal investigator or co-investigator on National Institutes of Health-funded and foundation grants investigating how age-related changes in movement and metabolism interact with the brain and cognition, and

the potential of lifestyle interventions to support healthy brain and body function in aging. Her work on arts and aging with Kennedy Center Citizen Artist Fellow Christina Soriano, M.F.A., has led to community collaborations and unique outreach opportunities. She is co-leader of the Wake Forest Pepper Center Bioluminescence Resource Core and a member of the Alzheimer's Disease Research Center Neuroimaging Core.

### ***Understanding the Mechanisms of Dance for Brain/Body Wellness in Aging***

Dance is a complex behavioral phenomenon that is intrinsically linked to music, movement, and social connections. From a scientific perspective, dance incorporates intervention targets aimed at improving or maintaining neurocognitive health with aging. Dance involves cognitive challenge, physical activity,



and social engagement, and incorporates key antecedents of behavioral change, including autonomy, relatedness, and self-efficacy. The Improvisational Movement for People With Memory Loss and Their Caregivers (IMOVE) trial (NCT03333837) tested the hypothesis that the movement and social aspects of a group dance intervention alter the connectivity of key brain networks involved in motor and social-emotional functioning, improving quality of life (QOL) in people living with dementia (PWD). PWD and caregivers met twice weekly for 12 weeks, assigned to either: (1) a movement group, with group improvisational dance (IMPROVment® Method) classes; (2) movement alone, using the same dance movement and auditory stimuli as the group class without social interaction; or (3) a social group, with improvisational party games to provide the fun and playfulness of the movement group without movement. The primary outcome was change in QOL among PWD. Key secondary outcomes were functional brain network measures assessed using graph-theory analysis of resting-state functional magnetic resonance imaging scans, and neuropsychiatric symptoms, gait, and balance.

Dr. Hugenschmidt will describe adaptations due to COVID-19, outcomes of IMOVE, the study design for our team's current trial, Effects of Dance and Music Appreciation on Brain Health and Fitness in People at Risk for Alzheimer's Disease (IGROOVE), and future directions.

## PANELISTS



**Maria Geffen, Ph.D.,** University of Pennsylvania

Dr. Geffen is a professor at the University of Pennsylvania, where she has directed the [Laboratory for Auditory Coding](#) since 2010. Dr. Geffen's research focuses on understanding how the brain encodes information about sounds. Dr. Geffen first became interested in systems neuroscience through her undergraduate thesis at Princeton University, where she explored the mechanics of whisking in rats. She completed her Ph.D. in biophysics at Harvard University, where she discovered a novel retinal circuit for processing moving images. She was then a fellow at the Center for Physics and Biology at Rockefeller University, where she explored the dynamics of natural sounds. Her research in the auditory system has identified a novel cell type that supports

hearing of unexpected sounds and elucidated the neuronal code for representation of communication signals in the brain. Her scientific results are regularly published in well-recognized journals, including *Nature Neuroscience*, *eLife*, and *PLoS Biology*. Her research is supported by multiple grants from the National Institutes of Health, and her research accomplishments have been recognized with prestigious awards, including the Burroughs Wellcome Fund's Career Award at the Scientific Interface, Klingenstein Foundation Award in the Neurosciences, and Human Frontiers Science Program Young Investigator Grant.

### ***Understanding the Role of Inhibition in Pattern Perception***

An important task of the auditory system is to detect unexpected sounds while preserving sensitivity to predictable sounds, such as within a repeated musical pattern. Nearly all neurons in the auditory cortex exhibit stimulus-specific adaptation, which decreases the sensitivity of neuronal populations to repeated sounds. Neurons in the auditory cortex form excitatory-inhibitory networks. Dr. Geffen's laboratory discovered that specific classes of inhibitory neurons can control adaptation to repeated sounds in a differential fashion. More generally, inhibitory neurons participate in shaping the representation of patterns of sounds, such as in music, in the brain.





**Shihab Shamma, Ph.D.,** University of Maryland, College Park

Dr. Shamma is a professor of electrical and computer engineering at the University of Maryland, College Park. His research focuses on the neural processing of speech and music in the auditory system, employing both animal and human behavioral and imaging experiments to address a large range of topics. On the sensory side, he studies how we perceive sound in noisy environments, sort its source, and encode it rapidly and adaptively in the brain. On the cognitive side, his work focuses on how humans and animals marshal the cognitive functions of attention, decision making, categorization, and motor actions to understand and become emotionally engaged with sounds, especially music and speech. On the engineering side, applications of

this research have spanned medical prosthetics and diagnoses, audio processing, and neuromorphic robotics. Dr. Shamma received his B.S. from Imperial College in London and his M.S. and Ph.D. in electrical engineering from Stanford University. He also received an M.A. in Slavic languages and literature from Stanford University.

### ***Music and the Mind***

Action, perception, and imagination are three intertwined functions that form the pillars of cognition, enabling us to learn skilled tasks, understand the world, and develop intuition. As we listen and play music, or when we dance and speak, we integrate articulatory, hand, and body movements to produce elaborate sensory (auditory, visual, somatosensory) signals that originate from our mind's social and musical culture and language. Musical engagement through listening, dance, and playing instruments fundamentally integrates the back-and-forth mirroring of the sensory world in the mind. Such engagement can guide scientifically anchored therapeutic paradigms toward a sense of well-being and pleasure.



**Lee Lindquist, M.D., M.P.H., M.B.A.,** Northwestern University

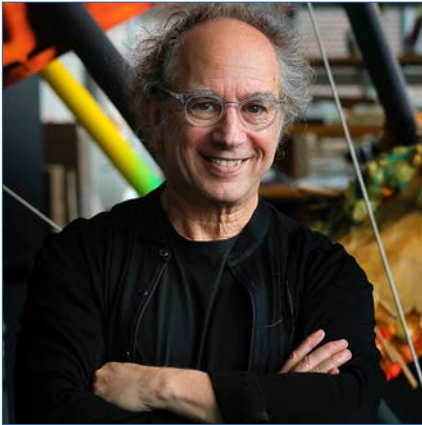
Dr. Lindquist is the division chief of geriatrics and George M. Eisenberg Professor of Geriatric Medicine at Northwestern University in Chicago, Illinois. As principal investigator of four National Institute on Aging (NIA) research project grants (R01) and three Patient Centered Outcomes Research Institute awards, Dr. Lindquist develops, tests, and disseminates technology-based interventions that support aging in place for older adults and their family caregivers. Dr. Lindquist is also a leader of Northwestern's NIA-funded Claude D. Pepper Older Americans Independence Center. Dr. Lindquist earned her M.D., M.P.H., and M.B.A. (Kellogg) from Northwestern University and completed dual clinical fellowships in geriatrics and internal medicine. Since becoming

chief of geriatrics over 10 years ago, she has grown the division, now ranked number 8 in the country for geriatrics, from 2 geriatricians to over 40 clinicians and researchers. Under her leadership, Northwestern has become an Age-Friendly Health System, with a geriatric emergency department, hospital at home, geriatric home-based primary care, hospital/clinics, and linked skilled nursing facilities. Clinically, Dr. Lindquist provides geriatric care for seniors in the office, home, and long-term settings. She is motivated by her grandparents, who taught her to enjoy music and play piano.



## ***Improvise To Improve Aging Outcomes***

The Lindquist Lab's research focuses on supporting aging in place for older adults and their family caregivers through technology-based interventions. With nonstop Federal funding for 18 years, Dr. Lindquist develops, tests, and disseminates interventions including: (1) teaching musical improv to older adults living at home and in independent living facilities, in collaboration with Second City, (2) using voice-activated intelligent personal assistants (e.g., Alexa, Echo) to support home/bed-bound older adults (e.g., programmable music), and (3) using virtual reality (Oculus) to decrease loneliness and isolation through tailored apps.



### **Tod Machover, M.M.,** [Massachusetts Institute of Technology Media Lab](#)

Professor Machover is Muriel R. Cooper Professor of Music and Media at the Massachusetts Institute of Technology (MIT) Media Lab, where he also directs the Opera of the Future group. Called a “musical visionary” by *The New York Times* and named “Composer of the Year” by *Musical America*, Professor Machover’s music has been commissioned and performed by prominent ensembles and soloists, including the Philadelphia Orchestra, the Royal Academy of Music (London), Yo-Yo Ma, Renée Fleming, and Joyce Di Donato, and has received numerous awards and honors. Known for developing new technologies for music, including intelligent/

interactive Hyperinstruments and Hyperscore graphical composition software, Professor Machover is celebrated for his innovative operas, such as the artificial intelligence-infused *VALIS* (commissioned by the Pompidou Center and revived at MIT), the robotic *Death and the Powers* (2012 Pulitzer Prize finalist), and *Schoenberg in Hollywood*, which was performed in the United States, Europe, and China. Through his research at MIT, Professor Machover has sought new ways to inspire creativity in young people, build large-scale community through collaborative composition (e.g., his *City Symphony* series), and develop technologies and concepts to combat illness and promote general health and well-being.

### ***New Technologies for Music Creation, Performance, and Participation***

At the MIT Media Lab, Professor Machover and his team create innovative musical initiatives for many contexts and communities. Their artificial intelligence-based “Hyperinstrument” technologies increase the expressive power of highly trained musicians, and they develop systems for creative musical engagement for the public, particularly youth. They have developed “prosthetic” musical communication systems, explored the potential of the voice for reflection and connection, pioneered musical uses of frequencies such as 40 Hz for healing, and developed MediMusical Instruments for telehealth rehabilitation of strokes and long-COVID. Their long-term goals include understanding and leveraging music for positive mental health outcomes and designing compositional tools for new music creation.



**Luana Colloca, M.D., Ph.D.,** University of Maryland

Dr. Colloca is an Mpower Professor and director of the Placebo Beyond Opinions Center at the University of Maryland School of Nursing. Dr. Colloca is an M.D. with a master's in bioethics and a Ph.D. in neuroscience. She completed postdoctoral training at the Karolinska Institute and a senior research fellowship at the National Institutes of Health. Over the last few decades, Dr. Colloca has studied the behavioral, neural, and pharmacologic mechanisms of pain modulation related to placebo and nocebo effects. Her lab combines music with technologies such as virtual reality to investigate the underlying mechanisms and identify applications for pain-related outcomes. Her work has been published in *Biological Psychiatry*, *Pain*, *Nature*

*Neuroscience*, *JAMA*, *Lancet Neurology*, *Science*, and *New England Journal of Medicine*. Her research has been cited over 16,500 times and featured in *National Geographic*, *New Scientist*, *The Washington Post*, *ScienceDaily*, *The Boston Globe*, *The New Yorker*, *Nature*, *The Guardian*, *The Wall Street Journal*, *U.S. News and World Reports*, and *USA Today*, among others. She is committed to science dissemination and has given a TEDx talk ([ted.com/talks/luana\\_colloca\\_are\\_placebos\\_the\\_solution](https://ted.com/talks/luana_colloca_are_placebos_the_solution)) and published an open-access book with Oxford University Press ([academic.oup.com/book/54240](https://academic.oup.com/book/54240)).

***Virtual Reality, Music, and Pain***

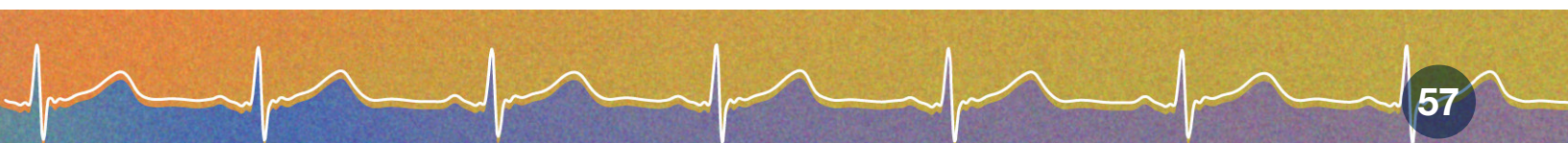
Fascinated by pioneering research on placebo and nocebo effects in pain modulation, Dr. Colloca contributes to the intersection of music, virtual reality, and pain management. Combining these elements presents an opportunity to better understand and alleviate pain. The prospect of delving into the behavioral, neural, and pharmacological aspects and incorporating technological advancements ignites Dr. Colloca's passion for unraveling the intricacies of top-down modulation mechanisms of pain perception. Leveraging insights to revolutionize pain-related outcomes, Dr. Colloca's research contributes meaningfully to a deeper understanding of the role of music and technologies in pain management.



**Juliet King, Ph.D.(c), ATR-BC, LPC, LMHC,** The George Washington University

Professor King is associate professor of art therapy at The George Washington University and adjunct associate professor of neurology at the Indiana University School of Medicine. A licensed counselor and art therapist, Professor King has over two decades as a clinician, administrator, and educator. She developed and implemented the graduate art therapy program at Herron School of Art & Design, with over 30 graduate student internships throughout Indiana. She continues to oversee the art therapy program at Indiana University Health's Neuroscience Center, serving patients with neurodegenerative disease and trauma. Professor King's research explores the systematic

integration of art therapy and neuroscience, with a focus on neuroaesthetics and contemporary neuroimaging that tests the psychological mechanisms of change in the creative arts therapies. She is pursuing a Ph.D. in translational health sciences, and her dissertation is on the development of a neuroscience-informed art therapy toolkit for the treatment of psychological trauma. In 2016, she wrote and edited *Art Therapy, Neuroscience and Trauma: Theoretical and Practical Perspectives*, and she is currently working on a second edition, set for publication in early 2024.



### ***Advancing Research: Neuroaesthetics and Creative Arts Therapies***

Transdisciplinary collaboration is the future of knowledge-making, and the most vexing problems we face cannot be solved by any single discipline. Investigating the biological mechanisms involved in aesthetic experiences requires their consideration as embedded in social contexts of familiarity, expertise, and culture, yet there remains a void in bridging the gaps across the most contemporary models. Enlisting creative arts therapists as translational researcher partners promotes the therapeutic utility of scientifically sound arts interventions across the arts-in-health spectrum.



# Session Five: Networks and Capacity Building of an Integrative Health Research Community

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**Co-Chair: Laura Thomas, Ph.D.,** National Institute of Mental Health

Dr. Thomas is a program officer in the Developmental Mechanisms and Trajectories of Psychopathology Branch, Division of Translational Research, National Institute of Mental Health (NIMH), where her portfolio covers pediatric anxiety disorders, obsessive-compulsive disorder, eating disorders, and tic disorders. Before assuming this role in 2022, she was a scientific review officer at the National Institute of Environmental Health Sciences. Dr. Thomas received her Ph.D. in cognitive neuroscience from Duke University and completed her postdoctoral fellowship in the Emotion and Development Branch of the NIMH intramural research program. While a postdoc, Dr. Thomas enjoyed playing flute and piccolo in the National Institutes of Health

(NIH) Philharmonia, and she has been part of the Sound Health initiative since its inception in 2016.



**Co-Chair: Caroline Sferrazza, M.S.,** National Institute on Aging

Ms. Sferrazza is a health specialist in the Behavioral and Systems Neuroscience Branch of the Division of Neuroscience at the National Institute on Aging (NIA). She supports research programs in the areas of cognitive and affective neuroscience, sensory and motor disorders of aging, postoperative cognitive decline and delirium, and data management and sharing. Prior to joining NIA, Ms. Sferrazza was a senior associate and science writer/analyst at Rose Li and Associates, where she managed the group's neuroscience portfolio. Ms. Sferrazza earned an M.S. in neurosciences at the University of California, San Diego (UCSD) and a B.A. in neuroscience and behavior from Vassar College, with a research focus on cellular and molecular mechanisms

of neurodegenerative and neuropsychiatric disease. Throughout her career, Ms. Sferrazza has cultivated expertise in the translation of technical scientific concepts across disciplines as well as to the public, developed in part through her service as director of the neurosciences outreach program at UCSD and as an organizer of numerous scientific workshops and events designed to facilitate multidisciplinary collaborations and share scientific research with diverse audiences.



**Co-Chair: Susan Magsamen, M.A.S.,** Johns Hopkins University

Ms. Magsamen is the founder and executive director of the International Arts + Mind Lab (IAM Lab), a pioneering neuroaesthetics initiative from the Pedersen Brain Science Institute at Johns Hopkins University School of Medicine. Her body of work lies at the intersection of brain sciences and the arts—and how our unique response to aesthetic experiences can amplify human potential. Ms. Magsamen is the co-author of *Your Brain on Art: How the Arts Transform Us* with Ivy Ross. She is also the designer of the [Impact Thinking](#) model, an evidence-based research approach to accelerate how we use the arts to solve problems in health, well-being, and learning. In addition to her role at IAM Lab, she is also the co-founder and co-director of the NeuroArts

Blueprint project in partnership with the Aspen Institute. Prior to founding IAM Lab, Ms. Magsamen worked in both the private and public sectors, developing social impact programs and products addressing all stages of life—from early childhood to aging adulthood. She created Curiosityville, an online personalized learning world, acquired by Houghton Mifflin Harcourt in 2014, and Curiosity Kits, a hands-on multisensory company, acquired by Torstar in 1995.

## SPEAKERS



**Charles Limb, M.D.,** University of California, San Francisco

Dr. Limb is the Francis A. Sooy Professor of Otolaryngology-Head and Neck Surgery and the chief of the Division of Otolaryngology, Neurotology, and Skull Base Surgery at the University of California, San Francisco (UCSF). He is the director of the UCSF Douglas Grant Cochlear Implant Center and past president of the American Auditory Society. Dr. Limb is the co-director of the Sound Health Network sponsored by the National Endowment for the Arts (NEA). He is also principal investigator of an NEA research lab that studies the neural basis of musical creativity. In 2022, Dr. Limb was selected as the National Institutes of Health (NIH) Clinical Center Distinguished Clinical Research Scholar and Educator in Residence and named as one of the Kennedy Center's Next 50, a group

of 50 national cultural leaders. His work on creativity and music perception in cochlear implant users has been featured in media and venues worldwide including National Public Radio, TED, *60 Minutes*, *National Geographic*, *The New York Times*, PBS, CNN, *Scientific American*, the British Broadcasting Company, the Kennedy Center, the Smithsonian Institution, the Library of Congress, the Sundance Film Festival, Discovery Channel, *Wired*, the Baltimore Symphony Orchestra, and the American Museum of Natural History.

### ***Sound Health Network: A New Opportunity for Collaboration***

In January 2017, the National Institutes of Health (NIH)/Kennedy Center workshop on music and the brain took place in Bethesda, Maryland. This remarkable gathering was galvanized and realized by the efforts of then NIH Director Francis Collins, M.D., Ph.D., and opera superstar Renée Fleming, in conjunction with Kennedy Center President Deborah Rutter. Twenty-five panelists were invited to discuss topics related to music, health, and brain science over a span of 2 days, ultimately leading to the formation of the Sound Health Initiative and the curation of the highly successful Sound Health events held at the Kennedy Center over the following years. This was followed in 2020 by the National Endowment for the



Arts (NEA) call for the establishment of the Sound Health Network, a multi-institutional collaboration between the NEA, NIH, the Kennedy Center, Ms. Fleming, and University of California, San Francisco. The Sound Health Network was launched in 2021, with a mission statement to promote research and public awareness about the impact of music on health and wellness. By collaborating with the above partners, the Sound Health Network provides a glue for this exciting community of scientists, musicians, therapists, clinicians, educators, and arts organizations.



**Joke Bratt, Ph.D., MT-BC, Drexel University**

Dr. Bratt is professor and program director of the Ph.D. in Creative Arts Therapies program in the College of Nursing and Health Professions at Drexel University (Philadelphia) and a board-certified music therapist. Her Music, Creativity, and Wellness Lab focuses on the development and testing of music therapy interventions for chronic pain management as well as mechanistic research to identify potential mediators of music therapy's impact on core chronic pain outcomes. She is the lead author of several Cochrane systematic reviews on music interventions with medical patients. She is the former editor-in-chief of the *Nordic Journal of Music Therapy*. She is a founding co-director of the

International Music Therapy Clinical Trials Network (IMTCTnet), and she leads the Music4Pain Network, a National Institutes of Health–funded multidisciplinary research network aimed at advancing mechanistic understanding of music-based interventions for pain.

***Music4Pain Network***

Pain is one of the most common and costly health problems worldwide. Although the pain-relieving effects of music-based interventions (MBIs) are well-established, lack of understanding of MBIs' mechanisms of action prevents us from exploiting their full therapeutic potential. In order for mechanistic research on music and pain to progress in an efficient and rigorous manner, multidisciplinary research is essential. Dr. Bratt will introduce the Music4Pain Network, aimed at bringing together neuroscientists, music therapists, musicians, neuropsychologists, rehabilitation scientists, psychophysicists, and more, to accelerate knowledge in three key areas: (1) development of a taxonomy of key terms and definitions related to MBIs, (2) increased understanding of the mechanisms underlying the benefits of music and MBIs for pain, and (3) identification of biomarkers and person variables that predict treatment response to MBIs. Network activities will be guided by a conceptual framework and formal research agenda. A core function of the network will be to stimulate innovative, multidisciplinary mechanistic research through pilot funding. The Music4Pain Network will also fund visiting scholar positions to help Ph.D. students and postdoctoral fellows gain skills and expertise related to network goals. In addition, the network will build the music and pain research workforce by mentoring new and early career investigators to develop research skills and support their efforts in obtaining extramural funding. Finally, the network will organize annual meetings, offer webinars and conference presentations, and share resources and network outputs with the larger scientific community.





**Jeffery Dusek, Ph.D.,** Case Western Reserve University

Dr. Dusek is an associate professor, Department of Family Medicine and Community Health, Case Western Reserve University, Cleveland, Ohio. Dr. Dusek has 25+ years of experience leading innovative integrative health and medicine research at research and health care institutions in the United States. He is principal investigator (PI) of a multisite R01 from the National Center for Complementary and Integrative Health (NCCIH) to study the effects of music therapy on pain in individuals with sickle cell disease. He is also PI of a network grant (U24) from NCCIH to assemble music therapists, neuroscience experts, and clinical trialists to explore the biological basis of how music therapy impacts pain. He has published over 100 scientific articles in peer-

reviewed medical literature and, according to Google Scholar, his research has been cited over 10,700 times. His research has been published in eminent journals such as the *Journal of the National Cancer Institute*, *Circulation*, *JAMA Network Open*, and *Proceedings of the National Academy of Sciences* and featured in such venues as *The New York Times*, *The Washington Post*, *The Boston Globe*, *USA Today*, and National Public Radio.

***Effective Network to advance Scientific Evidence related to Mechanisms of Music-Based Interventions for Pain and Support CoLLaborative Efforts (ENSEMBLE)***

This U24 will establish Effective Network to advance Scientific Evidence related to Mechanisms of music-Based interventions for pain and support collaborative Efforts (ENSEMBLE). ENSEMBLE will advance collaborative research efforts investigating the mechanisms by which music-based interventions (MBIs) influence various pain phenotypes. ENSEMBLE will be built on a foundation of well-integrated medical music therapy (MT) practice, strong mechanistic science in integrative health and medicine, and research investigating MT and biological mechanisms of pain in sickle cell disease as an exemplar pain condition. Leveraging the BraveNet Practice-Based Research Network, ENSEMBLE investigators will establish a vibrant collaborative network of music therapists; mechanistic scientists; pain, MBI, and integrative health and medicine researchers; and patient-advocacy organizations in pursuit of these aims. **Aim 1:** Promote meaningful, inclusive, and interdisciplinary collaboration between music therapists, mechanistic scientists, and pain, MBI, and integrative health and medicine researchers. **Aim 2:** Develop a comprehensive framework for conducting mechanistic studies in MBIs for pain management. **Aim 3:** Advance multiple pilot projects investigating novel biological mechanisms of action underlying the effects of MBIs for various pain phenotypes. **IMPACT:** ENSEMBLE will be instrumental in (1) promoting meaningful interdisciplinary dialogue, (2) building multi-institutional capacity for initiating MBI research in pain management, (3) generating preliminary data for future National Institutes of Health grant proposals, (4) improving data infrastructure, (5) developing future MT clinician researchers, (6) focusing future MT scientific efforts, and (7) disseminating best practices.



**Debra Burns, Ph.D., MT-BC**, Indiana University–Purdue University Indianapolis

Dr. Burns is professor and chair of the Department of Music and Arts Technology at Indiana University–Purdue University Indianapolis. She is internationally recognized for her research focusing on music-based interventions across the cancer treatment continuum from disease-directed treatment to survivorship and end of life. She is also interested in assessing music therapists' clinical reasoning and the integration of music therapy services to decrease symptom distress in cancer patients and at the end of life. She has collaborated extensively with National Institutes of Health–funded interdisciplinary teams in developing theoretical frameworks integrating music with identified

mechanisms and outcomes, developing treatment fidelity strategies and quality assurance procedures, training music therapy interventionists, and conducting mixed methods analyses in the context of music-based intervention research. Her publication record includes over 25 papers published in journals such as *Journal of Music Therapy*, *Journal of Pain and Symptom Management*, and *Supportive Care in Cancer*.

### ***Novel Technologies To Explore Mechanisms and Optimize Music-Based Intervention Pain Research***

Recent music-based intervention (MBI) clinical guidelines state there is inconclusive evidence to recommend the use of MBIs to alleviate pain, citing low quality evidence. The optimization of MBI research and clinical practice is hampered by (1) the absence of an evidence-based framework connecting MBIs to psychosocial, behavioral, and/or neurophysiological processes, pain biomarkers, and pain-related outcomes and (2) the overreliance on subjective measures that lack psychometric rigor and are prone to bias. Music perception and cognition, psychoacoustics, and brain mapping findings could provide important insights on the mechanistic underpinnings explaining how MBIs influence the multidimensional pain experience; however, the use of basic and mechanistic data to optimize MBIs is inconsistent. Objective measures, such as pain biomarkers (bioassays, electrophysiology, imaging, omics) could be used to simultaneously explore mechanisms and outcomes in MBI research; however, the lack of cross-disciplinary research has hampered this important work. To support the integration of basic and mechanistic expertise and knowledge into MBI research, we have brought together scientists spanning music therapy, psychology, biomedical engineering, medicine, neuroscience, integrative therapies, and molecular toxicology. The Music Mechanisms and Technologies Network (MMTN) will focus on supporting the exploration of novel technologies and methods to enhance the objective measurement of pain within the context of MBIs and bridge the gaps in basic, applied, and clinical research.



**Julene Johnson, Ph.D., B.M.**, University of California, San Francisco

Dr. Johnson is a cognitive neuroscientist with an undergraduate degree in music. She is a professor in the University of California, San Francisco Institute for Health & Aging. She also is the co-director of the Sound Health Network and principal investigator of the new National Institutes of Health/National Institute on Aging U24 Research Network to Accelerate Mechanistic Studies of Music for Dementia (RN-MusD). She has a long-standing interest in studying music, the brain, and health in older adults with and without dementia. Her previous research investigated preserved music skills in people living with Alzheimer's disease and understanding the relationship between brain and music



recognition in various neurodegenerative diseases. She also has experience leading randomized trials of music-based interventions (MBIs), including the large, cluster-randomized Community of Voices study that examined the effect of group singing on well-being of diverse older adults. Dr. Johnson's current research program focuses on (1) developing and testing MBIs to promote health and well-being among older adults with and without cognitive impairment, and (2) understanding cognitive function among diverse older adults. In 2010, she was a Fulbright Scholar in Jyväskylä, Finland, where she studied how community choirs help promote well-being among older adults.

### ***Research Network To Accelerate Mechanistic Studies of Music for Dementia (RNMusD)***

The purpose of this presentation is to provide an overview of the newly funded National Institutes of Health (NIH)/National Institute on Aging U24 "Research Network To Accelerate Mechanistic Studies of Music for Dementia" (RN-MusD). Experts from cognitive neuroscience, music therapy, bioengineering, geriatrics, and statistics created core nodes at the University of California, San Francisco; University of Houston; and Arizona State University. Alzheimer's disease and Alzheimer's disease related dementias (AD/ADRD) represent the most common causes of dementia. Living with dementia is associated with loss of independence, disability, and reduced well-being, and providing care has high costs and burden. Health disparities also exist. There is a need to identify novel, accessible, culturally relevant, cost-effective approaches to improve health for those living with dementia. People living with dementia (PLWD) can meaningfully engage with music, even into late stages. Studies associate music therapy or music-based interventions (MBIs) with improvements in well-being, as well as decreases in behavior issues for PLWD. However, studies are small, are mixed quality, and lack diversity, and underlying mechanisms are unclear. The NIH Stage Model and Science of Behavior Change methods can provide a framework for developing and testing MBIs for AD/ADRD. Moreover, body-brain imaging technologies can help elucidate how MBIs affect the brain and body in real-world settings. The network will accelerate rigorous, multidisciplinary, and mechanistic studies of MBIs by (1) building a collaborative network, (2) promoting multidisciplinary collaborations via a pilot project program, and (3) disseminating resources.

## PANELISTS



### **AZA Allsop, M.D., Ph.D.,** [Yale University](#), [Howard University](#)

Dr. Allsop is an assistant professor in the Department of Psychiatry at Yale University and an affiliate assistant professor and director of the Center for Collective Healing at Howard University. He's a first-generation American who grew up in Trinidad before moving to the East Coast. After studying biology, philosophy, and jazz studies at North Carolina Central University, Dr. Allsop sought out social neuroscience research training in the Tye lab at the Massachusetts Institute of Technology (MIT) as part of the Harvard Medical School-MIT M.D./Ph.D. program. His research investigates how social information is computed, integrated, and biased in the brain and the resulting impact on cognition and behavior. He also studies the mechanisms by which

music, mindfulness, and psychedelics modulate social connectedness and stress management. His research is guided by the belief that deconstructing these mechanisms will provide new models of group and community-based mental health treatment and a better understanding of how social groups function and offer critical insights into enhancing the development and function of society at large.



## **Music, Neuroscience, and Psychiatry**

Social cognition and behavior are vital to human survival, and impairments in social cognition have deleterious effects across various psychiatric conditions. However, there are no targeted therapeutics for the social domain. We utilize cutting-edge approaches in social neuroscience, music psychology, psychedelics, and machine learning to accelerate the development of music therapeutics that will address social symptoms in psychiatric conditions.



### **Christopher Bailey, M.L.I.S.,** [World Health Organization](#)

Mr. Bailey is the arts and health lead at the World Health Organization (WHO) and a co-founder of the Jameel Arts and Health Lab. The lab focuses on the evidence base for health benefits of the arts by building up a global network of research centers to look at effective practice as well as the foundational science of why the arts may benefit physical, mental, and social well-being. Educated at Columbia and Oxford Universities as well as the American Academy of Dramatic Arts, after a career as a professional actor and playwright, Mr. Bailey joined the Rockefeller Foundation as their research manager, and from there was recruited to the WHO, where he led the health informatics work and later their online communications team before starting the arts and

health program. He has also performed original pieces such as “Stage 4: Cancer and the Imagination.” The basic message of his work is to amplify the WHO definition of health, which states that health is not merely the absence of disease and infirmity but the attainment of the highest level of physical, mental, and social well-being. The arts have uniquely evolved to do just that.

### **The Virtuous Triangle**

Our interest is to support the virtuous triangle between identifying promising music for health practices, researching their scalability, especially to underserved populations, and the foundational science of why they might be effective, and connecting them to policy discussions for the widest possible impact. The problem is not the number of studies on the health benefits of music, there are many, but most have very small sample sizes and are not directly connected to policy discussions. By engaging these groups in the same discussions, we hope to break through to real, sustainable, scaled application of the health uses of music.



### **Nick Skinner, B.Mus.,** [Baltimore Symphony Orchestra](#)

Over the past several years, Mr. Skinner has become a prominent music educator and arts administrator in Baltimore. He works with the Baltimore Symphony Orchestra’s OrchKids Program, where he serves as the vice president. In this role, he oversees all aspects of the OrchKids Program. Mr. Skinner began his career teaching in the Howard County Public School System in Maryland as an elementary instrumental instructor. He then moved on to teach in the Baltimore County Public School System in Maryland at Catonsville High School, where he was the music director. He has also served as an arts administrator for the Archipelago Project, a non-profit organization devoted to arts advocacy. Mr. Skinner has become a distinguished

consultant and arts advocate and has led lectures, workshops, and seminars in Baltimore City; Traverse

City, Michigan; Waterbury, Hartford, and Stamford, Connecticut; Boston, Massachusetts, at the New England Conservatory; and Venezuela, with El Sistema. He was an adjunct professor at the University of Maryland, Baltimore County, where he taught “Management and Organizational Leadership in El Sistema” as part of a 1-year postbaccalaureate certification program. Mr. Skinner graduated from the Peabody Conservatory of Music with a bachelor’s degree in trumpet performance and music education.

### ***Music Education in Local School Communities and Across the Country***

In underserved communities, the absence of music education perpetuates a glaring inequality. Deprived of this essential element, students miss out on a transformative avenue for expression, creativity, and personal growth. Limited resources often result in scant access to instruments, instructors, and performance opportunities. Music, a powerful equalizer, becomes a privilege instead of a universal right. Ensuring equitable access to music education is crucial, especially when we view music as medicine.



**Lora Robinson, M.M.T., MT-BC, Howard University**

Professor Robinson is an assistant professor and the music therapy coordinator within the Chadwick A. Boseman College of Fine Arts of Howard University. She holds a bachelor of music in music therapy from Queens University of Charlotte, in Charlotte, North Carolina, and a master of music therapy from Shenandoah Conservatory in Winchester, Virginia. Professor Robinson passionately believes that music therapy should be a service accessible to anyone with a need. She is an advocate of equipping students with a variety of experiences to expose music therapy and music’s healing power to their communities in a positive, impactful way.

### ***Music Therapy Program at Howard University***

Howard University stands as the only Historically Black College and University that offers an undergraduate music therapy degree. The program combines music, psychology, and music therapy studies. Students engage in clinical placements throughout their program matriculation, providing them with supervised practice with a variety of clientele. Professor Robinson and her colleagues are advocates of collaborative educational and clinical experiences for their students. The students are the future clinicians, educators, and advocates for music being a healing tool. It is imperative that students have resources and support outside of their learning institution to assist them in accomplishing their professional goals.



**Kristin Sakoda, J.D., Los Angeles County Department of Arts and Culture**

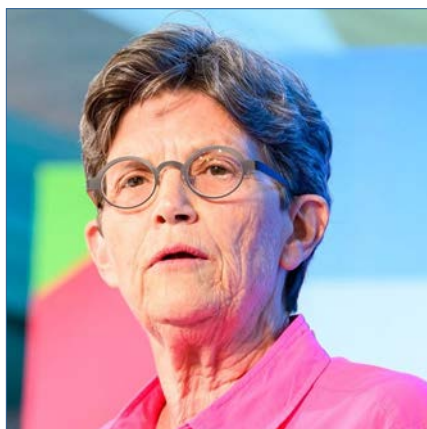
Ms. Sakoda is director of the Los Angeles County Department of Arts and Culture, a local arts agency with a mission to advance arts, culture, and creativity throughout the most populous county in the United States. The department provides grants and technical assistance to non-profit organizations, runs the nation’s largest arts internship program, coordinates public-private arts education initiatives, increases access to creative career pathways, commissions civic artwork, leads the Cultural Equity and Inclusion Initiative, and advances cross-sector cultural strategies to address civic issues. Ms. Sakoda is an arts



executive, attorney, and performing artist with more than 25 years in the field. She has appeared on national and international stages including with dance and social justice company Urban Bush Women and in musicals *Rent* and *Mamma Mia!* on Broadway. Prior to joining the department, she served at the New York City Department of Cultural Affairs overseeing a portfolio of strategic, programmatic, policy, legislative, and funding programs with a \$200 million annual budget. She was instrumental in advancing diversity and inclusion, public art, creative aging, and cultural facilities and affordable workspace for artists. She holds a J.D. from New York University School of Law and a B.A. from Stanford University.

### ***Building Cross-Sector Collaboration for Arts and Health Throughout Los Angeles County***

At the Los Angeles County Department of Arts and Culture, we believe arts, culture, and creativity are integral to civic life. We are increasingly engaged in cross-sector arts collaboration and the intersection of arts and health, from commissioning civic art at hospitals to providing healing-informed arts education for youth, grantmaking to community-based organizations, and partnering on the first-ever LA County Arts and Health Summit. I am honored to participate in “Music as Medicine” to share progress, learn from colleagues, and contribute to how we can collectively uplift, resource, and integrate arts into the infrastructures of the diverse communities we serve.



**Ruth Katz, J.D., M.P.H.,** *Aspen Institute*

Ms. Katz is executive director of the Aspen Institute’s Health, Medicine & Society (HMS) Program, which brings together groups of thought leaders, decision makers, and the informed public to grapple with health challenges facing the United States in the 21st century and to pursue practical solutions for addressing them. She also serves as a vice president of the Aspen Institute; directs Aspen Ideas Health, the opening 3-day event of the renowned Aspen Ideas Festival; and co-directs the NeuroArts Blueprint, a partnership between HMS and the International Arts + Mind Lab of the Johns Hopkins University School of Medicine. Prior to joining the Aspen Institute, Ms. Katz served as chief public health counsel of the Committee on Energy and Commerce

in the U.S. House of Representatives. She has also been the Walter G. Ross Professor of Health Policy of the George Washington University Milken Institute School of Public Health, dean of that school, and associate dean for administration at the Yale University School of Medicine. A graduate of the University of Pennsylvania, Ms. Katz earned a master’s degree in public health from Harvard University and a law degree from Emory University.

### ***Health Policy Perspectives for Music and Other Arts-Based Interventions***

Neuroarts—a burgeoning new field—is the study of how the arts and aesthetic experiences measurably change the body, brain, and behavior—and how this knowledge is translated into specific practices that advance health and well-being. This interdisciplinary work builds on a scientific research foundation established by many disciplines. The NeuroArts Blueprint initiative—a 5-year plan of action designed to cultivate this field—ultimately seeks to ensure that the arts and the use of the arts—in all their many forms—become part of mainstream medicine and public health.



## ILLUSTRATIVE PERFORMANCE



### **Fred Johnson**, David A. Straz Center for the Performing Arts

Mr. Johnson, vocalist, percussionist, storyteller, arts administrator, painter, and author, serves currently as artist in residence and community engagement specialist at the David A. Straz Center for the Performing Arts in Tampa, Florida. Mr. Johnson is also the program coordinator for the Straz Center's art and health program. He has spent the last 40 years performing internationally with some of America's greatest jazz artists and has worked extensively in communities facing conflict, utilizing the arts as a pathway for deeper understanding, healing, and communal transformation. Mr. Johnson has been mentored by West African master teachers and healers and has dedicated his life to utilizing art to inspire and empower individuals and

communities to awaken the full measure of our humanity for the greater good and well-being of us all.

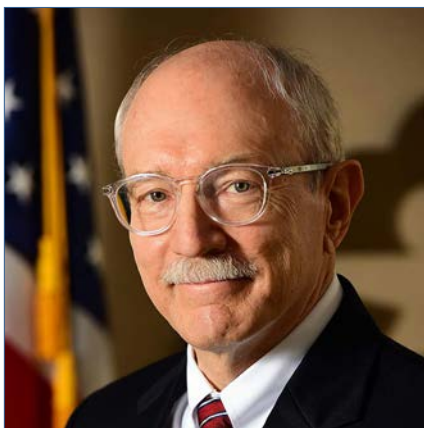
# Special Remarks



**Debara Tucci, M.D., M.S., M.B.A.**, National Institute on Deafness and Other Communication Disorders

Dr. Tucci is director of the National Institute on Deafness and Other Communication Disorders at the National Institutes of Health (NIH), a position she has held since September 2019. Prior to NIH, Dr. Tucci was a longtime faculty member at the Duke University Department of Head and Neck Surgery & Communication Sciences. Dr. Tucci's research has focused on understanding the biological effects of hearing loss in animal models and on treatment of otologic disease, including with cochlear implantation. She partnered with the Duke Clinical Research Institute and colleagues at Duke to develop a national practice-based research network, and she led a research team that implemented and

studied outcomes and cost-benefit of adult hearing screening in primary care clinics at Duke. She has trained and mentored many resident physicians, junior faculty, and graduate students, both informally and through development of formal research training and mentoring programs. Current work as co-chair of The Lancet Commission on Global Hearing Loss allows her to pursue her passion for understanding and impacting hearing loss disability in diverse and underserved populations worldwide.



**Richard Woychik, Ph.D.**, National Institute of Environmental Health Sciences and National Toxicology Program

Dr. Woychik was named director of the National Institute of Environmental Health Sciences and the National Toxicology Program on June 7, 2020, after serving as deputy director since 2011. He is a molecular geneticist with a Ph.D. in molecular biology from Case Western Reserve University and postdoctoral training with Dr. Philip Leder at Harvard Medical School. He spent almost 10 years at Oak Ridge National Laboratory, rising in the ranks to become head of the Mammalian Genetics Section and then, director of the Office of Functional Genomics. In August 1997, he assumed the role of vice chairman for research and professor in the Department of Pediatrics

at Case Western Reserve University. In 1998, he moved to the San Francisco Bay area, first as the head of the Parke-Davis Laboratory for Molecular Genetics and then, as chief scientific officer at Lynx Therapeutics. He returned to academics as the president and chief executive officer of The Jackson Laboratory in August 2002 and served in that role until January 2011.





**Nora Volkow, M.D.,** National Institute on Drug Abuse

Dr. Volkow is director of the National Institute on Drug Abuse (NIDA) at the National Institutes of Health. NIDA is the world's largest funder of research on the health aspects of drug use and addiction. Dr. Volkow's work has been instrumental in demonstrating that drug addiction is a brain disorder. As a research psychiatrist, Dr. Volkow pioneered the use of brain imaging to investigate how substance use affects brain functions. In particular, her studies have documented how changes in the dopamine system affect the functions of brain regions involved with reward and self-control in addiction. She has also made important contributions to the neurobiology of obesity, attention-deficit hyperactivity disorder (ADHD), and aging.

# Session Six: Integration of Music-Based Interventions into Health Care Systems

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**Co-Chair: Emmeline Edwards, Ph.D.**, National Center for Complementary and Integrative Health

Dr. Edwards is director of the Division of Extramural Research of the National Center for Complementary and Integrative Health (NCCIH). In that capacity, she is responsible for development of scientific programs or areas of science that fulfill NCCIH's mission as well as planning, implementation, and policy. NCCIH is one of 27 components of the National Institutes of Health (NIH), with a mission to define, through rigorous scientific investigation, the usefulness and safety of complementary and integrative health interventions and their roles in improving health and health care. Currently, Dr. Edwards is co-chair of the Trans-NIH Music and Health Working Group, a member of the

Sound Health Initiative Steering Committee, and advisor to the NeuroArts Blueprint. Dr. Edwards is also chair of World Women in Neuroscience, an independent mentoring and networking organization, with the primary mission of identifying and implementing mentoring and networking opportunities for women neuroscientists across the world.



**Co-Chair: Coryse St. Hillaire-Clarke, Ph.D.**, National Institute on Aging

Dr. St. Hillaire-Clarke joined the National Institute on Aging (NIH) Division of Neuroscience in August 2016 as a program director in the Behavioral and Systems Neuroscience Branch. She oversees the Sensory and Motor Disorders of Aging Program, which supports research on mechanisms of normal aging and disease-related changes in motor, visual, auditory, somatosensory, proprioceptive, vestibular, and chemosensory functions. She also represents the Institute on a number of NIH-wide working groups including Brain Research through Advancing Innovative Neurotechnologies (BRAIN) and the Music and Health Working Group. Prior to joining NIA, Dr. St. Hillaire-Clarke spent

6 years as a health program specialist at the National Institute of Neurological Disorders and Stroke (NINDS), where she helped manage the Parkinson's Disease Biomarkers Program and engaged in several NINDS strategic planning efforts. Dr. St. Hillaire-Clarke received her Ph.D. in neuroscience from Johns Hopkins University, where she conducted research to identify the key cellular and molecular events that underlie the growth and survival of neurons in the peripheral nervous system.



**Co-Chair: Sheri Robb, Ph.D., MT-BC, Indiana University**

Dr. Robb is a Walther Professor of Supportive Oncology in the Indiana University (IU) Schools of Nursing and Medicine and a full member of the IU Simon Comprehensive Cancer Center. Dr. Robb is internationally recognized for her expertise in pediatric music therapy and behavioral intervention research. Dr. Robb is a board-certified music therapist with degrees in music therapy and early childhood special education. She also completed a postdoctoral fellowship in behavioral oncology and cancer control at IU, followed by a training award in clinical and translational research from the Indiana Clinical and Translational Sciences Institute. Dr. Robb’s program of research focuses on development and testing of music interventions to manage distress

and improve positive health outcomes in children and adolescents with cancer and their caregivers. Most recently, her team has incorporated biomarkers into their trials to understand more fully how active music interventions work to mitigate cancer-related stress and its potential to improve immune function. Dr. Robb is an established investigator with 15 years of continuous funding from the National Institutes of Health. She also led publication of *Reporting Guidelines for Music-Based Interventions* to address calls for more transparent and accurate reporting in music intervention research.

## ILLUSTRATIVE PERFORMANCE



**Raul Midón**

Blind singer, songwriter, and guitarist Mr. Midón was a first-call session singer upon graduation from the studio jazz program at the University of Miami (1991). In 1999, he joined Shakira’s band. He later signed to a development deal with Warner Chappell. He moved to New York City in 2002. He debuted at Carnegie Hall for the Movie Music of Spike Lee and wrote for “She Hate Me.” Next, he was signed by producer Arif Mardin to Manhattan Records. He released his debut album *State of Mind* in 2006, making his television debut on the Late Show with David Letterman. He has worked with many legends including Bill Withers. Mr. Midón received back-to-back Grammy nominations in 2017 and 2018. He has become an accomplished recording engineer, too. In 2019, he

was invited to speak at his high school alma mater, Santa Fe Prep, and was awarded the Distinguished Alumnus Award from the University of Miami. In 2020, his album *The Mirror* was nominated for Best Jazz Album by the A2IM Awards, and he was also named Disability Rights Ambassador. In 2023, he released his long-awaited guitar duets album *Eclectic Adventurist*. He will release his next album of music called *Lost & Found* in March 2024.

## SPEAKERS

**Emmeline Edwards, Ph.D., National Center for Complementary and Integrative Health** (see biography on page 71)

***The NIH Toolkit for Music-Based Interventions: A Path to Strengthening Evidence-Based Research***

Music-based interventions (MBIs) have the potential to influence patient-relevant target outcomes, such as managing symptoms, slowing disease progression, rehabilitating, and improving quality of life in many



disease conditions across the lifespan. MBIs have shown promise for managing symptoms of various brain disorders. To fully realize the potential of MBIs and dispel the outdated misconception that MBIs are rooted in “soft science,” the National Institutes of Health (NIH) is promoting rigorously designed, well-powered MBI clinical trials. The pressing need of guidelines for scientifically rigorous studies with enhanced data collection led to the creation of the NIH MBI Toolkit for research on music and health across the lifespan. The toolkit defines the building blocks of MBIs, including a consolidated set of common data elements for MBI protocols, and core datasets of outcome measures and biomarkers for brain disorders of aging that researchers may select for their studies. A critical step toward incorporating MBIs into U.S. health care systems is the dissemination and implementation of the NIH MBI Toolkit’s guiding principles for large-scale, rigorous, and replicable evidence-based research. Utilization of the guiding principles in this toolkit is strongly recommended for NIH-funded studies of MBIs.

**Sheri Robb, Ph.D., MT-BC, Indiana University** (see biography on page 72)

### ***Reporting Guidelines for Music-Based Interventions: Improving Quality and Consistency***

Detailed intervention reporting is essential to interpretation, replication, and eventual translation of music-based interventions (MBIs) into practice. However, multiple reviews reveal sustained problems with reporting quality and consistency. MBIs are especially difficult to describe due to the complexity of music stimuli, variety of music experiences, and other factors unique to these interventions. In 2011, Dr. Robb and colleagues developed and published *Reporting Guidelines for Music-Based Interventions*. The MBI guidelines focus on detailed reporting of the music intervention and were designed to be used in conjunction with methodological checklists such as the Consolidated Standards for Reporting Trials (CONSORT) and Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) statements. The 2011 guidelines and related publications are publicly available through the *Journal of Health Psychology* and the Equator Network. In 2021, Dr. Robb initiated formation of an interdisciplinary working group that includes leadership from the National Center for Complementary and Integrative Health to update and improve the utility and validity of the current guidelines using a rigorous Delphi approach. The updated checklist includes eight areas considered essential to ensure transparent reporting of MBIs. The working group and expert panel members are developing an explanation and elaboration document to support investigators’ use of the new reporting guidelines and anticipate publication in early 2024.



**Richard Gershon, Ph.D., Northwestern University**

Dr. Gershon has focused his career on developing modern assessment tools and delivering assessment results to clinicians. He is division chief of outcome and measurement science in the Department of Medical Social Sciences at Northwestern University’s Feinberg School of Medicine. He was principal investigator (PI) for the National Institutes of Health (NIH) Toolbox for the Assessment of Neurological and Behavioral Function, where he created and oversaw 200 researchers to develop a battery of instruments to assess cognitive, motor, sensory, and emotional health. Over the last decade, he has led numerous validation studies for the NIH Toolbox, particularly in the detection of cognitive decline. Now, he is working to expand these assessments to

children ages 1 to 42 months with his role as PI on the NIH Infant and Toddler “Baby” Toolbox. He works across the age span as multiple PI for the Environmental Influences on Child Health Outcomes (ECHO) Measurement Core. Dr. Gershon is also working to make measurements available for smartphone

delivery as PI for the Mobile Toolbox for Monitoring Cognitive Function. Dr. Gershon continues to lead efforts to maintain and distribute the NIH Roadmap Patient Reported Outcomes Measurement Information System (PROMIS).

### ***Lessons Learned From Other Tools Developed by NIH***

Grant applicants need to know that the use of National Institutes of Health (NIH)-sponsored tools, including the NIH Music-Based Intervention Toolkit, will improve their applications and likely their chances of being funded because they were designed to improve the science. Even though NIH measurement tools are obvious choices, as well as being free or inexpensive to use, it will still take significant effort to ensure that scientists know about them. NIH can take active steps to encourage adoption. For example, NIH Toolbox use improved in early years when the National Institute of Neurological Disorders and Stroke added to their grant announcements that either the proposal NIH Toolbox was required or the researchers had to explain why an alternative was being used. This did not force use of the NIH Toolbox, but it did force researchers to consider using it. Applying this logic to the NIH Music-Based Intervention Toolkit would ensure that researchers consider using the toolkit when submitting an application. This session will talk about the past (and current) success of other NIH tools and how those successes can be leveraged to increase adoption of the music toolkit.



**Leslie Katzel, M.D., Ph.D.,** University of Maryland School of Medicine and Baltimore Geriatrics Research Education and Clinical Center

Dr. Katzel is an associate professor of medicine in the Division of Geriatrics and Palliative Medicine, Department of Medicine, University of Maryland School of Medicine; director of the Baltimore VA Medical Center Geriatrics Research, Education, and Clinical Center (GRECC); and co-principal investigator along with Drs. Alice Ryan and Jay Magaziner of the University of Maryland Claude D. Pepper Older Americans Independence Center. Dr. Katzel is a board-certified internist and geriatrician with fellowship training at Johns Hopkins and the National Institute of Aging/Gerontology Research Center. For the past 30 years he has been principal investigator or co-investigator on grants funded by the

National Institutes of Health and U.S. Department of Veterans Affairs (VA) that focus on the performance of exercise and lifestyle interventions in older adults with numerous medical comorbidities including metabolic syndrome, chronic kidney disease, Parkinson's disease, peripheral arterial disease, HIV, and stroke. He has published more than 160 journal articles and book chapters. Dr. Katzel also has a longstanding interest in research ethics and is chair of the VA Maryland Health Care System Research and Development Committee and chair of the University of Maryland Embryonic Stem Cell Oversight Committee.

### ***Integration of a Behavioral Intervention Into the Veterans Health Administration Health Care System***

The Veterans Health Administration (VHA) is the largest health care provider in the United States. The VHA is dedicated to providing whole health interventions including recreation therapy/creative arts services that include music therapy. The VHA also has a history of funding numerous centers of excellence and providing seed money that fosters collaboration and innovation. This talk will focus on the implementation of the "Gerofit" exercise intervention that was initially started at the Durham Geriatrics Research, Education, and Clinical Center and through pilot funding was disseminated to four additional sites and then ultimately to 31 sites throughout the VHA. The VHA has declared Gerofit a Best Practices program. The Gerofit implementation model can be applied to the integration of music as medicine interventions in other health care systems. Based on the Gerofit experience, health care systems must



value and encourage collaboration for implementation of standardized interventions (for example the National Institutes of Health Music-Based Intervention [MBI] Toolkit) that can be tailored and adapted to local needs. The sites must be able to identify local champions and leverage existing resources. Seed money and dedicated protected time are critical. Sustainability is ultimately a challenge for all programs given competition for health care resources. Finally, the sites and intervention as a whole must collect outcome data (MBI building blocks and common data elements) to examine potential benefits of music as medicine interventions in terms of patient outcomes.



**David Chambers, Ph.D.,** [National Cancer Institute](#)

Dr. Chambers is deputy director for implementation science in the Office of the Director in the Division of Cancer Control and Population Sciences at the National Cancer Institute. Dr. Chambers manages a team focusing on efforts to build and advance the field of implementation science through notices of funding opportunity, training programs, research activities, dissemination platforms, and enhancement of partnerships and networks to integrate research, practice, and policy. Prior to his arrival at the National Institutes of Health, Dr. Chambers worked as a member of a research team at Oxford University, where he studied national efforts to implement evidence-based practice within health care systems. He publishes on

strategic research directions in implementation science and serves as a plenary speaker at numerous scientific conferences. He received his A.B. degree (with honors) in economics from Brown University in 1997 and M.Sc. and D.Phil. degrees in management studies (organisational behaviour) in 1998 and 2001, respectively, from Oxford University (UK).

### ***A Brief Introduction to Dissemination and Implementation Research for Music-Based Interventions***

This presentation will offer a brief introduction to dissemination and implementation research, also referred to as implementation science, and its potential impact on the adoption, uptake, and sustainment of music-based interventions. After first providing the context for the development of the field, Dr. Chambers will discuss key concepts, theoretical models, and advances, showing limitations in our traditional view of the translation of research into practice. The presentation will offer key priority areas for moving the implementation of music-based interventions forward and conclude with a review of key resources to support the next generation of research studies.

## **PANELISTS**



**Debora Kuchka-Craig, M.H.A., F.H.F.M.A.,** [MedStar Health](#)

Ms. Kuchka-Craig is senior vice president of managed care for MedStar Health located in Columbia, Maryland. In this role, she is responsible for the development and execution of third-party payer strategy for MedStar Health. In addition to contract negotiations and payer relations on behalf of MedStar's hospitals, employed physicians, and diversified health care businesses, she also leads population health operations with executive oversight for various commercial accountable care organizations and MedStar's care transformation organization. With over 30 years of health care industry experience, Ms. Kuchka-Craig has served as both provider and payer. She is a fellow and past National Chair of the Healthcare



Financial Management Association (HFMA), a former Commissioner of the Maryland Health Insurance Plan Board, and a past recipient of Maryland's Top 100 Women. She is a lover of music and has enjoyed being a church organist, an accompanist for choral groups, a member of the Baltimore Symphony Orchestra Chorus, and a keyboardist and vocalist in a pop music band over the years. She received her bachelor of arts degree cum laude from Lehigh University and a master of science in health planning and administration from The Johns Hopkins Bloomberg School of Public Health.

### ***Payer/Provider's Perspectives***

Anyone who has experienced chills from experiencing a magnificent symphony orchestra, or the tingles and pure joy of an angelic soprano effortlessly floating celestial notes, understands that music not only comforts but heals. Music is indeed medicine! As someone who has been both payer and provider, I understand the challenges with health care economics. Providers cannot be all things to all patients, and payers cannot pay for all services benefiting their beneficiaries. During our discussion on integration of music-based interventions into health care systems, I will address my optimism for advancements in the integration of music as a component of care models.



### **Kimberly Sena Moore, Ph.D., MT-BC, Florida Gulf Coast University**

Dr. Sena Moore is a board-certified music therapist. She is associate director of the Bower School of Music at Florida Gulf Coast University, where she is an associate professor and coordinator of the music therapy program. Dr. Sena Moore's research focuses on emotion regulation development, particularly in preschoolers who are neurodevelopmentally at risk, as well as clinical music intervention development. She also serves as co-editor for the *Journal of Music Therapy*. Outside academia, Dr. Sena Moore is regulatory affairs associate for the Certification Board for Music Therapists, where she is involved in state-level advocacy, legislative, and policy issues that impact music therapy practice. She has presented extensively at

regional, national, and international conferences; her research has been published in the *Journal of Music Therapy*, *Music Therapy Perspectives*, *Arts in Psychotherapy*, and *Frontiers in Human Neuroscience*; and her work has been featured in media outlets such as *Psychology Today*, *Redbook*, and *CURE*.

### ***Public Advocate Perspectives***

There is one aim—for the public to more easily access safe and effective music-based intervention (MBI) and music resource options. “Access” can present in many ways, including access to qualified providers who provide safe, evidence-supported music experiences and access to funding that supports these options. Given challenges associated with negotiating health care systems, access should be more streamlined and easier to navigate. Finally, access requires enhanced awareness of music intervention and resource options, including research support, so that administrators can make informed policy and funding decisions, colleagues can make informed referrals, and the public is empowered in their health care decisions.



**Judy Simpson, MT-BC, American Music Therapy Association**

Ms. Simpson, director of government relations for the American Music Therapy Association (AMTA), represents the music therapy profession with legislators, agencies, and coalitions on the state and Federal levels. Since 2005, she has led AMTA's national state recognition initiative in collaboration with the Certification Board for Music Therapists. She has presented and participated in advocacy trainings and events in 28 states and has contributed to legislative and regulatory language in 41 states, supporting increased access to quality music therapy services provided by qualified board certified music therapists. In addition to her government relations work, Ms. Simpson is also responsible for providing reimbursement guidance to

AMTA members and music therapy consumers. She holds the professional designation of "Managed Healthcare Professional" from America's Health Insurance Plans and is the coauthor of "Music Therapy Reimbursement: Best Practices and Procedures." Prior to her work with AMTA, her 17 years of clinical experience as a board certified music therapist involved developing music therapy programs in hospital settings, including physical rehabilitation, oncology, labor and delivery, behavioral health, intensive care units, and general medicine.

***Practitioner Perspectives***

With over 70 years of clinical history in the United States, music therapy receives national and state recognition in several ways: the Older Americans Act, Department of Veterans Affairs Health Systems, health and education agency programs, and occupational regulation. Despite growing recognition of the profession, consistent third-party coverage has been challenging. Reimbursement has been limited to select Medicare Prospective Payment Systems (PPS), diagnosis-specific state Medicaid waivers, facility-based budgets, and case-by-case approval from private insurance companies. To increase service access, evidence designed to justify policy change and funding is necessary. Clearly defined functional outcomes and documented cost savings of music therapy interventions will improve reimbursement opportunities.



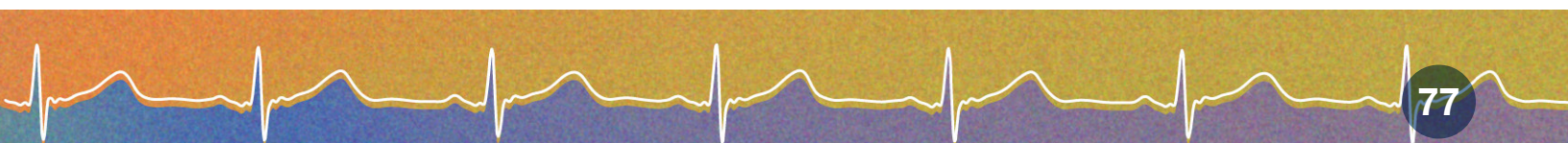
**Sarah Lock, J.D., AARP**

Ms. Lock is senior vice president for policy and brain health in AARP's Policy, Research, and International Affairs group. Ms. Lock leads AARP's policy initiatives on brain health and care for people living with dementia, including serving as the executive director of the Global Council on Brain Health, an independent collaborative of scientists, doctors, and policy experts. Ms. Lock represents AARP in the Leadership Council of Aging Organizations. She is a frequent writer and public speaker on issues related to healthy aging. Previously, she served as senior attorney/manager at AARP Foundation Litigation conducting health care impact litigation on behalf of older persons and authoring numerous amicus briefs on health care issues impacting

older Americans. Prior to AARP, Ms. Lock was a trial attorney for the U.S. Department of Justice and a legislative assistant in the U.S. House of Representatives.

***Policy Perspectives***

Music has immense power to connect us as human beings. For thousands of years, we have known music unites us emotionally and moves us physically. But before music can be used as part of





recognized health care interventions and paid for by our health insurance systems, policymakers need evidence it is safe and effective and whether its benefits are accessible and sustainable. [Music on our Minds](#) provides the Global Council on Brain Health's consensus statements on the state of evidence in 2020, and AARP is supporting the NeuroArts Blueprint's [economic analysis of music interventions](#) for dementia care.



**Wendy Weber, N.D., Ph.D., M.P.H.,** National Center for Complementary and Integrative Health

Dr. Weber is branch chief for the Clinical Research in Complementary and Integrative Health Branch in the Division of Extramural Research at the National Center for Complementary and Integrative Health (NCCIH). She joined NCCIH as a program director in 2009. Dr. Weber is the coordinator for NCCIH's Clinical Trial Specific Notices of Funding Opportunity (NOFOs) and point-of-contact for natural product-related clinical trial NOFOs. She is a member of the planning and oversight team for the NIH–U.S. Department of Defense (DOD)–U.S. Department of Veterans Affairs (VA) Pain Management Collaboratory and project scientist for its coordinating center. At NCCIH, Dr. Weber oversees a

portfolio of pragmatic clinical trials, natural product clinical trials, studies of complementary medicine to promote healthy behavior, and complex intervention research. Dr. Weber earned a Ph.D. in epidemiology and an M.P.H. from the University of Washington and a doctorate of naturopathic medicine (N.D.) from Bastyr University. Prior to joining NCCIH, she was a research associate professor at Bastyr University, where she conducted clinical trials. She has published in the field of complementary and integrative health in *Mayo Clinic Proceedings*, *JAMA*, and *Pediatrics*.

### ***Designing Trials To Be Informative to Payers Including Centers for Medicare & Medicaid Services (CMS)***

If they are designed well, clinical trials conducted within the health care setting can be informative to patients, providers, policymakers, and payers such as the Centers for Medicare & Medicaid Services (CMS). One design that can be informative to these groups is pragmatic clinical trials. CMS has expressed interest in the results of pragmatic clinical trials because they can be highly informative when they are designed to have strong rigor by using randomization, are powered to detect clinically meaningful improvements, reduce or address sources of bias, and enroll patients with diverse backgrounds and from diverse health care settings that are representative of CMS recipients.



**Jill Sonke, Ph.D.,** University of Florida

Dr. Sonke is director of research initiatives in the Center for Arts in Medicine at the University of Florida (UF), director of national research and impact for the One Nation/One Project initiative, and U.S. director of the EpiArts Lab, a National Endowment for the Arts research lab in partnership with University College London. She serves on the steering committee for the Jameel Arts & Health Lab and served during the COVID-19 pandemic as a senior advisor to the Centers for Disease Control and Prevention. She is an affiliated faculty member in the UF School of Theatre + Dance, the Fixel Institute for Neurological Diseases, and the Center for African Studies, as well as an editorial board member for *Health Promotion Practice* journal. Dr. Sonke is a

dancer and a musician, is a mixed methods researcher, and has 28 years of leadership in the field of arts



in health. She is the recipient of numerous awards and over 350 grants for her programs and research in the arts and health.

### ***Social Prescribing Perspectives***

Social prescribing (SP) is a means for identifying nonmedical, health-related social needs and subsequently connecting people to nonclinical resources within their community to improve their health and well-being. SP programs are increasingly being implemented throughout the world, including in the United States, where more than 25 pilot programs are underway. This presentation will overview current activities related to SP practice, research, and policy in the United States, with a focus on the development of resources positioned to advance the quality of SP research and evidence synthesis.

# Day Two Closing Session

## CO-CHAIRS:

**Francis S. Collins, M.D., Ph.D.**, NHGRI NIH Distinguished Investigator and Former NIH Director

**Renée Fleming, M.M., Artistic Advisor**, John F. Kennedy Center for the Performing Arts



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