



THE UCLA HERB ALPERT SCHOOL OF MUSIC

UCLA | College of
Letters and Science

**UNDERGRADUATE INTERDEPARTMENTAL
PROGRAM FOR NEUROSCIENCE (M170)
&
MUSIC INDUSTRY, SCIENCE
& TECHNOLOGY PROGRAM (M103)**

**MUSIC MIND & BRAIN
SYLLABUS
SPRING TERM, 2017-2018 ACADEMIC YEAR**

Professor: Mark Jude Tramo, MD PhD

Location: Schoenberg Music Building, Room 1420

Time: April 5 – June 14, Thursdays 6:30 – 9:30 PM

URL: <https://ccle.ucla.edu/course/view/18S-NEUROSCM170-1>

UPPER DIVISION COURSES

MUS IND 103. Music Mind and Brain (4)

Seminar, three hours/wk; outside study, nine hours/wk.

This seminar takes an interdisciplinary approach to understanding brain mechanisms mediating music perception, performance, and cognition. Students' natural interest in music serves as a springboard for learning basic concepts about how the brain works. Seminars focus on specific themes such as harmony perception, emotion and meaning in music, and creativity. The course is designed to help students understand methodologies currently used to investigate mind-brain correlates. Fundamental principles in neurophysiology, neuroanatomy, neuroimaging, and neurology that are relevant to basic research in cognitive neuroscience and auditory neuroscience are emphasized. After three foundational lectures by Professor Tramo, student study-groups present key papers from professional neuroscience, psychology, and medical journals. Weekly homework assignments reinforce the main points covered in lectures, seminars, and assigned reading. The final examination is take-home. Letter grading is based on attendance/participation (40-50%), presentation (10-20%), and final exam score (30-40%).

Faculty

Mark Jude Tramo, MD, PhD

Dept of Neurology, David Geffen School of Medicine at UCLA

Dept of Musicology, UCLA Herb Alpert School of Music

Co-Director, University of California Multi-Campus Music Experience Research Initiative (UC MERCI)

Director, The Institute for Music & Brain Science

Email: mtramo@ucla.edu
URL: <http://www.BrainMusic.org>

Guest Faculty

John Iversen, PhD
Swartz Center for Computational Neuroscience, UCSD
Co-Director, University of California Multi-Campus Music Experience Research Initiative (UC MERCI)
Advisory Board, The Institute for Music & Brain Science
URL: <http://MERC.I.UCSD.edu>

Tom Sturges
Whilom Head of Creative, Universal Music Publishing
Advisory Board, The Institute for Music & Brain Science

David Alexander, MD
Dept of Neurology, David Geffen School of Medicine at UCLA
Susan & David Wilstein Chair in Rehabilitation Medicine
Medical Director, California Rehabilitation Institute

Prerequisites

- None

Enrollment

- Open to all UCLA undergraduates. Priority is given to students presently enrolled in the Neuroscience Program Major or Minor and in the Music Industry, Science, & Technology Program Minor.
- PTEs – to be discussed after the first seminar

Requirements

- ATTENDANCE/PARTICIPATION
Each class is broken up into 3 blocks (~50 mins each) separated by 2 breaks (~10 mins each)
Attendance Score = 10 classes/term x 3 blocks/class = 30 blocks/term
Participation
 - eye contact
 - questions
 - active participation in class discussions
 - at 1-2 turns serving as the “Class Scribe”Absences are not excused unless Professor Tramo receives an email from a dean, faculty member, or health professional ≥ 24 hours before class start
- READING
Class notes
Handouts
Course website announcements, PDFs, etc

Articles assigned from professional science, medicine, and music journals for presentations and reading:

- go to The Institute for Music & Brain Science website, <http://www.BrainMusic.org>
- on the Home Page, click on "Education"; there, click on "Institute's eLibrary"
- find the PDF using the author's name(s) or title of the paper
- download the PDF of the paper and read it.

OR

- go to the UCLA electronic library, search e-journals using the name of the journal the paper was published in
- find the year, volume, and page number of the paper
- download a PDF of the paper and read it

- **PRESENTATION**

One Powerpoint presentation of a professional journal publication as member of a weekly seminar study-group

Active participation in class discussions

- **FINAL EXAMINATION**

Take-home, open-book, takes about one hour to complete

Administered during our usual class time during Final Examination week

Posted on the course website on **Thursday June 14th 6:30 PM**

Must be completed *independently* by each student and emailed back to Professor Tramo no later than **Thursday June 14th 9:30 PM**

Recommended Books

- *Harvard Dictionary of Music, 4th Edition*. Don Michael Randel (Ed), 2003
- *Human Neuroanatomy, 9th Edition*. Malcolm Carpenter, 1996
- *Science of Sound, 3rd Edition*. Thomas Rossing et al, 2001
- *Oxford Handbook of Music Psychology*. Susan Hallam et al (Eds), 2009
- *Fundamentals of Hearing, 5th Edition*. William Yost, 2009
- *On the Sensations of Tone as a Physiological Basis for the Theory of Music, 2nd Edition*. Hermann Helmholtz, 1885
- *Auditory Neuroscience: Making Sense of Sound*. Jan Schnupp et al (Eds), 2012
- *The Auditory Cortex*. Jeffrey Winer & Christopher Schreiner (Eds), 2011
- *The Cognitive Neurosciences, 5th Edition*. Michael Gazzaniga & G Ronald Mangun (Eds), 2014
- *Emotion and Meaning in Music*. Leonard Meyer, 1956
- *Every Idea Is a Good Idea: Be Creative Anytime, Anywhere*. Tom Sturges, 2014

LECTURE & SEMINAR SCHEDULE

April 5

Lecture 1: Introduction to Music, Mind, & Brain

- Course Overview & Syllabus
 - Learning Tools
- Fields of Study in Music, Neuroscience, Psychology, & Health Sciences
 - Human Neuroanatomy: Key Terms & Structures
 - Functional Brain Organization & Music Cognition

April 12

Lecture 2: Experimental Design & Methods

- Conceptual Approaches to Understanding Mind-Brain Correlates
 - Experimental Methods for Studying Mind-Brain Correlates
 - Current Knowledge & Future Directions for Research

April 19

Introductory Lecture 3: Sound & Hearing

- Pictures of Sound
- Auditory Psychophysics
- Physiology and Anatomy of the Auditory Nervous System
- Psychoacoustics of Pitch Perception: Simple Pitch vs. Complex Pitch

[APRIL 14 - Study List Deadline \(becomes official\)](#)

April 26

Seminar 1: Pitch Perception

- Neural Representations of Tone Frequency in the Ear & Brain: Microanatomy, Neurochemistry, & Neurophysiology
- Neural Representations of “Virtual Pitch” in the Auditory Nerve & Auditory Cortex: Place Codes, Rate Codes, & Temporal Codes
 - Functional Neuroanatomy of Pitch Perception: Cortical Lesion Effects in Stroke & Epilepsy Patients

May 3

Seminar 2: Harmony Perception

- Theory of Harmony in Western Tonal Music: Key Terms & Concepts
 - Psychoacoustics of Tonal Harmony: Consonance & Dissonance
 - Temporal Coding of Tonal Harmony in the Auditory Nerve
 - Cerebral Lateralization & Harmony Perception: Split-Brain Studies in Epilepsy Patients
 - Neurophysiology of Harmony Perception: Cortical Event-Related Potentials

May 10***Seminar 3: Melody Perception***

- Scales & Keys in Western Music:
Mathematical Descriptions & Cognitive Representations
- Tonal Information Processing: Miller's Magical Number 7, Plus or Minus 2
 - Experimental Psychology of Melody Discrimination
 - Neural Coding of Tone Sequences in Auditory Cortex
 - Functional Neuroanatomy of Melody Perception:
Cortical Lesion Effects in Stroke & Epilepsy Patients

May 17***Seminar 4: Rhythm Perception & Production******Guest Professor: Dr. John Iversen, UCSD***

- Introduction
 - Rhythm & Sensorimotor Integration
- Effect of Movement on Rhythm Perception in Infants
- Neurophysiological Correlates of Rhythm Perception:
Magnetoencephalography (MEG)
- Functional Neuroanatomy of Rhythm Perception: fMRI &
Cortical Lesion Effects in Stroke & Epilepsy Patients

May 24***Seminar 5: Emotion & Meaning in Music***

- Semiotics in Music & Language
- Neurophysiological Correlates of Semantic Processing:
Cortical Event-Related Potentials
- Psychophysiology & the Autonomic Nervous System:
Chills, Thrills, & Subconscious Processing
 - Neurochemical and Neuroanatomical Correlates of
Emotional & Autonomic Responses to Music: fMRI, PET, & Lesion Effects

May 31***Seminar 6: Intelligence, Talent, & Creativity******Guest Professor: Tom Sturges***

- Gardner's Multiple Intelligences
 - Heredity, Brain Morphometry, IQ, & Melody Perception
- Music Training, Development, & Neural Plasticity: "Perfect Pitch"
 - Functional Neuroanatomy of Music Improvisation: fMRI
 - Creativity & Psychopathology

- Creativity in Songwriters, Rock Stars, & Everyday Life

June 7

Seminar 7: Music, Health, & Medicine

Guest Professor: David Alexander, MD

- Effects of Music on Autonomic Indices of Pain & Stress in Hospitalized Infants
- Effects of Music in Post-Surgical ICU Patients
- Melodic Intonation Therapy for Speech Disorders in Stroke Patients
- Music & Movement in Parkinson Disease

June 14

Final Examination