UPPER DIVISION COURSES
MUS IND 103. Music Mind and Brain (4)
Seminar = 3 hours/wk; outside study = 9 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, rhythm production, emotion and meaning, 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, music, 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 (30%), homework (15%), presentation (15%), and final exam score (40%).

Note:
• Students needing academic accommodations based on a disability should contact the Center for Accessible Education (CAE) at (310) 825-1501 or in person at Murphy Hall A255. In order to ensure accommodations, students need to contact the CAE within the first two weeks of the term. Students who would like to help with a classmate’s accommodations, please call CAE at (310) 825-1501 or visit CEA in person at Murphy Hall A255.
• Please read the Student Code of Conduct (https://www.deanofstudents.ucla.edu/studentconductcode). According to Senate Regulation A-306 (https://senate.ucla.edu/regulations/chapter1#bootstrap-fieldgroup-accordion-item--section-4-grades-3), faculty and TAs are required to report suspected acts of academic dishonesty to the Office of Student Conduct (https://www.deanofstudents.ucla.edu/Contact-Us).

• Faculty and TAs are required under the UC Policy on Sexual Violence and Sexual Harassment to inform the Title IX Coordinator—A NON-CONFIDENTIAL RESOURCE—should they become aware that you or any other student has experienced sexual violence or sexual harassment.

Faculty

Mark Jude Tramo, MD, PhD
Neuroscience Program, Dept of Integrative Biology & Physiology, UCLA College of Letters & Science
Music Industry Program, Dept of Musicology, UCLA Herb Alpert School of Music
Dept of Neurology, David Geffen School of Medicine at UCLA

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

Teaching Assistants

Julia Schorn
Dept of Psychology, UCLA College of Letters & Science
juliaschorn@g.ucla.edu

Nathan Pham
Dept of Bioengineering, UCLA Henry Samueli School of Engineering & Applied Science
bphamjr@gmail.com

Guest Faculty

Robert Fink, PhD
Chair, Music Industry Program
Vice-Chair & Professor, Dept of Musicology, UCLA Herb Alpert School of Music
URL: http://https://www.musicology.ucla.edu/fink-robert

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://MERCI.UCSD.edu
Eric Gardner
Panacea Entertainment

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
Advisory Board, The Institute for Music & Brain Science

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 at 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
Absences are not excused unless Professor Tramo receives a verifying email from a dean, faculty member, or health professional as soon as possible – i.e., before the absence or no later than 1 week after the date of the absence from class.

• READING
Class notes
Handouts
Course website announcements, PDFs, other
Articles assigned from professional science, medicine, and music journals for presentations and reading:
- 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

• HOMEWORK
Weekly homework assignments will be posted on the course website and are due before class starts the following week. Answers will be reviewed during class.

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

• FINAL EXAMINATION
Take-home, open-book, takes 1-2 hours to complete
Administered during our usual class time during Final Examination week
Posted on the course website on Thursday December 13th 6:30 PM
Must be completed independently by each student and emailed back to Professor Tramo no later than Thursday December 13th 11:30 PM

Recommended Books
• *Oxford Handbook of Music Psychology.* Susan Hallam et al (Eds), 2009
• *On the Sensations of Tone as a Physiological Basis for the Theory of Music, 2nd Edition.* Hermann Helmholtz, 1885
• *The Relentless Pursuit of Tone: Timbre in Popular Music.* Robert Fink et al (Eds), 2018
• *Auditory Neuroscience: Making Sense of Sound.* Jan Schnupp et al (Eds), 2012
• *The Auditory Cortex.* Jeffrey Winer & Christopher Schreiner (Eds), 2011
• *Emotion and Meaning in Music.* Leonard Meyer, 1956

LECTURE & SEMINAR SCHEDULE

**Sept 27**
*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

**Oct 4**
Lecture 2: Experimental Design & Methods
• Conceptual Approaches to Understanding Mind-Brain Correlates
• Experimental Methods for Studying Mind-Brain Correlates
• Randomized-Controlled Clinical Trials in Medical Research
• Current Knowledge & Future Directions for Research

Oct 11
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

Fri OCT 12 - Study List Deadline (becomes official)

Oct 18
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

Oct 25
Seminar 2: Harmony Perception
• Theory of Harmony in Western Tonal Music: Key Terms & Concepts
• Scales & Keys: Mathematical Descriptions & Cognitive Representations
• Tonal Information Processing: Miller’s Magical Number 7, Plus or Minus 2
  • Psychoacoustics of Tonal Harmony: Consonance & Dissonance
• Cerebral Lateralization & Harmony Perception: Split-Brain Experiments
• Neurophysiology of Harmony Perception: Cortical Event-Related Potentials

Nov 1
Seminar 3: Timbre & Melody Perception
Guest Professor: Dr. Robert Fink, UCLA
• The Relentless Pursuit of Tone
  • Timbre in Popular Music
• Tone and Timbre as Sociocultural Constructs
• Timbre Discrimination vs. Recognition: Split-Brain Experiments
• Experimental Psychology of Melody Discrimination
• Functional Neuroanatomy of Melody Perception:
  Cortical Lesion Effects in Stroke & Epilepsy Patients

Nov 8
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

Nov 15
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

Thurs-Fri NOV 22-23 – Thanksgiving holiday

Nov 29
Seminar 6: Intelligence, Talent, & Creativity
Guest Professor: Eric Gardner
• 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

Dec 6
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

Fri DEC 7 – Instruction ends

**Dec 13**
*Final Examination*

Sat DEC 8 - Fri DEC 14 – Final Examinations
Fri DEC 14 – Quarter ends