UPPER DIVISION COURSES
M170/M103. 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. The mid-term exam and final exam are take-home. Letter grading is based on attendance/participation (30%), presentation (20%), mid-term exam (10-20%), and final exam (30-40%).

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
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)
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Teaching Assistant

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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
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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

Tom Sturges
Whilom Head of Creative, Universal Music Publishing
Advisory Board, The Institute for Music & Brain Science
Eric Gardner, MFA  
Chairman/CEO/Founder, Panacea Entertainment  
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 (45-50 mins each) separated by 2 breaks (10-15 mins each)  
Attendance Score = 10 classes/quarter x 3 blocks/class = 30 blocks/quarter = 30 points  
*Electronic devices are prohibited from the classroom during the 45-50 min seminar blocks and must be turned off and stowed out of sight in order to receive attendance credit for each block*  
Seminar Participation  
- make eye contact  
- ask questions  
- participate in class discussions  
Missing one day amounts to missing three hours of class time. Missing three hours of lectures is especially problematic because the material that is covered is fundamental to understanding the journal publications presented by students.  
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 are key, especially your notes on the nine hours of lectures.  
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

• PRESENTATION
One slide presentation of a professional journal publication as a member of a weekly seminar Study Section is required.
Aim for 20 minutes of slides. There will be additional time allotted for teaching and student questions.
Study Sections are required to meet in person at least twice.
Study Sections are intended to foster in-person collaborations among classmates with similar intellectual interests, and to socialize students in preparation for their entry into the real world, where science requires collaboration and social interactions play an important role in career development and job advancement.
Students with different backgrounds help each other understand the challenging journal papers being presented.
Each student is expected to practice her/his presentation with the Study Section, who in turn makes suggestions for improvement.

• MID-TERM EXAMINATION (Week 5)
Take-home, open-book, takes approximately 1-2 hours to complete.
Covers material from the three lectures and from assigned reading.
Distributed Monday April 29th 9 AM via CCLE Announcement that is automatically emailed to each student
Email completed exam to mtramo@ucla.edu by Thursday May 2nd by 6 PM

• FINAL EXAMINATION (Finals Week)
Take-home, open-book, takes approximately 2-3 hours to complete.
Administered during our usual class time during Final Examination week:
Thursday June 13th 6:30 - 9:30P
Distributed via a CCLE course website “Announcement” that is automatically emailed to each student
Must be completed independently by each student and emailed back to Professor Tramo by 1159 PM

Recommended Books
• The Unanswered Question. Leonard Bernstein, 1981
• On the Sensations of Tone as a Physiological Basis for the Theory of Music, 2nd Edition. Hermann Helmholtz, 1885
• Foundations in Music Psychology: Theory & Research. PJ Rentfrow & DJ Levitin (Eds), 2019
• Oxford Handbook of Music Psychology. Susan Hallam et al (Eds), 2009
• The Relentless Pursuit of Tone: Timbre in Popular Music. Robert Fink et al (Eds), 2018
• Emotion and Meaning in Music. Leonard Meyer, 1956

**LECTURE & SEMINAR SCHEDULE**

Monday April 1 – Instruction begins

**April 4**

*Lecture 1: Introduction to Music, Mind, & Brain*
- Course Overview & Syllabus
- Learning Tools
- Student Study Groups
- Fields of Study in Music, Neuroscience, Psychology, & Health Sciences
  - Music: Key Terms & Concepts
  - Functional Brain Organization & Music Cognition

**April 11**

*Lecture 2: Conceptual & Methodological Approaches*
- Karl Popper, Falsificationism, & Philosophy of Science
- Human Neuroanatomy: Key Terms & Structures
- Experimental Methods for Studying Mind-Brain Correlates

Fri APRIL 12 - Study list deadline (becomes official)

**April 18**

*Lecture 3: Sound & Hearing*
- Pictures of Sound
- Auditory Psychophysics
- Physiology and Anatomy of the Auditory Nervous System
  - Neural Coding: Tuning Curves, Place Codes, Rate Codes, & Time Codes
- Psychoacoustics of Pitch Perception: Simple Pitch vs. Complex Pitch

**April 25**

*Seminar 1: Pitch Perception*
• Neural Coding of Tone Frequency in Primate Auditory Cortex: Topographic Organization, Histochemistry, & Connectivity Patterns
• Neural Coding of Pitch in Primate Auditory Cortex
• Functional Neuroanatomy of Pitch Perception in Humans: Cortical Lesion Effects in Stroke & Epilepsy Patients

Mid-Term Examination distributed via CCLE and email

May 2
Mid-Term Examination due via email by 6P

Seminar 2: Harmony Perception
• Theory of Harmony in Western Tonal Music: Key Terms & Concepts
• Scales & Keys: Mathematical Descriptions & Cognitive Representations
  • Psychoacoustics of Tonal Harmony: Consonance & Dissonance
• Cerebral Lateralization & Harmony Perception: Split-Brain Experiments
• Neurophysiology of Harmony Perception: Cortical Event-Related Potentials

May 9
Seminar 3: Melody Perception
• Miller’s Magical Number 7, Plus or Minus 2
• Experimental Psychology of Melody Perception
• Functional Neuroanatomy of Melody Perception: Cortical Lesion Effects in Epilepsy Patients

May 16
Seminar 4: Rhythm Perception & Production
Guest Professor: John Iversen, PhD
• 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 23
Seminar 5: Emotion & Meaning in Music
• Semiotics in Music & Language
• Psychophysiology & the Autonomic Nervous System: Chills, Thrills, & Subconscious Processing
• Neurochemical and Neuroanatomical Correlates of
Emotional & Autonomic Responses to Music: fMRI, PET, & Lesion Effects

Monday MAY 27 – Memorial Day holiday

May 30

**Seminar 6: Talent, Intelligence, & Creativity**
**Guest Professors: Tom Sturges & Eric Gardner**

- What Is Talent? Behind the Scenes with The Beatles & Other Popular Artists
- Creativity, Psychopathology, & Drugs
- Howard Gardner's Multiple Intelligences
- Music Training, Development, & Neural Plasticity: “Perfect Pitch”
- Functional Neuroanatomy of Jazz & Rap Improvisation
- Creativity in Songwriters, Rock Stars, & Everyday Life

June 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 JUNE 7 – Instruction ends
Sat JUNE 8 - Fri JUNE 14 – Final Examinations

June 13

**Final Examination**

Fri JUNE 14 – Quarter ends