Dissecting Orpheus: Finding Music in the Brain

Instructor: Zoe Weiss (zw36@cornell.edu)
Class Times: Tuesday/Thursday, 1 hour 15 minutes

Course Description:

While the power and substance of musical experiences have fascinated thinkers for millennia, the last twenty years has seen a dramatic expansion of investigation of these phenomena from within the fields of music cognition and music psychology. This 3000-level course is aimed at students interested in exploring the intersection between music and this growing body of research into music's unique neural and psychological properties. This is not a course about music perception — i.e. how musical elements such as pitch or rhythm are processed in the brain. Rather, this course is interested in music's centrality to the human experience and how researchers have attempted to locate it within the complex entanglement of mind, brain, body, and culture.

Structure and scope:

The four units (evolution, language/meaning, emotions, and the body) will serve as broad topics and case studies through which we will attempt to bridge the gap between the empirical sciences and the humanities. Readings are drawn from a variety of disciplines including the cognitive sciences and music psychology, medical neurology, musicology, literature, and philosophy. We will tackle large questions: How and why did musicality evolve in humans? In what ways is music similar to or different from language? What is the relationship between the brain's structure and musicality? How can music make us feel? What is the role of the body in both the brain's experience of music and our conscious experience of music? Students will have the freedom to investigate other topics of interest in their final projects. In addition to exploring these large questions, we will also engage with the issues of methodology that arise from investigating them. How have researchers approached these questions? How is knowledge produced in these different disciplinary approaches? What critiques can we offer?

Learning Outcomes:

The course will be discussion-based and require dedicated student participation. Familiarity with Western musical notation is not required, but we will spend time cultivating listening skills and developing vocabulary with which to describe our reactions to music. The course will emphasize writing as a means for synthesizing the empirical and the experiential elements we explore. By the end of the semester, students will be able to fluently describe their personal experiences with music and analyze both the broader effects of music and specific works of music using concepts and research from the fields of cognition and psychology.

Expectations and Inclusion:

We take as a starting point that each person's relationship to music is intensely personal and equally valid and important. The richness of our classroom is directly related to the diversity of experiences and identities that we all bring to it. Respect, curiosity, and openness are paramount to making our class a safe environment in which we can all be challenged to grow. Your access to this course is vital and I will work with you to arrange any and all accommodations required for your full participation. If you are ever uncomfortable, overwhelmed, or struggling, please reach out and we will work together to find you the support you need.

Assignments/Projects:

- Vocabulary/Concept journal — students will keep a list of vocabulary words that jump out to them from the readings (at least 3 per week) for use in class and assignments. These may be words you have never encountered before, words or ideas that have an unfamiliar meaning in the context of music-cognition, or simply words and ideas you like. You will use these words in your weekly reading responses and may be asked to share them as part of class discussions. Counts towards class participation grade.

- Weekly Reading Responses — ten reading responses are due throughout the semester. These 350-500 word essays are an open-ended opportunity for thoughtful reflection on the readings. Each response should include at least one entry from your vocabulary journal (in bold). A summary of the contents of a reading assignment is not sufficient, you should be using the ideas and data presented in the readings as a jumping off point for your own thoughts. Responses may connect readings to each other or to other ideas students have encountered outside of class. They may include an exploration of the questions raised by the research, issues of methodology, and scope of application. Reflections about specific music and listening practices (whether general or personal) are also encouraged.

- Debate — week nine will feature an in-class debate about music's ability to evoke and/or express emotions. Small groups of students will be assigned several readings arguing different positions and each group will be responsible for representing that position in the debate. Each group will write and deliver an opening statement and should be prepared with a number of arguments, counterarguments, and musical examples to support their position.

- Final Project (paper and presentation) — for their final project, students will write a 12-15 page paper using cognitive-psychological research to investigate a single piece of music. Drawing on two different topics within the realm of music-cognition (one of which must have been covered in class), students will cite specific scientific studies (not just synthetic overviews) and make an original argument for how this research can aid our understanding of a specific musical work (other musical examples may be used as well). What light does the research shed on the music? What questions about musical cognition does the piece ask and has the scientific literature addressed them? In addition to this argument, students will also reflect on how their personal experience of the music has been changed by their research. Students will give 15 minute presentations on this research during class time.

Grading — Grades will be assigned on the following basis:

Attendance/Participation: 30%
Weekly reading responses: 30%
Debate: 5%
Final Project: 35% (10% presentation, 25% final paper)

Evaluation criteria:

- Attendance: students are each allowed two absences throughout the semester, this includes absences due to minor illnesses. Every further absence will result in a 5% grade deduction. Emergencies and extenuating circumstances may be discussed with the instructor.

- Participation: students are expected to arrive on time and prepared for a lively discussion. This preparation consists of reading all assigned articles and chapters and formulating some questions and ideas based on them before class time.

- Weekly reading responses: these will be evaluated based on depth of engagement with the ideas presented in the readings and clarity of prose. Responses will not receive letter grades but rather be marked on a check-plus, check, check-minus scale. These should be understood as meaning excellent work, good work, and subpar work. Work that is inadequate (below check-minus) will not receive credit. Late assignments will be graded with a maximum of half credit if turned in no more than 3 days late, after that no credit will be given.

- Debate: the debate will be evaluated on group preparedness, comprehension of the assigned position, persuasive argument for that position, and individual participation. No letter grade will be given.

- Final projects: in addition to meeting the basic requirements of the assignment, these projects will be evaluated on four criteria:
    1) An engaging presentation, a carefully crafted and well-written paper
    2) Demonstrated command of the scientific literature and ideas within it
    3) Convincingly argued connection between these ideas and the specific musical example
    3) Thoughtful reflection on personal experience of the piece

Weekly Schedule:

Introduction

1.1: Introduction: What is music anyway?
- In class reading: Introduction from Oliver Sacks *Musicophilia;* excerpts from Bruno Nettl "Music" in Grove Music Online
- Discussion: How do our cultural assumptions effect even the "empirical" study of music cognition? In what ways might the very definition of music vary between researchers in the humanities and sciences?

1.2: Introduction: Why do humans make art?
- Reading: Gazzaniga *Human*, chapter 6 "What's up with the arts?"
- Assignment: Find a piece that is important to you and that you'd like to know more about
- Listening exercise: Practice using metaphorical language (through unusual comparisons) to get specific about sound. Physical actions, smells, temperature, texture, size, etc. [use a variety of unfamiliar examples: several non-western examples, Xenakis, Purcell fantasia #7, Reich]
- Discussion: What specific elements of the arts are unique to humans? What are Gazzaniga's artistic priorities? Are there oversights here?

Unit One: Where did music come from?

2.1: Music among non-primates
- Reading: Patel MLB 7.3.5; Kroodsma *The Singing Life of Birds* (chap 1)
- Listening exercise: Continue developing descriptive language
- Discussion: How different are animal "musical" sounds from human ones? What is the basis for our inclusion or non-inclusion of these sounds under the heading "musical" (affect, purpose, aesthetics, structure, complexity, innovation)? Does learning constitute a form of cultural transmission, and does this affect our sense of whether birds have "music"?

2.2: Music in primates
- Reading: Mithen *The Singing Neanderthals*, chapter 8; Snowdon and Teie "Emotional communication in monkeys" in EEC
- Assignment: Reading response #1 due
- Listening exercise: Primate calls
- Discussion: Is the case for "musical" sounds more solid for our closest evolutionary cousins? Does it seem more likely that human musicality evolved from primates than from birds or whales? What can we learn about human musicking from this brief survey of non-human musics? Does any of this change our definition of music?

3.1: Did music evolve?
- Reading: Huron "Is Music an Evolutionary Adaptation" in CNM, chap. 5; Kleinmen "Darwin and Spencer on the origin of music" in MNN, chap. 1; Nettl "Music as a Universal Language" in *The Study of Ethnomusicology*, chap. 3.
- Discussion: Is it useful to think of the emergence of human musicality through the lens of evolution? Is music a single monolithic adaptation or do you buy Nettl's suggestion of multiple evolutionary pathways?

3.2: Theories of musical evolution (part 1)
- Reading: Mithen, chaps. 9-11; Tomlinson *A Million Years of Music,* chap. 1.
- Assignment: Reading response #2 due
- Discussion: Begin with them sharing from their reading responses. What do you make of the various theories put forward? What exactly are these theories attempting to account for?

4.1: Theories of musical evolution (part 2)
- Reading: Mithen, chaps. 12-14; Tomlinson, chap. 3.
- Listening exercise: early hominid music making
- Discussion: Continue previous class's discussion about evolutionary theories incorporating new ideas from readings.

4.2: Musical evolution versus language
- Reading: Snowdon et al "Music, Evolution, and Neuroscience" in MNN, chap. 2; excerpts from Patel MLB, chap. 7.
- Assignment: Reading response #3 due
- Discussion: Is there any way to empirically test the various hypotheses we've encountered? How do the theories of musical evolution we've discussed overlap or not with language?

Unit Two: What is music's relationship to language and meaning?

5.1: Music without language; language without music
- Reading: Mithen, chaps. 3-5; Peretz "Brain specialization for music" in CNN, chap. 13.
- Listening exercise: excerpts of two works by Shebalin (pre- and post-stroke). Are they works of the same mind? Does his loss of language change the music?
- Discussion: How different are the skills required for music and language? What do the cases of savants and those with loss of function tell us about "normal" musicality?

5.2: Learning music and language
- Reading: Mithen, chap. 6; Nettl "A nonuniversal language" in *The Study of Ethnomusicology,* chap. 5; Trehub "Music lessons from infants" in OHMP, chap. 21.
- Assignment: Reading response #4 due
- Listening exercise: Lullabies
- Discussion: Are different musics equivalent to different languages? Just how entangled is music with language acquisition? Looking backwards, does this change our views about musical evolution?

6.1: Meaning in music and language
- Reading: Patel MLB, excerpts from chap. 6; Peretz et al "Neural Overlap in Processing Music and Speech"
- Listening exercise: Songs in foreign languages
- Discussion: How do language and music communicate differently? When combined, do they work with or against each other?

6.2: Can music have meaning?
- Reading: Zbikowski "Musical gesture and musical grammar: a cognitive approach" in NPMG, chap. 4; Agawu *Music as Discourse,* chap. 1.
- Assignment: Reading response #5 due
- Listening exercise: Programmatic music
- Free writing: Describe a piece of music that communicates a very specific meaning to you? How does it do so?
- Discussion: How do we want to define "meaning"? Does the multiplicity of music's meanings dilute those meanings?

Interlude: The divided brain

7.1: What do the hemispheres do?
- Reading: McGilchrist "The Master and his Emissary" chaps. 1 & 2.
- Discussion: Just how different are the hemispheres of the brain? How is McGilchrist's argument different from popular ideas about "right brain/left brain" differences?

7.2: Music, language, and the divided brain
- Reading: McGilchrist, chap. 3.
- Assignment: Reading response #6 due
- Discussion: How does the divided brain idea change our view of the relationship between music and language? Does it change some of our previous ideas about musical evolution?

Unit Three: Music as the Language of Emotions

8.1: Holiday — no class

8:2: Music and emotion
- Reading: Patel MLB 6.2.2 and 6.5; Mithen, chap. 7; Juslin "Emotional responses to music" and "Emotion in music performance" in OHMP, chaps. 12 and 35.
- Listening exercise: Intense emotionality
- Discussion: Are your daily interactions with music emotional? What kinds of emotional experiences have you had with music? How might music express/evoke a broad (or narrow) range of emotions?

9.1: Intense aesthetic responses
- Reading: Huron "Aesthetics" in OHMP, chap. 14; G. Gabrielle Starr "Feeling Beauty" Introduction and chap. 1.
- Assignment: Reading response #7 due
- Discussion: Is there a differentiation between aesthetic emotions and non-aesthetic emotions? Do musical aesthetic emotions function identically to other aesthetic emotions?

9.2: Debate: 'cognitivists' vs. 'emotivists'
- Reading: Groups will be assigned individual readings
- Debate Preparation: Groups should write an opening statement and be prepared to articulately argue their position citing relevant readings, studies, and musical examples.

10.1: Musical pleasure
- Reading: Zatorre "Musical pleasure and reward"; Zatorre and Salimpoor "From perception to pleasure"; Gebauer et al "Ever-changing cycles of musical pleasure"
- Listening exercise: Pleasure and predictive coding
- Discussion: How does the chemical model of musical pleasure inform or contradict our ideas about musical evolution? Musical emotions? How can we relate the narrative experience of musical pleasure to the neurological?

10.2: Emotions and the body
- Reading: Damasio and Carvalho "The nature of feelings"; Davidson "Bodily movement and facial actions"; Damasio *Looking for Spinoza*, chap. 3 "Feelings"
- Assignment: Reading response #8 due
- Discussion: What are emotions? Where do emotions come from? What is the role of the body in generating emotions? What is the role of the body in expressing or evoking emotion in musical performance?

Unit Four: Music and the Body

11.1: Listening with the body
- Reading: Hodges "Bodily Responses to Music" in OHMP, chap. 11; Cross "Listening as covert performance"; Fritz and Koelsch "Acoustically mediated emotional contagion" in EEC, chap. 18; DeNora *Music in Everyday Life,* chap. 4.
- Listening to the body
- Discussion: What is listening? How does music shape the body? How does the body shape our experience of music?

11.2: Social interaction
- Reading: Gazzaniga *Human*, chapter 5; Davidson "Movement and collaboration in music performance" in OHMP, chapter 34; King and Ginsborg "Gestures and glances: interactions in ensemble rehearsal" in NPMG, chap 9.
- Assignment: Reading response #9 due
- Mirroring activity
- Presentation: "Mirror Neurons, Imitative Counterpoint, and the Pleasures of Polyphony"

12.1: Dance
- Movie day — how can dance and bodily movement magnify or contradict musical expression and meaning?

12.2: Performance
- Reading: Brown et al “Expert music performance: cognitive, neural, and developmental bases.” in MNN, chap. 4; Le Guin "Boccherini's Body" introduction and chap. 1.
- Listening: Le Guin's Boccherini performances
- Discussion: What is the performing body? What does performance give access to? How distinct is the performing brain from the listening brain?

13.1: Can music heal the body?
- Reading: Thaut "Music as Therapy in Early History" in MNN, chap. 8; Sacks *Musicophilia*, chaps. 16, 19, & 29.
- Assignment: Reading response #10 due
- Discussion: How has music been used for healing? What are its future possibilities? Given the complexity of music's interaction with the body, the brain, and culture, what are the strengths and limitations of music as therapy?

Final Projects

13.2: Individual Meetings [no class]: Final projects

14.1: Project presentations (day 1)

14.2: Holiday [no class]

15.1: Project presentations (day 2)

15.2: Project presentations (day 3)

Final papers are due at the end of reading period

Key Texts:

Altenmüller, Eckart, Stanley Finger, and François Boller, eds. *Music, Neurology, and Neuroscience: Evolution, the Musical Brain, Medical Conditions, and Therapies*. Amsterdam: Elsevier, 2015. **[MNN]**

Altenmüller, Eckart, Sabine Schmidt, and Elke Zimmermann, eds. *The Evolution of Emotional Communication: From Sounds in Nonhuman Mammals to Speech and Music in Man*. Oxford: Oxford University Press, 2013. **[EEC]**

Hallam, Susan, Ian Cross, and Michael Thaut, eds. *The Oxford Handbook of Music Psychology*. Oxford ; New York: Oxford University Press, 2009. **[OHMP]**

Gazzaniga, Michael S. *Human : The Science behind What Makes Us Unique*. New York: Ecco, 2008.

Gritten, Anthony, and Elaine King, eds. *New Perspectives on Music and Gesture*. Burlington, VT: Ashgate, 2011. **[NPMG]**

Juslin, Patrik N., and John Sloboda. *Handbook of Music and Emotion: Theory, Research, Applications*. Oxford University Press, 2011. **[HME]**

McGilchrist, Iain. *The Master and his Emissary: The Divided Brain and the Making of the Western World*. New Haven, CT: Yale University Press, 2009.

Mithen, Steven. *The Singing Neanderthals: The Origins of Music, Language, Mind, and Body*. Cambridge, MA: Harvard University Press, 2006.

Nettl, Bruno. *The Study of Ethnomusicology : Thirty-Three Discussions*. Third edition. Urbana: University of Illinois Press, 2015.

Patel, Aniruddh D. *Music, Language, and the Brain*. Oxford: Oxford University Press, 2008. **[MLB]**

Peretz, Isabelle, and Robert J. Zatorre, eds. *The Cognitive Neuroscience of Music*. Oxford ; New York: Oxford University Press, 2003. **[CNM]**

Sacks, Oliver. *Musicophilia : Tales of Music and the Brain*. New York: Alfred A. Knopf, 2007.

Tomlinson, Gary. *A Million Years of Music : The Emergence of Human Modernity*. First edition. New York: Zone Books, 2015.

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Cross, Ian. "Listening as Covert Performance." *Journal of the Royal Musical Association* 135, no. sup1 (February 1, 2010): 67–77.

Damasio, Antonio. *Looking for Spinoza: joy, sorrow, and the feeling brain.* Orlando: Harcourt, 2003.

Damasio, Antonio, and Gil B. Carvalho. "The nature of feelings: evolutionary and neurobiological origins." *Nature Reviews Neuroscience* 14 (February 2013): 143-152.

Davidson, Jane W. "Bodily Movement and Facial Actions in Expressive Musical Performance by Solo and Duo Instrumentalists: Two Distinctive Case Studies." *Psychology of Music* 40, no. 5 (September 1, 2012): 595–633.

DeNora, Tia. *Music in Everyday Life*. Cambridge: Cambridge University Press, 2000.

Deutsch, Diana, ed. *The Psychology of Music*. 2nd ed. San Diego: Academic Press, 1999.
Eerola, Tuomas, and Jonna K. Vuoskoski. "A Review of Music and Emotion Studies: Approaches, Emotion Models, and Stimuli." *Music Perception: An Interdisciplinary Journal* 30 no. 3 (February 2013): 307-340.

Garrido, Sandra, and Emery Schubert. "Individual Differences in the Enjoyment of Negative Emotion in Music: A Literature Review and Experiment." *Music Perception: An Interdisciplinary Journal* 28 no. 3 (February 2011): 279-296.

Gebauer, Line, Morten L. Kringelbach, and Peter Vuust. "Ever-Changing Cycles of Musical Pleasure: The Role of Dopamine and Anticipation." *Psychomusicology: Music, Mind, and Brain*, Neurosciences and Music, 22, no. 2 (December 2012): 152–67.

Gingras, Bruno, Henkjan Honing, Isabelle Peretz, Laurel J. Trainor, and Simon E. Fisher. "Defining the Biological Bases of Individual Differences in Musicality." *Philosophical Transactions of the Royal Society B: Biological Sciences* 370, no. 1664 (March 19, 2015).

Iacoboni, Marco. "Imitation, Empathy, and Mirror Neurons." *Annual Review of Psychology* 60 (2009): 653-670.

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Levitin, Daniel J. *This Is Your Brain on Music : The Science of a Human Obsession*. New York, N.Y.: Dutton, 2006.

Molnar-Szakacs, Istvan, and Katie Overy. "Music and mirror neurons: from motion to 'e'motion." *Soc Cogn Affect Neurosci* 1 no. 3 (2006): 235-241.

Peretz, Isabelle, Dominique Vuvan, Marie-Élaine Lagrois, and Jorge L Armony. "Neural Overlap in Processing Music and Speech." *Philosophical Transactions of the Royal Society B: Biological Sciences* 370, no. 1664 (March 19, 2015): 20140090.

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Sachs, Matthew E., Antonio Damasio, and Assal Habibi. "The Pleasures of Sad Music: A Systematic Review." *Frontiers in Human Neuroscience* 9 (July 24, 2015).

Starr, G. Gabrielle. *Feeling Beauty : The Neuroscience of Aesthetic Experience*. Cambridge, Massachusetts: The MIT Press, 2013.

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Vuoskoski, Jonna K., and Tuomas Eerola. “The Role of Mood and Personality in the Perception of Emotions Represented by Music.” *Cortex* 47, no. 9 (October, 2011): 1099-1106.

Vuoskoski, Jonna K., William F. Thompson, Doris McIlwain, and Tuomas Eerola. “Who Enjoys Listening to Sad Music and Why?” *Music Perception: An Interdisciplinary Journal* 29, no. 3 (February 2012): 311-317.

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Zatorre, Robert J., Joyce L. Chen, and Virginia B. Penhune. “When the Brain Plays Music: Auditory–motor Interactions in Music Perception and Production.” *Nature Reviews Neuroscience* 8, no. 7 (July 2007): 547–58.

Zatorre, Robert J. “Musical Pleasure and Reward: Mechanisms and Dysfunction.” *Annals of the New York Academy of Sciences* 1337, no. 1 (March 1, 2015): 202–11.

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