MUMT 616 & PSYC 740

TIMBRE AS A FORM-BEARING ELEMENT IN MUSIC: PERCEPTUAL AND COGNITIVE ISSUES

Time: Tue 8:35-11:25am (with a 20 min break)
Location: Music Library Seminar Room A-510, 527 Sherbrooke St W, New Music Building

Instructor: Prof. Stephen McAdams, 550 Sherbrooke St. W., 5th floor, Suite 500, Room 502
Office Hours: By appointment (stephen.mcadams@mcgill.ca)

Course Web Site: The myCourses site www.mcgill.ca/mycourses/ contains all information for MUMT 616/PSYC 740.

Course Objectives: Over the course of this seminar, music theoretic, performance-related, psychophysical, and cognitive perspectives on musical timbre and its role as a bearer of musical form will be surveyed and discussed. The main aim is to lay the groundwork for a unified theory of musical timbre and a psychological foundation for a theory of orchestration practice. A transdisciplinary, inquiry-based learning approach is adopted in this course: students are expected to be proactive and to discover, create, and communicate knowledge on their own to the benefit of the whole class.

Content: The seminar covers a variety of interdisciplinary topics concerning the perceptual "representation" of timbre in the auditory system, multidimensional models of timbre as predictors of perceptual and musical effects of timbre, the role of timbre as a structuring force in music, the eventual limits imposed on this role by perception and memory for absolute timbre and timbral relations, and the use of timbre as an expressive device in musical performance.

Prerequisites: None.

Readings: Required readings from journal articles will be made available on myCourses. The readings are to be completed before the corresponding course dates listed below, in order to maximize the course time spent in discussion and debate. Note that lecture material will not be limited to the readings.

Method and evaluation: Three hours of lecture, discussion or student presentation per week. Grades will be based on:

1. student-led discussions [20%],
2. presentation of individual projects [30%],
3. group projects [50%], with two separate components
   a. presentation of group analyses of selected pieces of music [25%], and
   b. presentation of group projects on those pieces of music [25%].

Expectations concerning evaluated components:

1. Student-led discussions: For each topic, summarize the main BIG issues in both the required and supplementary readings for the indicated week, as well as in other relevant literature. Be sure to explain how these issues relate to the development of a theory of

musical timbre. Draw from pieces of music from different styles and explain how they support or disconfirm these ideas and claims. Focus on convergences and divergences between composers' and theorists' conceptions, on the one hand, and listeners' perceptions, on the other, across different styles. Come up with a set of questions for discussion with the rest of the class on this subject. Dig deeply and make it provocative! Do your presentation on the issue (30 min) in such a manner as to stimulate discussion, which you are to animate with deep questions (45 min). Please make an effort to create an integrated presentation, not just individual presentations by everyone in the group. Make a PowerPoint or Keynote presentation on your topic and submit it in Assignments by 6pm the day before your presentation.

2. Presentation of individual projects: Come up with a major issue concerning timbre as a form-bearing element in music that particularly interests you. You can make it relevant to your own discipline. Select 2 articles not in the reading list. They can be from any domain, as long as they concern perception, cognition and analysis of musical timbre. You will make a presentation in PowerPoint or Keynote that is 15 minutes long, followed by a 5-minute discussion period. In your presentation, lay out in a logical fashion the issue you have selected and why it constitutes an important contribution to a theory of the cognitive dynamics of music listening. Outline the approach and results of the articles and summarize what they contribute to understanding your issue. Illustrate with short musical examples. Set things up so that the following discussion period will be animated and provocative. All presentation files are to be submitted in Assignments by 6pm October 13th.

Group projects are a public presentation of a thought experiment that aims to make a significant contribution to a theory of the role of timbre in musical experience. Pick an idea about the perception and/or cognition of musical timbre and the experience of form. Develop clear hypotheses based on that idea. Design a thought experiment to test your hypotheses. You need to do a review of the relevant literature to show what has already been done, which also serves as a basis for refining your hypotheses. The experiment itself should include a set of musical excerpts (the choice of which must be justified with respect to your hypotheses), one or more tasks that your listeners must perform, a clear description of the data that will be generated by this task, an explanation of how the task gets at your hypotheses, predictions about what the data will be (you can have several possible outcomes and need to describe them all), how you would analyze them to determine if your hypotheses are correct or not, and depending on each possible outcome, what this contributes to a general framework of the perception and cognition of timbre. There will be two presentations related to the group project:

3. Presentation of group analyses of pieces of music: you will make a group presentation of 45 minutes followed by 30 minutes of discussion; present your big question, your hypotheses and the pieces of music you have chosen to test them. Analyze the music in your presentation to show us what aspects of the musical materials and forms address your questions and what you predict the results will be, based on the score and recordings in the case of written music or on recorded sound in the case of non-notated musics. The aim here is to use score-based **and/or** aural music analysis as a tool for

designing your experiment. All presentation files are to be submitted in Assignments by 6pm October 27th.

4. Presentation of group projects on the pieces of music analyzed in (3): you will make a group presentation of 45 minutes followed by 30 minutes of discussion; present the whole project with questions, hypotheses, chosen task to get at an answer to the questions, the music (pieces or excerpts) you would use as they would be presented to your listeners in the experiment, the possible outcomes in the data, how you would analyze them and interpret them, and how the different outcomes would contribute to knowledge in this domain and/or change or challenge existing music theories. You should plan on collecting pilot data from yourselves and your friends to get a sense of how listeners will perform in your experiment and what challenges would arise in doing the experiment. All presentation files are to be submitted in Assignments by 6pm November 17th.

Attendance at all sessions is mandatory. Absence without a valid excuse (doctor's note, death certificate, etc.) will result in subtraction of 5 points out of 100 of final grade for each session missed.

Academic Integrity: McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/students/srr/honest/ for more information).
L'Honnêteté Académique: L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le site www.mcgill.ca/students/srr/honest/).

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.
Conformément à la Charte des droits de l'étudiant de l'Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tous les travaux rédigés qui sont notés.

Course Outline

(Professor McAdams reserves the right to change the schedule as a function of the flow of discussion and the needs of the class. The class will be informed as changes occur.)

Week 1: September 3.

Lecture 1: Introduction. Timbre as a form-bearing dimension in music

What are the psychological constraints on form-bearing dimensions in music? What is timbre and what does it have to do with musical structure and form?

Readings: McAdams (1989), McAdams & Goodchild (2017), Siedenburg & McAdams (2017). Supplementary: Boulez (1987), Nattiez (2007).

Week 2: September 10.

Discussion 1: Timbre as a form-bearing dimension in music. Presentation materials must be submitted on myCourses by 6:00PM September 9.

Lecture 2: Multidimensional scaling and timbre space

How to characterize the complexity of timbre perception. Experimental methods, data analysis techniques, psychophysical quantification of timbral dimensions. What is the predictive power of a timbre space as a model, i.e. to what extent do timbre space structures generalize across studies and sets of sounds or listeners? Exploratory vs. confirmatory studies.

Readings: McAdams (2019a). Supplementary: Grey & Gordon (1978), McAdams et al. (1995), Caclin et al. (2005), Peeters et al. (2011).

Week 3: September 17.

Discussion 2: Timbre space representation as a tool for conceiving of how to compose with or analyze timbral structures. Presentation materials must be submitted on myCourses by 6:00PM September 16.

Lecture 3: Timbre and auditory scene analysis

Timbre as arising from perceptual fusion of acoustic components. Timbre as a structuring force in the organization of sequences, musical units, and musical sections. Timbre-based attentional selection in music listening.

Readings: McAdams (1984), McAdams (2019b). Supplementary: McAdams & Bregman (1979), Kendall & Carterette (1993), Iverson (1995), Sandell (1995), Bey & McAdams (2003, Exp. 2), Tardieu & McAdams (2012)

Week 4: September 24.

Discussion 3: Implications for a timbre-based musical syntax of the fact that timbre arises from and affects perceptual organization. Presentation materials must be submitted on myCourses by 6:00PM September 23.

Lecture 4: Psychological foundations for a theory of orchestration
What psychological foundations are needed for the development of a theory of orchestration practice grounded in auditory perceptual and cognitive processes? Using auditory grouping principles as a starting point.
Readings: Adler (2002, chap. 15), Read (2004, Part II, chaps. 1 & 2), Goodchild & McAdams (2018). Supplementary: Chiasson et al. (2013), Touizrar & McAdams (in press)

Week 5: October 1.
Discussion 4: Issues in the development of a psychologically based theory of orchestration practice. Presentation materials must be submitted on myCourses by 6:00PM September 30.

Lecture 5: Absolute and relative perception of timbre
Timbre and sound sources (source classification and identification, categorical perception). What is the role of timbre-based categorization and identification in music perception? Perception of timbral intervals and contours. Musical operations on timbral patterns. What are the possibilities and limits in creating timbral scales and using them for musical structures?
Readings: McAdams (1993), McAdams & Cunibile (1992), Tillmann & McAdams (2004). Supplementary: Slawson (1985, chaps. 1-2), Smalley (1994).

Week 6: October 8.
Discussion 5: Absolute versus relative perception of timbre and the implications of these two modes of perceiving on the role of timbre as a structuring force in music. Presentation materials must be submitted on myCourses by 6:00PM October 7.

Lecture 6: Timbral expression and musical emotions
Timbral expression in performance. Timbre as a contributor to the evocation of emotional experience in music listening.
Readings: Paraskeva & McAdams (1997), Juslin & Laukka (2003), Bigand et al. (2005), Goodchild et al. (2019). Supplementary: Juslin (2000), Dubnov et al. (2006), McAdams et al. (2017)

Weeks 7-8: October 15, 22. Individual project presentations and discussion.
Assignment: Each individual prepares a 20-min presentation on their project. All presentation materials must be posted on the myCourses site by 6:00 PM October 13.

Weeks 9-10: October 29, November 5. Group analysis presentations and discussion.
Assignment: Each group prepares a 45-min presentation on their project. All presentation materials must be posted on the myCourses site by 6:00 PM October 27.

Weeks 11: November 12. In-class consultations on group projects.
Assignment: Each group brings in a first draft of their presentation for examination and constructive criticism with the instructor. Exact schedule to be determined at a later date.

Weeks 12-13: November 19, 26. Group project presentations and discussion.

Assignment: Each group prepares a 45-min presentation on their project. All presentation materials must be posted on the myCourses site by 6:00 PM November 17.

Required Readings

Course reserve: https://mcgill.on.worldcat.org/courseReserves/course/id/15781819
All other readings are on myCourses.

Adler, S. (2002). *The Study of Orchestration*, 3rd ed., New York: W. W. Norton. [on reserve]

Bigand, E., Vieillard, S., Madurell, F., Marozeau, J. & Dacquet, A. (2005). Multidimensional scaling of emotional responses to music: The effect of musical expertise and of the duration of the excerpts. *Cognition and Emotion*, 19, 1113-1139.

Dubnov, S., McAdams, S. & Reynolds, R. (2006). Structural and affective aspects of music from statistical audio signal analysis. *Journal of the American Society for Information Science and Technology*, 57, 1526-1536.

Goodchild, M. & McAdams, S. (2018, published online) Perceptual processes in orchestration. In E. I. Dolan & A. Rehding (Eds.), *The Oxford handbook of timbre*, Oxford University Press, New York, NY. doi: 10.1093/oxfordhb/9780190637224.013.10

Goodchild, M., Wild, J. & McAdams, S. (2019). Exploring emotional response to orchestral gestures. *Musicæ Scientiæ*, 23(1), 25-49.

Juslin, P. & Laukka, P. (2003). Communication of emotions in vocal expression and music performance: Different channels, same code? *Psychological Bulletin*, 129, 770-814.

McAdams, S. (1984) The auditory image: A metaphor for musical and psychological research on auditory organization. In W.R. Crozier & A.J. Chapman (eds.), *Cognitive processes in the perception of art*, pp. 289-323. North-Holland, Amsterdam.

McAdams, S. (1989). Psychological constraints on form-bearing dimensions in music. *Contemporary Music Review,* **4**(1), 181-198.

McAdams, S. (1993). Recognition of sound sources and events. In S. McAdams & E. Bigand (Eds.), *Thinking in Sound: The Cognitive Psychology of Human Audition* (pp. 146-198). Oxford: Oxford University Press.

McAdams, S. (2019a). The perceptual representation of timbre. In K. Siedenburg, C. Saitis, S. McAdams, A. Popper & R. Fay (Eds.) *Timbre: Acoustics, Perception, and Cognition*, pp. 23-58. Springer, Cham, Switzerland.

McAdams, S. (2019b). Timbre as a structuring force in music. In K. Siedenburg, C. Saitis, S. McAdams, A. Popper & R. Fay (Eds.) *Timbre: Acoustics, Perception, and Cognition*, Springer, pp. 211-244. Cham, Switzerland.

McAdams, S., & Cunibile, J. C. (1992). Perception of timbral analogies. *Philosophical Transactions of the Royal Society, London*, series B, **336**, 383-389.

McAdams, S. & Goodchild, M. (2017). Musical structure: Sound and timbre. In R. Ashley & R. Timmers (Eds.), *Routledge companion to music cognition*, pp. 129-139, Routledge, New York, NY.

Paraskeva, S., & McAdams, S. (1997). Influence of timbre, presence/absence of tonal hierarchy and musical training on the perception of musical tension and relaxation schemas. In T.

Rikakis (Ed.), *Proceedings of the 1997 International Computer Music Conference* [CD-ROM]. Thessaloniki, Greece: Aristotle University.

Read, G. (2004). *Orchestral Combinations*. Lanham, MD: Scarecrow Press. [on reserve]

Siedenburg, K & McAdams, S. (2017). Four conceptual distinctions for the auditory "wastebasket" of timbre. *Frontiers in Psychology*, 8, 1747. doi: 10.3389/fpsyg.2017.01747

Tillmann, B., & McAdams, S. (2004). Implicit learning of musical timbre sequences: Statistical regularities confronted with acoustical (dis)similarities. *Journal of Experimental Psychology: Learning, Memory and Cognition*, **30**, 1131-1142.

Supplementary Readings

Bey, C. & McAdams, S. (2003). Post-recognition of interleaved melodies as an indirect measure of auditory stream formation. *Journal of Experimental Psychology: Human Perception and Performance*, **29**, 267–279.

Boulez, P. (1987). Timbre and composition-timbre and language. *Contemporary Music Review,* **2**(1), 161-172.

Caclin, A., McAdams, S., Smith, B. K. & Winsberg, S. (2005). Acoustic correlates of timbre space dimensions: A confirmatory study using synthetic tones. *Journal of the Acoustical Society of America,* **118**, 471-482.

Chiasson, F., Traube, C., Lagarrigue, C., & McAdams, S. (2017). Koechlin's volume: perception of sound extensity among instrument timbres from different families. *Musicae Scientiae*, 21(1), 113-131. doi:10,1177/1029864916649638

Grey, J. M., & Gordon, J. W. (1978). Perceptual effects of spectral modifications on musical timbres. *Journal of the Acoustical Society of America,* **63**, 1493-1500.

Nattiez, J.-J. (2007). Is timbre a secondary parameter? English translation of "Le timbre est-il un paramètre secondaire?", *Cahiers de la Société québécoise de recherche en musique*, 9(1-2), 13-24.

Iverson, P. (1995). Auditory stream segregation by musical timbre: Effects of static and dynamic acoustic attributes. *Journal of Experimental Psychology: Human Perception and Performance,* **21**, 751-763.

Kendall, R. & Carterette, E. (1993). Identification and blend of timbres as a basis for orchestration. *Contemporary Music Review*, **9**(1-2), 51-67.

McAdams, S. & Bregman, A. (1979). Hearing musical streams. Computer Music Journal, **3**(4), 26-43.

McAdams, S., Douglas, C. & Vempala, N. (2017). Perception and modeling of affective qualities of musical instrument sounds across pitch registers. *Frontiers in Psychology*, **8**, 153. doi: 10.3389/fpsyg.2017.00153

McAdams, S., Winsberg, S., Donnadieu, S., De Soete, G., & Krimphoff, J. (1995). Perceptual scaling of synthesized musical timbres: Common dimensions, specificities, and latent subject classes. *Psychological Research,* **58**, 177-192.

Peeters, G., Giordano, B.L., Susini, P., Misdariis, N. & McAdams, S. (2011). The Timbre Toolbox: Extracting audio descriptors from musical signals. *Journal of the Acoustical Society of America*, **130**, 2902-2916.

Sandell, G. (1995). Roles for spectral centroid and other factors in determining "blended" instrument pairings in orchestration. *Music Perception*, **13**(2), 209-246.

Slawson, W. (1985). *Sound Color*. Berkeley, CA: University of California Press. [CD on reserve]

Smalley, D. (1994). Defining timbre – refining timbre. *Contemporary Music Review*, 10(2), 35-48.

Tardieu, D. & McAdams, S. (2012). Perception of dyads of impulsive and sustained instrument sounds. *Music Perception*, 30, 117-128.

Touizrar, M. & McAdams, S. (in press). Perceptual aspects of the orchestration in The Angel of Death by Roger Reynolds: Timbre and auditory grouping. In P. Lalitte (Ed.), *Analyse musicale et perception. Actes des Journées d'Analyse Musicale 2016*, Editions universitaires de Dijon.