PSY 407/507 F2011 – Sem Neuroscapes: Natural Scenes and the Brain

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Office Hours: by appointment
Time: Wed 1:30-2:50 in room 143 Straub
CRN: PSY 507 (15591) & PSY 407 (15570)

In this seminar we explore how the structure of natural scenes is reflected in perception, art, and the brain. Topics covered will include the visual system's response to fractals in nature and art, the representation of the structure of visual scenes in art, and the perception and representation of natural scenes in the human brain.

The course is offered for variable credit (1-4 credits). All participants taking the class for 1 or more credits are expected to come prepared with questions and comments on each week's readings. Participants taking the course for 2 or more credits must also make a presentation and lead a discussion on one of the topics. Participants taking the course for 3 credits are also required to write a short 1-page single-spaced reaction essay describing their insights and opinions of the research covered in the seminar and possible directions for future research while those taking the course for 4 credits are also required to write a research proposal paper. Participant input is welcome regarding possible papers or topics for discussion not listed in the syllabus. The syllabus and all readings will be posted on the course website (http://blackboard.uoregon.edu).

Schedule and Topics

Week 1 (Sept 28): **Introduction and Organizational Meeting**
Week 2 (Oct 5): **Fractals and the Art of Jackson Pollack**
Week 3 (Oct 12): **Fractals & Visual Preference**
Week 4 (Oct 19): **Statistics, Visual Scenes, & Art**
Week 5 (Oct 26): **Statistics of Natural Scenes & Perception**
Week 6 (Nov 2): **Scene Perception and Representation I**
Week 7 (Nov 9): **Scene Perception and Representation II**
Week 8 (Nov 16): **No Class!! (Neuroscience Conference)**
Week 9 (Nov 23): **Scene Perception and Representation III**
Week 10 (Nov 30): **Scene Perception and Representation IV**

Papers/Essays Due: 4:00 Friday December 2nd.

Reading List

1. Introduction and Organizational Meeting

2. Fractals and the Art of Jackson Pollack

--Taylor, RP. (2002). Order in Pollock's Chaos. Scientific American, 287: 84-89.

--Taylor, RP, Micolich, AP, Jonas, D. (1999). Fractal Analysis of Pollack's drip paintings. Nature, 399: 422.

--Taylor RP, Spehar B, Van Donkelaar P, & Hagerhall CM. (2011). Perceptual and physiological responses to Jackson Pollock's fractals. Frontiers in Human Neuroscience, 5: 1-13.

--**Supplement**: Fairbanks MS & Taylor, RP. (2011). Scaling analysis of spatial and temporal patterns: From the human eye to the foraging Albatross. In: Nonlinear Dynamical Analysis for the Behavioral Sciences Using Real Data. Boca Raton: Taylor and Francis Group.

3. Fractals & Visual Preference

--Spehar B, Clifford CWG, Newell BR, & Taylor RP. (2003). Universal aesthetic of fractals. Computers & Graphics, 27: 813-20.

--Haherhall CM, Purcell T, & Taylor RP. (2004). Fractal dimension of landscape silhouette outlines as a predictor of landscape preference. Journal of Environmental Psychology, 24: 247-55.

--**Supplement**: Knill DC, Field, D, & Kersten, D. (1990). Human discrimination of fractal images. Journal of the Optical Society of America, 7: 1113-23.

4. Statistics, Visual Scenes, & Art

--Graham DJ & Field, DJ. (2007). Statistical regularities of art images and natural scenes: Spectra, sparseness and nonlinearities. Spatial Vision, 21: 149-64.

--Redies C, Hasenstein J., & Denzler J. (2007). Fractal-like image statistics in visual art: similarity to natural scenes. Spatial Vision, 21: 137-48.

--**Supplement:** Graham DJ & Redies C. (2010). Statistical regularities in art: Relations with visual coding and perception. Vision Research, 50: 1503-09.

5. Statistics of Natural Scenes & Perception

--Yang Z & Purves D. (2003). A statistical explanation of visual space. Nature Neuroscience, 6: 632-40.

--Geisler WS. (2008). Visual perception and the statistical properties of natural scenes. Annual Review of Psychology, 59: 167-92.

6. Scene Perception and Representation I

--Green MR & Olivia A. (2008). The briefest of glances. Psychological Science, 20: 464-72.

--Park S, Brady TF, Greene MR, & Oliva A. (2011). Disentangling scene content from spatial boundary: Complementary roles for the parahippocampal place area and lateral occipital complex in representing real-world scenes. The Journal of Neuroscience, 31: 1333-40.

--**Supplement:** Green MR & Olivia A. (2009). Recognition of natural scenes from global properties: Seeing the forest without representing the trees. Cognitive Psychology,

58: 137-76.
--Supplement: Oliva, A & Torralba, A (2007). The role of context in object recognition. Trends in Cognitive Sciences, 11, 520-27.

7. Scene Perception and Representation II
--Epstein RA & Higgins JS. (2007). Differential parahippocampal and retrosplenial involvement in three types of visual scene recognition. Cerebral Cortex, 17: 1680-93.
--Park, S & Chun, MM. (2009). Different roles of the parahippocampal place area (PPA) and retrosplenial cortex (RSC) in panoramic scene perception. Neuroimage, 47: 1747-56.
--**Supplement**: Epstein RA. (2008). Parahippocampal and retrosplenial contributions to human spatial navigation. Trends in Cognitive Sciences, 12: 388-96.

8. No Class!! (Neuroscience Conference)

9. Scene Perception and Representation III
--Henderson, JM, Zhu, DC, & Larson, C. (2011). Functions of parahippocampal place area and retrosplenial cortex in real-world scene analysis: An fMRI study. Visual Cognition, 19: 910-27.
--Kravitz DJ, Peng CS, Baker CI. (2011). Real-world scene representations in high-level visual cortex: it's spaces more than places. Journal of Neuroscience, 31: 7322-33.

10. Scene Perception and Representation IV
--Mullally, SL & Maguire, EA. (2011). A new role for the parahippocampal cortex in representing space. Journal of Neuroscience, 31: 7441-49.
--Wolbers, T, Klatzky, RL, Loomis, JM, Wutte, M.G., & Giudice, NA (2011). Modality-independent coding of spatial layout in the human brain. Current Biology, 21: 984–989.