Midterm II will cover the material we’ve covered since the first midterm. This includes the lectures from 1/29 to 2/19, textbook Chapters [5,7-10], and the two supplementary readings on color and language (Kay2006, Davidoff1999). The exam will be a mixture of multiple choice, fill-in-the-blank, and short answer questions. You will not be able to use any external sources of information during the exam (e.g., books or notes). You will need to bring the same scantron form as before (Form Number: X-101864-PAR-L). A practice midterm will be posted to give you a sense of some of the questions. A good way to study for the exam is to answer the Lecture Guide questions, the Test Yourself questions in the course textbook (e.g., pg 90), and to do the practice midterm. Some of the short answer questions will be taken directly from or be very similar to the Test Yourself and Lecture Guide questions.

The lists of important concepts, phenomena, and methods below should guide your studying:

**Common Themes Across Four Visual Domains**

1. For each of the four visual domains covered (i.e., object recognition, color perception, size & depth perception, and motion perception), you should be able to explain why they are hard problems.

2. You should also be able to explain some of the mechanisms the visual system uses to solve these hard problems.

3. You should be able to give examples of how different visual domains help one another (e.g., how motion perception helps size & depth perception).

4. You should know some of the specialized parts of the brain involved in processing each visual domain (e.g., cortical area MT for motion).

**Methods**

For each method you should know what kind of questions they’re good for answering and how to apply them to new problems. Memorizing one example application of each method should help with this.

1. Event-Related Potentials (ERPs)
2. Functional magnetic resonance imaging (fMRI)
3. Positron emission tomography (PET)
4. Microstimulation
5. Lesioning
6. Visual Masking
Details Specific to a Topic
You should be able to explain, to give examples of, and/or to apply the following:

**VISUAL OBJECT RECOGNITION**
The difference between the Structuralist and the Gestaltist theories of perception
The 9 Gestalt “laws” of perceptual grouping
The properties of figure vs. ground
Factors that influence what parts of an image are perceived as figure
Helmholtz’s likelihood principle and Bayesian inference (note, all you need to know about Bayesian inference is that it is a way of precisely implementing the likelihood principle and that it requires the brain to know the probability that a certain state of the world would generate a particular stimulus)
The light-from-above heuristic
The oblique effect
Non-classical receptive fields and the role (or lack thereof) of feedback between and lateral connections within a cortical area
Structural-description models of object recognition (and evidence for or against them)
Image-description models of object recognition (and evidence for or against them)
Persistence of vision

**PERCEIVING COLOR**
What it means to be able to perceive “color”
Hue, saturation, & lightness
Chromatic vs. achromatic color
Continuous vs. categorical perception
Selective reflectance
Selective transmission
Trichromatic theory of color vision (and evidence supporting it)
Opponent-process theory of color vision (and evidence supporting it)
Dual-process theory of color vision
Cortical visual areas involved in processing color
What people see when they are missing particular visual pigments (note, you do not have to memorize the names of different types of color deficiencies)
Color constancy
Mechanisms for achieving color constancy
Lightness constancy
Mechanisms for achieving lightness constancy
Whorf’s Linguistic Relativity Hypothesis
How color language can affect color processing in non-linguistic tasks
Evidence from the World Color Survey that indicates that there are universal tendencies in the way languages construct color categories
PERCEIVING DEPTH & SIZE
Oculomotor depth cues (convergence & accommodation)
Monocular depth cues (8 pictorial, 3 movement-produced)
Binocular depth cues (binocular disparity)
The ranges at which some depth cues are useful (Table 8.1)
Corresponding points on one’s retinas
The horopter
Angle of disparity
Random-dot stereograms
Disparity selective cells & evidence that they are involved in depth perception
Top-down effects on depth perception (pgs 189-190)
Visual angle
Size distance scaling (Emmert’s Law)
Size constancy
Holway & Boring’s experiment on size perception in the absence of depth cues
How relative size can function as a size cue
Misapplied-size constancy scaling explanation of size illusions
Conflicting cues theory explanation of size illusions
How occlusion effects size perception

PERCEIVING MOTION
Real motion vs. apparent motion
The temporal correspondence problem
Structure from motion (e.g., biological motion)
Optic flow (what it is and what it provides information about)
Corollary discharge model (and evidence supporting it)
Real movement neurons (what they are and where they’re found)
The shortest path heuristic
The occlusion heuristic
The aperture problem
The lack of “apparent motion momentum”
Cortical area MT and evidence that it is involved in motion perception
Evidence that MT neurons solve the aperture problem
Cortical area MST and evidence that it is involved in optic flow perception
Movement aftereffects
How motion perception is a vector sum of a distributed neural code
Evidence that neural processing of real motion, apparent, and implied motion overlaps to some extent

PERCEPTION & ACTION
How action can facilitate perception
The importance of the ecological validity of laboratory experiments
Examples of the reciprocal relationship between action and perception
Affordances
The information provided by optic flow
How the brain responds differently to objects depending on how useful they are for navigation
The role of the parietal lobe in action (navigation, reaching, and grasping)
Mirror neurons and their possible role in imitation and understanding the actions of others