

PSYCHOLOGY 438/538

The text is Sensation and Perception by Goldstein. A midterm and a final examination will be given. The assigned readings are: Week of Jan. 6: Chapters 1 and 2; Jan. 13: Chapter 3; Jan. 20: Chapter 4; Feb. 3: Chapter 5; Feb. 10: Chapter 6; Feb. 17: Chapter 7; Feb. 24: Chapter 8; March 2: Chapters 9 and 10. Office hours are 11:30-12:20 M, W, F and by appointment. Office: 331 Straub.

Lecture Outline

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Study Questions for Midterm

Lecture

1. Sketch the eye indicating the main structures. What are the functions of the cornea, the pupil, and the lens? What and where is the fovea? Why is there a blind spot?
2. Define and explain (a) nearsightedness, (b) farsightedness, (c) presbyopia.
3. What is meant by a receptive field? Describe the difference between receptive fields of ganglion cells and simple cells.
4. Explain why a ganglion cell is not stimulated by an area of uniform intensity but is stimulated by an intensity difference at a contour.
5. Compare the photopic (cone) and scotopic (rod) visual systems with respect to acuity, absolute threshold, light and dark adaptation, wavelength sensitivity, retinal location and color vision.
6. Define x-cells, y-cells, simple cells and complex cells.
7. State the three laws of additive color mixture. Explain how the hues on the color circle can be matched by mixing red, green and blue lights.
8. Sketch the color circle indicating how it may be used to predict the hue seen when hues are mixed.
9. What was the Young-Helmholtz theory of color vision? What facts of color vision posed problems?
10. How is hue encoded by the cones and by the ganglion cells? Cite experimental studies to support the trichromatic (cone) and opponent (ganglion cell) mechanisms.
11. How does the light reflected by a surface to the eyes depend on the spectral energy distribution of the light source and the spectral reflectance curve of a surface? Sketch the spectral energy distribution of tungsten light and of sunlight.
12. Why is color mixture involved in the perception of the hues of common objects?
13. Explain why a dim star viewed by the fovea is not visible, but when viewed 10 degrees from the fovea becomes visible.
14. Describe the mechanism of accommodation.
15. How does brightness vary with the light intensity, dark adaptation, place on the retina, and wavelength.
16. How do the convergence and spatial summation of rods and cones differ? How do these differences affect the sensitivity and acuity of the rod and cone systems?
17. Sketch the rod and cone spectral sensitivity curves. Explain what these curves show.
18. Sketch and explain the dark adaptation curve for a small spot of red light, a small spot of white light in the fovea, a large spot of white light in the near periphery (10 degrees from the fovea).
19. How does changing the illumination from sunlight to tungsten affect the perception of hue in a photograph taken with daylight

film? How does it affect our perception of hue? What is color constancy? Indicate how chromatic adaptation and memory color contribute to color constancy.

20. How does changing stimulus intensity affect the rate of nerve firing? What is the refractory period? What is spontaneous activity?
21. Explain why red and blue papers which appear equally bright in daylight appear unequal in brightness in dim light.
22. Explain why a mixture of yellow and blue paint produces green, while superimposing yellow and blue lights produces white.
23. Why is there a dark spot at the center of intersection of vertical and horizontal white bars in an arrangement of black squares with vertical and horizontal white bars between the squares?

Reading

Pp. 60-61 1, 2, 5-7, 10-12, 14-18, 20
Pp. 104-105 1, 5-8, 10-21, 23, 24, 26-30, 32-37, 39
Pp. 141-142 7-21, 23, 25, 26, 28, 30-32

Study Questions for Final

Lecture

1. What are Mach Bands? How does lateral inhibition (i.e. the center/surround antagonism of ganglion cells) produce Mach Bands?
2. What is simultaneous contrast? How is simultaneous contrast affected by light intensity, spatial separation, and figure-ground?
3. When staring at the center of a fuzzy-contoured disk, why does the disk disappear and take on the color of the gray background? Why does this not occur for a sharp contoured disk?
4. What is the psychophysical and physiological evidence for spatial-frequency channels? How do spatial-frequency channels explain the contrast-sensitivity function?
5. Why is the contrast-sensitivity function important for understanding visual acuity?
6. What is meant by lightness constancy? What mechanisms yield lightness constancy with overall changes in illumination and with local changes in illumination?
7. Why is lightness constancy for shadows and highlights in a photograph poor compared to their occurrence in a real scene?
8. What produces lightness constancy in the perception of transparency? Why is it good?
9. Describe the Mach card demonstration and explain its significance.
10. What conditions produce illusory contours? What determines the locus of illusory contours?
11. Describe how figure-ground, grouping, and schemata affect the perception of shape.
12. How does Hoffman explain the reversal of figure and ground in the face-vase figure?
13. What are the principles of "simplicity" and "unconscious inference"? How would these principles explain the effects of convexity and symmetry on figure-ground?
14. Define the laws of proximity, similarity, good continuation, and common fate. Give examples.
15. Describe Pritchard's experiment using stabilized imagery. What is the significance of the results?
16. Draw and explain the block diagram presented in lecture to characterize the process of seeing. What is the evidence for separate organizational and representational processes?
17. How does the rat-man demonstration (pp. 17, 19, and 21) show the influence of representational processes on pattern recognition?
18. Explain why there is a failure of orientation constancy when a square is rotated 45 degrees but not when a T is rotated 45 degrees. Why does surrounding the square with a rectangle yield orientation constancy?
19. To what does bottom-up and top-down processing refer? Give examples of each.
20. What are some of the ways in which the perception of a shape and of a texture differ?
21. Know the definition and limitations of each of the monocular and binocular cues for distance and depth.
22. In looking a picture what cues inform us that we are looking at a flat 2D surface? How can these cues be eliminated? What happens to our perception?
23. Define corresponding and non-corresponding retinal receptors. What is the horopter? What is Panum's area? When are double-images seen?

24. Define crossed and uncrossed disparity and explain how binocular disparity provides information for depth. How does depth depend on perceived distance?
25. What is the significance of the Julesz random dot stereogram? Is there physiological evidence for disparity detectors?
26. Describe the Gibson and Walk experiment on the perceptual effect of a sudden change in texture density.
27. Distinguish between physical size, angular size, and perceived size. What is the size-distance invariance hypothesis?
28. What is Emmert's law? How is it related to size-distance scaling?
29. What is the moon illusion? Describe the apparent distance theory of the moon illusion.
30. What is the significance of the Ames room demonstration?
31. Describe the findings and significance of the Holway and Boring experiment on the perception of size.
32. What is meant by position constancy? Distinguish between saccadic and pursuit eye movements and discuss the occurrence of position constancy with each.
33. What is the corollary discharge theory? What psychophysical and physiological evidence supports it?
34. Describe two ways to produce a mismatch between the corollary discharge and a motion signal. What is perceived?
35. What are the two systems for apparent movement? Describe and explain the order in which information is processed by the low and high level systems for apparent movement.
36. Distinguish between group movement and element movement in the Ternus display. Describe the results of Pantle and Picciano.
37. Describe how a motion detector might work.
38. What is the motion after effect? How can it be explained by the adaptation of motion detectors?
39. Give an example of organizational processes in the perception of movement. How can they be explained by a "simplicity" principle?
40. Explain the statement that in perceiving motion we see whatever motion is common to all moving parts and then see the remaining motions as relative movements of the parts.

Reading

Pp. 186-187	1-18, 21-30, Boxes 2
Pp. 224-225	6-9, 15-21, Boxes 1,2
Pp. 270-271	3, 8-17, 20-24, Boxes 1-3
Pp. 314-315	3-11, 14-23, 31-32, Boxes 1,2
Pp. 352-353	5-9, 10, 13, 20, 23-25, 30-33, Boxes 1,2
P. 379	2-10, 29, 34