Chapter 6

**COLOR PERCEPTION**

1. The textbook describes color as a “perceptual attribute” influenced by the wavelength of light (which is not a color). So what is color exactly? Are objects colored? Is light colored? Is anything in neural activity colored? What do you think the experience of color is all about and what gives rise to it?

*Hints and discussion: The question raises the philosophical issue of qualia (properties of perceptual experience). Color is one of the more compelling examples of qualia. Discussion can be pushed in the direction categorical perception: why is color perceived categorically across the continuous visible spectrum? Why does a change in a few nanometers in one range may cause a slight change in the shade of red, but an equal change in wavelength at another part of the spectrum causes a shift from red to orange?*

1. It is difficult, if not impossible, to explain in words the experience of color. Thus, it seems to be impossible to describe to a person born blind what “red” looks like and how it is different from “green” or “blue”. This difficulty is called the “explanatory gap” and philosophers disagree over whether it is due to the inherent ineffableness of color, or whether it is just a short-coming of language that may be solved in time as language changes and evolves. How would you try to explain color to a person that has never experienced it? What is your opinion on the explanatory gap?

*Hints and discussion: while highly philosophical, this question can encourage students to think deeply about qualia and may work as a follow up to the previous discussion question.*

1. In Chapter 3, the Purkinje shift was discussed in relation to the transition from photopic (cone) vision to scotopic (rod) vision during dark adaptation. This phenomenon is associated with, in dim illumination, objects reflecting long wavelength light to appear darker than objects reflecting short wavelength light. Using the information presented in Figure 6.12, can you explain why this is so?

*Hints and discussion: This question will encourage students to comprehend the graph and to apply their understanding of it to a perceptual phenomenon. The rods have a peak spectral sensitivity of 498 nm, which falls in the blue/green end of the spectrum. In scotopic vision, the rods are thus more sensitive to objects reflecting light in this part of the spectrum.*

1. The most recent evolutionary change to color vision was the L-cone system, completing the trichromatic system by adding the ability to discriminate the longer wavelengths from the short and middle wavelengths. Further, trichromacy occurs almost exclusively in primates. What do you think might be the evolutionary advantage of this adaptation?

*Hints and discussion: Being able to distinguish long wavelength light from short and middle wavelengths enables the perception of red as distinct from blue and green. Thus, it enables the ability to identify ripe fruit (which is characteristically red, orange, or yellow) from foliage (which is characteristically green). Another hypothesis is that the system enables the ability to detect skin flushing which is associated with arousal, and thus may play a role in social behavior and/or mating (noting this is only relevant to primates, whose faces are often hairless). Discussion can proceed from here to speculate about what associations people have with the color red and why these associations might exist.*