Questions based on Schneider chapters and lectures:

1. The last major retinal projection to be discovered was the retinohypothalamic projection. It was probably the first to evolve. Why is this connection so important?

2. The pineal gland received direct visual input early in vertebrate evolution. Describe the much less direct connection to this gland from the retina in present-day mammals.

3. What was very likely the first important function of visual image detection? It is likely that this function resulted in a change from bilateral visual inputs to a dominance of inputs from the contralateral side. What descending connection to the motor system made this change adaptive?

4. The pretectal nuclei are involved in some protective responses to visual inputs, but orienting responses required greater acuity. What midbrain structure controls such responses? What kinds of plasticity occur in this structure?

5. Name the five main optic-tract termination areas in the order they are reached by the optic tract. What additional areas receive sparse retinal projections?

6. Describe at least two pathways for information from the retina to reach the endbrain. Which do you think is the fastest way?

7. What is the nature of the lamination in the dorsal nucleus of the lateral geniculate body, and how does it vary from species to species?

8. What are the five neuromeric divisions of the embryonic CNS traversed by the optic tract, in order?

9. What animals have a very large optic tectum? Name three animals or groups of animals.

10. Why is the term “optic tectum” misleading about this structure?

11. In reptiles and birds, one pathway to the endbrain is strikingly different from any pathway in mammals. Describe the pathway in reptiles and birds.

12. What are the optic radiations? How does temporalization of the hemispheres distort these fibers?

13. What visual areas are believed to be the most primitive? Why are there so many visual areas in animals with large brains?

14. Explain what is meant by proportional connectivity, absolute connectivity, and small world architecture.

15. What are the two major transcortical pathways of the mammalian visual system, and what are their major functions?

Questions on readings: Allman

1. "The advantages and costs of front-facing eyes": Give examples of both advantages and costs. How did a cost of front-facing eyes increase the adaptive advantages of social groups?

2. What data on the midbrain indicate that the large bats known as megachiropterans are not "flying primates"?

3. How do areas 17 (striate cortex) and MT stand out from other neocortical areas in stained sections of the brains of primates?

4. What is meant by "classical" and "non-classical" receptive fields of MT neurons? What does the existence of very large non-classical receptive fields imply about connectivity of the neurons?

5. What specialized neocortical areas concerned with vision, beyond the striate area, have been found in humans by functional magnetic resonance imaging? Give two examples.

6. Allman has found neurons unique to the brains of humans and great apes. Where are these neurons?

Questions on readings: Striedter ch 5, and lectures

7. Describe an example of "mosaic evolution" in the dorsal midbrain of mammals.

8. Describe two examples of mosaic evolution in the hindbrain of fishes.

9. What is Harry Jerison's principle of proper mass? When (in what circumstance) does this principle work best?

10. What is the functional correlate of relative size of the hippocampus in birds?

Questions on readings: Striedter ch 6, and lectures

11. Give two examples of lamination in the brain's visual system or other systems. Why does Striedter use examples of lamination in his discussion of "phylogenetic conversion"? What is "perhaps the most spectacularly laminated brain region in vertebrates" found in certain fish?

12. What is meant by "proliferation by phylogenetic segregation" in the dorsal thalamus?

13. Describe how the primate visual cortex has provided a striking example of phylogenetic proliferation by addition.

14. Describe the relationship of neocortical size to number of visual neocortical areas in mammals.

9.14 Brain Structure and Its Origins

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