

9.14

Classes #35-37: Neocortex

Questions on Schneider chapters 32:

1. What sensory modality and what projections of this modality underlie the two major types of learning which were so important in evolution of the forebrain? Contrast the two types of learning.
2. What part of the primitive pallium of pre-mammalian reptiles did neocortex evolve? What part of the mammalian cortex does this pallial region in modern reptiles most closely resemble?
3. What structure in the bird endbrain evolved in a way that resembles the way that neocortex evolved in mammals?
4. Describe three different types of axon projections in the neocortex that begin and end within the cortex.
5. The neurologist/neuroanatomist Marek Marsel Mesulam has pictured the paralimbic cortical areas as divided into two main regions related to the two major types of learning referred to in question 1. What did he call these two regions?
6. Discussion question: How does the hippocampal system facilitate the ability to anticipate the stimuli that an animal or person is about to encounter? What neocortical areas are primarily involved?
7. Contrast the anticipatory activity of the neocortical areas rostral to the primary motor cortex with the anticipatory activity of the multimodal association areas of the parietal and temporal lobes.
8. What was probably the earliest parcellation of the pallium in chordates?
9. Discuss factors that must have influenced thalamic parcellation during brain evolution.
10. Discuss the common belief that the multimodal association areas of the neocortex, including the posterior parietal areas and prefrontal areas, are recent products of brain evolution.
11. How does human ability to cook food promote larger brain size?

Questions on Schneider chapters 33, 34

[To be added]:

Questions on Allman ch 7:

1. What animals are closest to humans in the brain-body weight relationship? (See p 161 and following pages.)

2. In this relationship, how do humans compare with fruit-eating primates and with leaf-eating primates?
3. How does human ability to cook food promote larger brain size? (See the discussion of energy requirements of various organs, p 166f.)
4. How does parenting relate to the constraint that probably sets an upper limit in the evolution of brain size (p 175)?
5. Sexual dimorphism in brains corresponds to differences in behavior between the sexes. How does this relate to longevity? (Why do females live longer in many, but not all, species? See p 177ff.)
6. How does Allman relate the male vs female longevity findings on humans to the serotonin system? How might this relate to hippocampal size (from the findings of Robert Sapolsky)? (See pp 184-188.)
7. What is meant by calling humans a pedomorphic ape? (See figure p 197 and discussion in the text.)
8. What changes in Wernicke's area of the human brain appear to result from greater education, according to Golgi studies by Arnold Scheibel and collaborators (p 202)?
9. What are the "two great buffers against misfortune" in human evolution, in addition to more recent cultural institutions? See p. 203. (These two things come together in the "social brain" hypothesis.)

Questions on Supplementary reading: Striedter ch 9 (Some of this may be covered in class.)

10. What are several differences between prosimian and simian skulls, and the correlates of these differences? (See figure 9.2)
11. Primate-typical brain features (mostly specializations of neocortex) involve what three regions? What, briefly, are their functions? (See section beginning on p 305.)
12. What are functions of the ventral premotor area, unique to primates? (See p 307.)
13. In what two regions are there neocortical areas that may be unique to humans?
14. What behavioral innovation in humans appears to be correlated with the halt in brain size expansion about 100,000 years ago?
15. Briefly summarize a few downsides to the great expansion of brain size in humans. (Give examples.)

Questions on Nauta & Feirtag ch 13, ch 16.

Questions on Brodal ch 21:

[included with Nauta Qs, and in Qs on Association Cortex]

Questions on Purves & Lichtman ch 4:

[list on Development: not written]

Questions on Rakic (1995):

[list on Development: not written]

MIT OpenCourseWare
<http://ocw.mit.edu>

9.14 Brain Structure and Its Origins

Spring 2014

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.