Philosophy of Neuroscience
Philosophy 151
Winter, 2012

Directions and Questions for First Exam

Bring ***two*** bluebooks available in the university bookstore with ***nothing*** written in or on them (not even your name). These may be redistributed at the time of the exam.

The exam will consist of the two parts, for which the instructions are as follows:

Part A. Answer each of the following six questions in two to three sentences each (do not go on at length—you will *not* receive extra credit for going beyond a basic answer). Each question is worth up to 5 points (30 points total).

The actual questions will be drawn from those listed below:

1. What were the main claims of Gall's phrenology?
2. What is meant by holism?
3. What is it to localize a mental function?
4. How did researchers use war injuries to identify a retinotopic map in striate cortex?
5. What sorts of stimuli did Hubel and Wiesel use to elicit responses from simple cells in V1?
6. What was Lashley's principle of mass action?
7. How did Mishkin, Ungerleider and Macko characterize the two visual pathways?
8. What are double-dissociations and what are they supposed to show?
9. What role do mathematical models play in studying visual processing?
10. What is the task of computational theory in Marr's three levels of analysis?
11. What is meant by top-down processes in perception?
12. What is meant by "naturalized philosophy"?
13. What is the deductive-nomological model of scientific explanation?
14. What is meant by decomposing a mechanism?
15. In what ways can researchers recompose the mechanisms they study?
16. What is meant in saying that a mental state is multiply realizable?
17. What is claimed by those characterizing perception as theory-laden?
18. What are the main claims of the neuron doctrine?
19. What was the principal point of disagreement between Golgi and Cajal?
20. What criteria did Brodmann use to demarcate areas of the brain?
21. What is meant by a stimulation study?
22. How do ERP studies differ from simply recording EEG?
23. How is subtraction used in neuroimaging studies?

Parts B. Address the following two questions each in an essay (35 points each).

On the actual exam, I will pick two of the following questions. Write as clear and detailed essay as you can in the time allotted.

1. In studies linking MT to motion perception, three different research techniques were employed—analysis of deficits after lesions, recording from MT neurons, and stimulation of MT cells. Describe how each of these techniques works and what each, on its own, shows about the

operation performed by MT. Taken individually, what are the limitations of each? How do they complement each other? How might skeptics still raise doubts about what MT itself does? Can these skeptical objections ever be fully to rest?

2. Mishkin, Ungerleider, and Macko on the one hand and Milner and Goodale advance different interpretations of the differentiation of visual processing into two streams. What is the basic difference between their accounts? How could competent investigators differ in such ways? What roles do such differences play in the development of scientific inquiry? How might they be resolved in the future?

3. Controversies between holists and localizationists have arisen several times in the history of neuroscience. Make clear what are the differences between holists and localizationists. Focus on two episodes we have discussed and for each identify what sorts of evidence the advocates for each side in the debate offered for their position. How did the controversy get resolved in each case? Are controversies between holists and localizationists likely to be an ongoing feature of neuroscience, or can one of the positions be permanently refuted?

4. Describe how the projects of decomposition and recomposition figure in the development of mechanistic explanations, drawing examples for the history of neuroscience research on vision. Identify and discuss at least two examples of research contributing to the decomposition of visual processing, making clear what information each provided about the mechanisms of vision. Discuss at least one example of attempts to recompose the visual system, being clear about how the recomposition was done and what understanding it provided about how vision works.

5. Defenders of neuroimaging studies contend they provide reliable information about the brain processes involved in performing cognitive tasks. Critics, on the other hand, sometimes claim that the results are artifacts of the techniques used. What does it mean to claim that the claims of neuroimaging studies are artifacts? What are the reasons one might suspect that such studies are artifacts? What arguments can be advanced to defend neuroimaging against these challenges?

6. Discuss one of the cases we have encountered (other than Mishkin vs. Milner) in which competing researchers reached incompatible accounts of the phenomenon they were investigating. Describe the common phenomenon they were investigating and how each went about examining it. Make clear what reasons each researcher offered for his/her view. How is it that highly competent researchers can reach divergent views? How did the disagreement get resolved?

7. The computer metaphor for the brain has been highly influential in the development of neuroscience. Explain in what ways those adopting the metaphor treat the brain as like computers and give examples of how the metaphor has been invoked by neuroscientists. Make it clear why some researchers find the metaphor compelling and how it figures in their approach to understanding the brain. What reasons would others have for rejecting the metaphor?

8. Visual illusions are often employed in the study of visual processing in the brain. What are visual illusions and why are they thought to be useful for studying vision? Give a couple examples of illusions and describe what they are supposed to reveal about visual processing. What do they reveal that would be harder to demonstrate with non-illusory stimuli? How might somewhat criticize studies based on illusions as misleading?