

Directions and Questions for Final 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 distinguished the conditions in which Berger recorded alpha waves and beta waves?
2. What do PET and fMRI studies directly measure and how it is thought to be related to brain activity?
3. How is subtraction used in typical neuroimaging studies to relate cognitive activity to brain activity?
4. What is the fundamental feature that makes pictures, maps, words, and possibly brain states (depending on one's view of brain states) representations?
5. What is the main difference between how van Gelder and Bechtel understand the Watt governor?
6. What is it, according to Grush, to use a representation off-line?
7. What is the main difference between closed-loop and pseudo-closed-loop control?
8. What does Akins present as the traditional view of the senses?
9. Why does Akins deny that thermoreceptors represent temperature?
10. What point about representations does Chemero make by introducing the finger wagging task?
11. What is the strategy Chemero advocates for developing a dynamical explanation of a behavior?
12. What is meant by "point attractor" in dynamical systems accounts?
13. What does Burnston mean by "computational absolutism" in discussing what brain areas do?
14. What relation does the theory-reduction model assume to hold between a reducing theory and the theory it reduces?
15. When, on the theory-reduction account advocated by the Churchlands, should a theory be eliminated?
16. Identify three of the goals claimed to be served by reducing psychological theories to neuroscientific ones.
17. What is the research strategy associated with ruthless reduction?
18. To what level should a reduction aim to reduce psychological phenomena on Bickle's account of ruthless reduction?
19. What is a fundamental difference between ruthless reduction and mechanistic reduction?
20. What is meant by a connectome?
21. How does a small-world network differ from a regular lattice?
22. What is meant by characterizing the brain as endogenously active?
23. What is meant by the Default Mode Network?

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 an essay as you can in the time allotted.

1. PET and fMRI images are sometimes treated as comparable to photographs of brain activity and thus as providing credible evidence about the brain mechanisms involved in cognition. How is the comparison to photographs supposed to support the credibility of neuroimages? What are the arguments Roskies makes against treating neuroimages as like photographs? Are these arguments compelling? Does the comparison to photographs enhance the credibility of neuroimages?
2. Bechtel and Grush agree that representations play a role in control systems, but they differ as to the type of control system in which one finds representations. Briefly characterize the different types of control systems that Grush distinguishes and explain in which types Bechtel and Grush respectively locate representations and the role they play in these types of control systems. Present what you take to be the strongest argument for each of their positions and adjudicate the disagreement between them.
3. Construct a debate between Grush and Chemero about how representations should figure in neuroscience. What are the contexts in which Grush claims representations occur? How would he respond to Chemero's finger-wagging task? Would he think it involves representations? If not, when would he think representations are needed? How would Chemero respond to Grush? Referee the debate by indicating who has the better case and why.
4. Compare the account of the function of brain area MT developed by Zeki and van Essen (which we discussed earlier in the course) with that advanced by Burnston. What type of evidence does Burnston point to that suggests the need to revise the standard account of what MT does? How does the position he characterizes as Computational Absolutism respond to this evidence? What is the alternative response that Burnston proposes? What are the main arguments for each position? Which position is the most reasonable for neuroscience to pursue?
5. Given a theory-reduction framework, what would be involved in the reduction of psychology to neuroscience? How might co-evolution figure in such a reduction? What are the primary objectives that would be served by such a reduction? Also present what you take to be the strongest argument against pursuing such a reduction. Defend a position as to whether such reductions should be pursued.
6. Explain what Bickle has in mind by ruthless reduction and what you take to be his strongest argument for ruthless reduction. Consider one of the alternative accounts of reduction and both explain how it differs from ruthless reduction and identify what you take to be the strongest argument for favoring it over ruthless reduction. Defend a position about which version of reduction should guide attempts to relate neuroscience to cognition.
7. How useful is it to develop a connectome for various species (worms, fruit flies, mice, humans)? What benefits would a connectome offer researchers trying to study how the species generates behavior? What are the limitations of connectomic analysis? What else is required to develop a useful explanation of behavior?
8. How do the reactive and endogenously-active paradigms for characterizing brain behavior differ? Describe examples of research discussed in this class that treat the brain as a reactive system and how that has led to understanding important aspects of brain function. Why is it harder to investigate and understand the significance of endogenous activity? How are studies of the resting state attempting to understand endogenous activity? Can these studies proceed independently of the reactive paradigm or do they depend in important respects on studies done in the reactive paradigm?