

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 are the central components of a mechanistic explanation?
2. What sorts of phenomena did Descartes argue could not be explained mechanistically?
3. Why are some cells in the hippocampus referred to as “place cells”?
4. What activity has been observed in place cells when rodents are in the start area but temporarily held back from running a maze they have run previously?
5. What is it to simulate a mechanism mentally?
6. How can computational models be used to recompose a mechanism?
7. What is meant by an “attractor” in a dynamical system?
8. What are the two characteristics of a small world?
9. Why is the loss of a node in a network with especially high degree typically serious?
10. What is the question to be answered at Marr’s computational level?
11. On Bickle’s account of ruthless reduction, what role does animal behavior play in developing a reductive explanation?
12. How far down should researchers try to go in explaining psychological phenomena on Bickle’s account of ruthless reduction?
13. What is a fundamental difference between ruthless reduction and mechanistic reduction?
14. What, beyond being a response to a stimulus, is required on traditional accounts of representation to make a brain process a representation of the stimulus?
15. What does Egan mean in calling a characterization of a computational process in terms of representational content a gloss?
16. What point is Akins making when she calls our sensory systems narcissistic?
17. Why does Akins think narcissistic sensory systems are evolutionarily sensible?
18. How does Chemero understand the relation between organisms and their environments that makes it unnecessary to invoke representations?
19. What is an artificial neural network?
20. How do researchers train artificial neural networks?
21. What sort of evidence is used to argue that perception is influenced “top-down”?
22. What does the predictive coding hypothesis claim?
23. How does heterarchy differ from hierarchy?
24. What is meant by a kludge?

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. Mechanists often speak of recomposing a mechanism. Explain what mechanistic explanation involves and how recombination figures in it (use an example discussed in this course) and why it is important to the project of developing a mechanistic explanation. What are some ways researchers go about recomposing mechanisms? Are there new insights that might be gleaned from reconstructing a mechanism?
2. 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.
3. Some researchers have thought it would be informative to study the brains of especially successful (or otherwise exceptional or distinctive) people after they have died. Imagine that a research team develops a complete structural connectome at the level of individual neurons, their dendrites and axons, of such a human being. What might researchers learn, either about the individual or about people in general, from the resulting connectome? Be sure to discuss some of the ways researchers have analyzed networks to explain how complex systems behave as well as limitations as to what can be learned from a structural network.
4. A mechanist (you can use me as an example) and a dynamicist (e.g., Chemero) meet at a bar and get into a *friendly* discussion. Each tries to engage the other to see how the other could help with their own endeavor. Construct a dialogue between them. Where would each argue that the other would fall short without their contribution? What would each offer as distinctive contributions of their approach? Is there a way they could combine their perspectives in developing explanations of cognitive activities? Are there issues on which they might just have to agree to disagree?
5. Is the characterization of cells in the hippocampus as place cells merely a gloss? Explain what Egan means by a gloss and why she views such attributions of content to representations to be a gloss. Also explain why, on her account, providing such a gloss is important for the scientists. What sort of evidence might researchers advance to show that the organism is actually using these cells to represent places? Would such evidence provide a compelling rebuttal to Egan?
6. Lupyán and Clark argue that our perception and language use rely on predictive coding. Explain what this involves. ChatGPT has learned what it knows from making predictions about texts and learning from its errors. On the surface it seems like it is employing predictive coding. And it has learned a lot. It has proven itself very capable of conversing in English. But it is also quite capable of making things up. A lawyer recently relied on it to write a brief only to discover it made up the cases on which the brief was based. Does ChatGPT represent a good test of the predictive coding hypothesis? Why or why not?
7. Cats can live in the protected environment of a laboratory after their complete cortex has been removed. How, in light of what we have covered in this course about subcortical areas of the brain, is this possible? Normal cats do have a cortex and apparently use it (think of Hubel and Wiesel's studies). What might it provide that decorticated cats are lacking? Assume for a moment that we too could continue to live with our complete cortex removed. What would we be able to do and what normal human activities would be activities that would be beyond us?