

Directions and Questions for the 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 three 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 is Mendel's law of independent assortment?
2. What was known about chromosomes before they were linked with Mendel's factors (genes)?
3. What role did the Mendelians, who opposed natural selection as explaining the origin of species, allow that natural selection might play?
4. How was crossover used by the Morgan school to map the location of genes on chromosomes?
5. What does the Hardy-Weinberg equilibrium describe?
6. How did R.A. Fisher go about relating Mendelian factors to the continuous variation in traits emphasized by the Biometricians?
7. What is meant by epistasis and why did it pose a challenge for Fisher's approach?
8. In what respects is Fisher's treatment of population genetics similar to theories of the behavior of gases?
9. What were the primary differences in focus between Sewall Wright and Fisher?
10. What is meant by "genetic drift"?
11. Why do Hull and Ghiselin think treating species as natural kinds presents a problem for evolutionary theory?
12. What is meant by the expression *species as individuals*?
13. What entities at a level of organization higher than individual genes have been considered as units of evolution? (Identify at least two)
14. What is the major characteristic of genes that leads Dawkins to view them as *the* units of selection?
15. What, in evolutionary biology, is meant by *altruism*?
16. Why are function attributions viewed as teleological?
17. Why are systems employing negative feedback sometimes viewed as teleological?
18. What does it mean to call something an adaptation in the strict sense?
19. In what respect does Aristotle's account of function seem to involve backwards causation?
20. How does the past figure in Larry Wright's account of functions?

21. What is Cummins' analytic strategy for explaining function?
22. What is meant by calling an adaptationist explanation a "just-so" story?
23. What are some (state at least two) of the factors, besides genes, that advocates of developmental systems theory identify as being inherited by organisms?
24. What is the primary difference between developmental systems theory and Evo-Devo with regard to the role of genes?
25. What is the Deductive-Nomological Model of explanation?
26. What role does decomposition play in mechanistic research?
27. How do nomological and mechanistic accounts differ in terms of the role played by logic in explanation?
28. What is it about mechanistic research that makes it reductionistic?
29. What did Schrödinger mean by "negentropy"?
30. What makes a mechanism autopoietic for Varela?

Part B. Address the following question in an essay (35 points).

On the actual exam, I will pick one of the following questions for you to write on:

1. Mendel set out to provide an explanation of hybridization. What exactly did he explain? Describe the explanation he developed and discuss the nature of the evidence he offered for it. Was he able to directly observe the entities he proposed in his account? If not, what sort of argument does he offer for them actually existing?
2. What made de Vries, Bateson, and others construe Mendel as providing an alternative to Darwin's account of the origin of species? What alternative account of the origin of species did they offer? Why, especially for a plant or animal breeder, would make such a non-Darwinian alternative seem plausible? Why would it seem to them more promising than the approach of the biometricians (be specific about what in particular about the biometrician's approach made it seem lacking in promise as an account of new species)?
3. What is meant by the evolutionary synthesis (as it appeared in the work of Fisher)? What was synthesized and why did it have to be synthesized? What role did population genetics play in producing the synthetic account of evolution? How do you suppose Darwin would have responded to the Fisher's account? Are there ways he would have seen Fisher as improving on his own account of evolution? Are there important features of Darwin's view of evolution that are not adequately incorporated into Fisher's account?
4. Fisher and Wright developed conflicting models of gene change during evolution. In large part this conflict was based on the fact that Fisher and Wright began with different assumptions about the conditions under which evolution occurs. Explain what assumptions both Wright and Fisher began with and how these assumptions influenced their respective models (and in doing so be sure to explain each of their models). Discuss how Fischer might have defended continuing with his models while acknowledging that his assumptions don't literally hold. Is he justified in doing so? Why was it difficult to settle this dispute?

Part C. Address the following question in an essay (35 points).

On the actual exam, I will pick one of the following questions for you to write on:

1. What is the main critique advocates of developmental systems theory make of gene-based accounts of heredity? What is their alternative proposal? Explain in particular what is meant by the parity thesis and how accepting it might alter the way one approaches evolutionary processes. Does focusing on developmental systems offer a valuable new perspective or is it a distraction for those trying to understand evolution?
2. What do Gould and Lewontin mean by the “adaptationist programme” and what is their critique of it. What are some of the other approaches to understanding the evolution of species that they think ought to be consider but are neglected by the adaptationist programme? How might an adaptationist respond to their criticisms? Are the criticisms really telling against adaptationism?
3. Contrast the conception of reduction advanced within nomological accounts of explanation with that offered by mechanistic accounts. One place to focus is on the role of logic in the different accounts of reduction. What does the outcome of successful reduction look like in each case? Flesh this out with a biological example drawn from material covered in this course.
4. Construct a dialogue, set in the present, between a vitalist/holist and a mechanist which brings out what you think are the best arguments for each position and the answers the other would give to those arguments. Your dialogue should be inspired by the traditional vitalist/holist objections to mechanism, but you may take liberties in bringing the position up to date as a criticism of recent mechanistic biology.