Philosophy of Biology
Philosophy 147
Fall, 2007

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 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 meant by essentialism?
2. What is meant by teleology?
3. What were examples of mechanistic explanations offered by early mechanists for non-biological phenomena?
4. What characteristic was initially (e.g., in the 17th century) taken to be definitive of cells?
5. What problem did Schwann confront in attempting to extend the idea of cells as basic units to animals?
6. What role did crystals play in Schwann's understanding of cells?
7. What was meant by *phlogiston* and what phenomena was it used to explain?
8. Why was fermentation construed as an ordinary chemical reaction prior to 1830?
9. What view were Wohler and Liebig making fun of when they satirically proposed that yeast have bladders that look like champagne bottles and proposed "these infusoria gobble sugar, and discharge ethyl alcohol from the intestine and carbon dioxide from the urinary organs."
10. How did Liebig differentiate the chemical activities of plants and animals? What motivated his view?
11. What was Pasteur's stance on the ability of science to study fermentation?
12. What led Buchner to propose the existence of zymase? What did he take it to be?
13. What features of living organisms did Bichat see as showing that mechanism was not applicable to living organisms?
14. What surprising discovery did Bernard make when he tried to find the locus of the decomposition of sugar in animals?
15. What did Bernard mean by the "determinism of phenomena"? What role did it play in his science?
16. What does Bernard mean by an "internal environment"?
17. What is Paley's watchmaker argument?
18. What was the basis for Cuvier making the claim "Give me one bone, and I can reconstruct the entire organism"?
19. What about Lamarck's conception of evolution makes it progressive?

20. Explain what was meant by transmutation of species.
21. What is Lyell's uniformitarian principle?
22. What role does artificial selection play in Darwin's account of evolution?
23. Why is variation so important to Darwin's account of evolution?
24. What does Darwin mean by the "struggle for existence"?
25. What, for Darwin, is the relation between species and varieties?
26. Why was Darwin so concerned about how old the earth might be?
27. Why would blending inheritance be a problem for Darwin's account of the origin of species?
28. What does "phylogeny recapitulates ontogeny" mean?
29. What is Galton's principle of regression to the mean?
30. What is eugenics?

Parts 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. Although biologists have identified cells as parts of organisms since the first applications of the microscope in the 17th century, the conception of what cells are and what is particularly important to the identity of cells changed fundamentally, especially during the 19th century. Describe the how the conception of what cells are changed from Hooke to Schleiden and Schwann to Virchow and explain what were the major factors that influenced how these different biologists characterized cells.

2. Compare and discuss the ways of conceptualizing living phenomena advanced by Xavier Bichat (traditionally seen as a vitalist) and Claude Bernard (traditionally seen as a mechanist). Discuss the implications of each of their frameworks for the development of biology as a science. How successful do you think Bernard was in explaining the features of living organisms on which Bichat focused? Explain.

3. In advancing his theory of the cell, Theodor Schwann considered himself to be a mechanist. What did he take to be central to being a mechanist and how did his cell theory exemplify a mechanist viewpoint? How did his account of fermentation lead others to view him as a vitalist? How would Schwann go about defending the view that this account of fermentation was still mechanistic? Was he really a mechanist or a vitalist? Defend your answer.

4. Fermentation was the focus of extensive investigation by chemists and biologists in the 19th century. Describe the different views that were taken by the major investigators during the century (e.g., Lavoisier, Schwann, Liebig, Pasteur, and Buchner) and discuss the understanding each exemplifies as to how biological phenomena should be investigated and explained. What would have been the implications if no one succeeded in producing cell-free fermentation?

Parts 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. Darwin commented on his reading of Paley that it was the only part of his college education that "was of the least use to me in the education of my mind." What feature of living things did Paley emphasize that was also central for Darwin? How did Darwin and Paley differ in the way they explained this feature? How did/would Darwin defend his explanation as better than Paley's?

2. On his voyage on the Beagle Darwin read Lyell's *Principles of Geology* from which he learned the principle of uniformitarianism. What constraints did uniformitarianism place on geology? Darwin sought to extend the principle to the attempt to explain the traits of living organisms. What does uniformitarianism require of explanations of the traits of organisms? How does his theory of natural selection satisfy the uniformitarianism principle? What sort of defense could Darwin or others provide for insisting on uniformitarianism? How would scientific inquiry be different if one rejected it?

3. Darwin starts *On the Origin of Species* with an account of artificial selection. What role does it play in the argument of the *Origin*? What are its limitations in providing support for the theory of natural selection? Does Darwin successfully address these limitations? Overall, does it provide a good experimental test bed for Darwin's account of natural selection?

4. Lamarck advanced a theory of evolution half a century before Darwin. Why did Darwin feel the need to put forward his own theory of evolution rather than simply endorsing Lamarck's theory? Describe the major differences between their theories and why Darwin preferred his theory to Lamarck's. Darwin on occasion would invoke Lamarck's conception of inheritance of acquired characteristics. What problems confronting his own preferred explanation of the origin of species led him to do so? Does this make him into a Lamarckian?