

Majors Biology: An Evolutionary Synthesis

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A majors biology course, developed by Dr. R. C. Ydenberg at Simon Fraser University, has been designed around the central unifying themes of evolutionary change and earth history. The course emphasizes understanding of concepts, rather than learning of facts, and all examinations, including laboratory examinations, are open book.

The course deals with the major topics of diversity of life, genetics, development, behavior, and ecology. To illustrate the approach taken in the course, a laboratory unit on *The Design of Organisms* is described below.

In this laboratory unit, students consider living organisms and their structure with the eye of a design engineer. Two functional systems are investigated: systems for the delivery of oxygen to animal tissues and mammalian bone design. Students carry out a design analysis of selected structures. The function of the structure is identified, the physical constraints acting on it are considered, and the tradeoffs are calculated. Actual trait values are compared to calculated optimal values. The role of natural selection in favoring optimal design is considered. Other exercises in this unit explore the mass and speed of dinosaurs, using scaling principles, and consider the role of natural selection in the evolution of complex, well-designed structures.