

Biology/Geology 350  
Invertebrate Paleontology: The History of Life on Earth  
Exam Number Two

QUESTION SIX  
THE ECOLOGY AND GEOLOGICAL RECORD OF  
PELAGIC PROTOCTISTS

BACKGROUND:

This question is similar to the last, in that it assumes, but does not require you to relate, knowledge of the structure, anatomy, and taxonomy of those protocists that are pelagic. Instead, we are after interpretations of these organisms, and the fossils they produced. Because these are pelagic (floaters) much of their interpretation requires principles of oceanography, and global patterns of continental distribution, oceanic and atmospheric circulation, and similar principles. Thus, the approach to these is different from the approach to the benthic types.

Margulis and Schwartz list 27 phyla of protists, many so widely divergent that they clearly represent fundamentally different evolutionary strategies, and likely different evolutionary origins. Many of these are of great importance in modern ecosystems, and must have been important in ancient ecosystems as well. But of the 27 phyla, only 8 have significant fossil records and that is our focus here.

Nonetheless, one of the goals of paleontologic study is reconstruction of past conditions on the earth. Fossils are especially good for this because organisms are adapted to and reflect specific environmental conditions. When confronted with a geologic deposit, however, it is not always easy to reconstruct the conditions of its formation, even if it is full of fossils. Usually what is necessary is a good collateral understanding of the oceanography and geology of modern oceans, whose principles can then be extrapolated back to the past.

QUESTION:

- (A) Given with the test slip a labeled map of ***Global Distribution of Deep Ocean Sediments and Oceanic Circulation Patterns***, do the following:
- (1) Discuss what the terms pelagic and hemipelagic mean (technical details are not necessary).
  - (2) Describe or explain any patterns you see in the distribution of the sediments on the map.
  - (3) Present an argument for the composition of the base sediment in the ocean basins, and why it is distributed the way it is relative to the other sediments.
  - (4) Discuss and illustrate the patterns of oceanic circulation, and its relationships, if any, to insolation, atmospheric circulation, and the Coriolis effect.

- (B) Draw a geologic cross section illustrating the essential features of a typical ocean basin and adjacent continent, including all important parameters. On this diagram clearly and unambiguously depict information to accompany the next part.
- (C) Compose a discourse on the present-day distribution of geologically important Protist organisms across a typical ocean basin/continental shelf, and the **processes** which influence where and how these organisms live, and when, if, and under what conditions their skeletons might end up in a deposit.
- ☺ Discuss all groups, but concentrate on those which produce significant fossil deposits.
  - ☺ Include discussion of any special environmental/geological/oceanographic circumstances responsible for geologically important or especially concentrated deposits of fossils, or mineral deposits produced by life activity.
  - ☺ Where possible include examples from the geologic record which may be explained by the principles outlined above.