Chapter 11
The Deep-Sea Floor

The deep-sea floor descends sharply down continental slopes to the dark, cold, and featureless abyssal plains, punctuated only by a scattering of tectonically active ridges, rises, and trenches.

11.1 LIVING CONDITIONS ON THE DEEP-SEA FLOOR
Most of the seafloor is covered with thick accumulations of fine sediment particles, mineralized skeletal remains of planktonic organisms, known as oozes, that accumulate very slowly (about 1 cm/1000 yr).

11.2 TRANSFER OF OXYGEN AND ENERGY TO THE DEEP SEA
The diffusion and sinking of cold dense water masses are the chief mechanisms of O$_2$ transport into the deep sea,

Dissolved O$_2$ is slowly diminished by animals and bacteria, leaving an O$_2$ minimum zone at intermediate depths.

Below this zone, dissolved O$_2$ gradually increases to just above the sea bottom.

Food for deep-sea benthic communities sinks from above at rates that are tightly coupled with primary productivity at the sunlit surface.

11.3 LIFE ON ABYSSAL PLAINS
A shift in dominant taxonomic groups occurs in deeper water
• echinoderms, polychaete worms, pycnogonids, and isopod and amphipod crustaceans become abundant
• mollusks and sea stars decline in number.

Although both density and biomass of organisms decline markedly at greater depths, species diversity on abyssal plains is comparable with or even exceeds that of soft-bottom communities in shallow inshore waters.

Most benthic animals in the deep sea are infaunal deposit feeders, extracting nourishment from the sediment in much the same manner as earthworms.

Croppers have merged the roles of predator and deposit feeder by preying heavily on populations of smaller deposit feeders and bacteria.

11.4 VENT AND SEEP COMMUNITIES
Hydrothermal Vent Communities
✓ Deep-sea hot springs, recently discovered along the axes of ridge and rise systems, support unique communities of deep-sea animals and bacteria.
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Dissolved H$_2$S emerging from seafloor cracks is used as an energy source by chemosynthetic bacteria. These bacteria become the source of nutrition for dense populations of the unique animals clustered around these springs.

Cold-Seep Communities
Densely populated animal communities dependent on chemosynthetic bacteria, include:
- cold-water brine seeps
- methane seeps
- earthquake-disturbed sediments of deep-sea fans

Objectives

1. To explore the unique environmental characteristics of the abyssal sea floor, including types and sources of sediments as well as ambient temperature, pressure, and oxygen concentration.
2. To summarize mechanisms of oxygen and energy transfer to the deep sea.
3. To review deep-sea species diversity and feeding strategies commonly employed.
4. To explore the characteristics of deep-sea hot springs and other densely populated animal communities dependent on chemosynthetic bacteria for primary production.