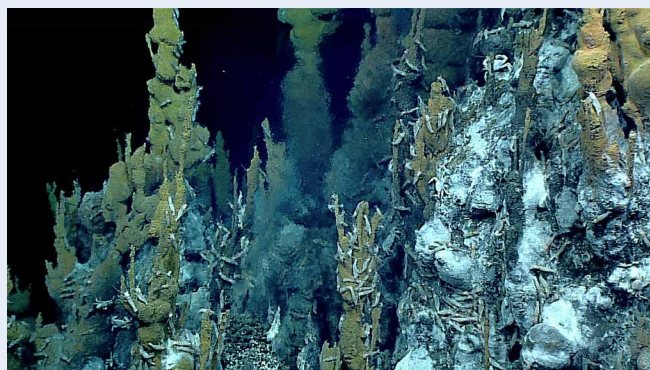


**FIGURE 1–21**



*A hydrothermal vent chimney.<sup>21</sup>*

up through a vent determines the appearance of the vent. For example, warm-water vents have water temperatures below 30 degrees Celsius and are generally clear in color. White smokers have water temperatures running from 30 degrees Celsius to 350 degrees Celsius and look white because of the presence of light-colored compounds such as barium sulfide. Black smokers emit water that is black because of the presence of dark-colored metal sulfides such as iron, nickel, copper, and zinc and have water temperatures above 350 degrees Celsius. Despite their seemingly unlivable temperatures, hydrothermal vents are host to a variety of organisms. They will be discussed in further detail in the ecosystem section of this guide.

### ***Biological Provinces***

Marine biologists categorize marine habitats according to where they are located in marine systems. Marine biologists generally group organisms based upon the organisms' lifestyles. Organisms that live on the bottom are classified as living in the benthic environment and are referred to as the **benthos**. Organisms that live in the benthic environment can either move around or live attached in one place (**sessile**). Sea stars or crabs are examples of benthic organisms that move around, while sponges or corals would be examples of benthic organisms that are sessile.

Organisms that live up in the water column, away from the benthic zone, occupy the **pelagic** environment. Pelagic organisms are further divided according to how they can locomote in the water column. **Plankton** are organisms that are at the mercy of ocean currents and are carried from place to place. The word plankton is derived from the Greek word for "drifters." Plankton largely drift from place to place in the ocean, although

there is some evidence that some plankton can direct their movement. Plankton can either be phytoplankton, which are microscopic marine algae, or zooplankton, which are tiny drifting animals. Zooplankton include tiny protozoans and copepods as well as juvenile forms of many larger marine animals such as fish and crustaceans.

Animals that swim well enough to oppose currents are called **nekton** and are mostly vertebrates, primarily marine mammals and fish. However, squids are a great example of invertebrate nekton. Some creatures blur the lines between these human-made classifications for zones. For instance, sting rays are considered to be part of the nekton because they can swim and oppose currents, but they are also considered to be part of the benthic zone because they spend the majority of their time on the bottom, rather than swimming in the water column. Many marine animals, including the egg and larval stages of many fish and benthic invertebrates, will live the early part of their life as plankton in the pelagic zone and then transform to dramatically different lifestyles as adults.

The benthic and pelagic zone can be further divided based on the characteristics of each zone. The benthic zone is divided based on depth and the continental shelf. The first zone of the benthic zone on the continental shelf is called the intertidal zone, which is the boundary between the land and the sea, between the tides. This area is exposed when the tide is out but is underwater at high tide. The zone below the intertidal zone, is called the subtidal zone. Beyond the continental shelf, the benthic zone is divided into the bathyal, abyssal, and hadal zones. These three zones are considered part of the deep-sea floor.

The pelagic environment is also divided with reference to the continental shelf. The neritic zone is the pelagic environment over the continental shelf to the shelf break. The oceanic zone is the water beyond the shelf break. The pelagic environment is also divided into zones based on depth and light. The shallowest zone, called the epipelagic zone, extends to ~200 meters and has plenty of light for photosynthesis to occur. Plankton thrive in the epipelagic zone because there is enough sunlight to provide plenty of food. Below the epipelagic zone is the mesopelagic zone. The mesopelagic zone is the deeper water beyond the continental shelf. The mesopelagic zone extends to ~700 meters deep. This zone is referred to as the twilight zone because there is