26–3 Cnidarians

Imagine that you are swimming in warm, tropical waters. Far away, delicate jellyfishes float in the ocean currents. Within arm's reach, sea fans sway in the shallow currents. Brightly colored sea anemones cling to rocks, looking more like underwater flowers than animals. All these creatures are animals in the phylum Cnidaria (ny-DAYR-ee-uh), a group that includes hydras, jellyfishes, sea anemones, and corals. These fascinating animals are found in waters all over the world. Some cnidarians live as individuals. Others live in colonies composed of dozens or even thousands of connected individuals.

What Is a Cnidarian?

A few important features unite the cnidarians as a group. **Cnidarians are soft-bodied, carnivorous animals that have stinging tentacles arranged in circles around their mouths. They are the simplest animals to have body symmetry and specialized tissues.** Cnidarians get their name from the **cnidocytes** (NY-duh-syts), or stinging cells, that are located along their tentacles. **Figure 26–11** shows the structure of cnidocytes. Cnidarians use these cells for defense and to capture prey. Within each cnidocyte is a nematocyst (NEM-uh-toh-sist). A **nematocyst** is a poison-filled, stinging structure that contains a tightly coiled dart. When an unsuspecting shrimp or small fish brushes up against the tentacles, thousands of nematocysts explode into the animal, releasing enough poison to paralyze or kill the prey.

CHECKPOINT *What is the function of cnidocytes?*

Guide for Reading

Key Concepts
- What is a cnidarian?
- What two body plans exist in the cnidarian life cycle?
- What are the three groups of cnidarians?

Vocabulary
cnidocyte
nematocyst
polyp
medusa
gastrovascular cavity
nerve net
hydrostatic skeleton
external fertilization

Reading Strategy: Finding Main Ideas Before you read, skim the section to identify the key concepts. Read the section carefully, and then write down the information that supports each key concept.

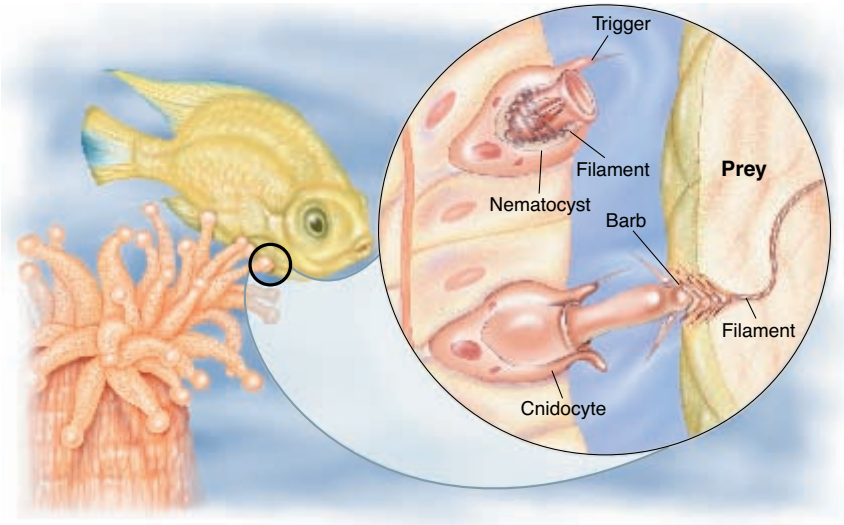


Figure 26–11 **Cnidarians are carnivorous animals that have stinging tentacles arranged around their mouths. Stinging cells called cnidocytes are used to capture and paralyze prey.** Within each cnidocyte is a stinging structure called a nematocyst. Here, a sea anemone captures a fish that has brushed the trigger of the nematocyst. When an animal touches the trigger of a nematocyst, the filament inside uncoils and shoots a barb into the animal.

SECTION RESOURCES

Print:
- ***Laboratory Manual A,*** Chapter 26 Lab
- ***Laboratory Manual B,*** Chapter 26 Lab
- ***Teaching Resources,*** Lesson Plan 26–3, Adapted Section Summary 26–3, Adapted Worksheets 26–3, Section Summary 26–3, Worksheets 26–3, Section Review 26–3, Enrichment
- ***Reading and Study Workbook A,*** Section 26–3
- ***Adapted Reading and Study Workbook B,*** Section 26–3
- ***Lab Worksheets,*** Chapter 26 Exploration

Technology:
- ***iText,*** Section 26–3
- ***Transparencies Plus,*** Section 26–3

Section 26–3

1 FOCUS

Objectives
26.3.1 ***Explain*** what a cnidarian is.
26.3.2 ***Describe*** the two body plans that exist in the cnidarian life cycle.
26.3.3 ***Describe*** how cnidarians carry out essential functions.
26.3.4 ***Identify*** the three groups of cnidarians.
26.3.5 ***Describe*** the ecology of cnidarians.

Guide for Reading

Vocabulary Preview
Explain that the name *cnidarian* is derived from Greek *knide,* which means "nettle." A nettle is a common plant with toothed leaves and stinging hairs. Point out that the first Vocabulary term, *cnidocyte,* is derived from the same Greek word.

Reading Strategy
Point out that the section's Key Concepts are in boldface type. Have students write the boldface sentences in their notebooks and find information that supports each.

2 INSTRUCT

What Is a Cnidarian?

Use Visuals
Figure 26–11 Ask: **In this figure, what part of a cnidarian is enlarged in the inset?** *(The end of a tentacle)* Point out that the inset shows two specialized cells. Ask: **What are these cells called?** *(Cnidocytes)* **What is the stinging structure inside each cnidocyte called?** *(A nematocyst)* **What is released from the nematocyst that kills or paralyzes prey?** *(A poison)* L1 L2

Answer to . . .
CHECKPOINT *Cnidocytes function in defense and capturing prey.*

Form and Function in Cnidarians

Use Visuals

Figure 26–12 As students study the figure, point out that a cnidarian has only two tissue layers, the epidermis and the gastroderm. Then, ask: **What is located between those tissue layers?** *(The mesoglea, which varies from a thin, noncellular layer to a thick jellylike material)* **In which form is the mesoglea most prominent?** *(The medusa)* Emphasize that the mesoglea is not a tissue layer made of cells. L1 L2

Build Science Skills

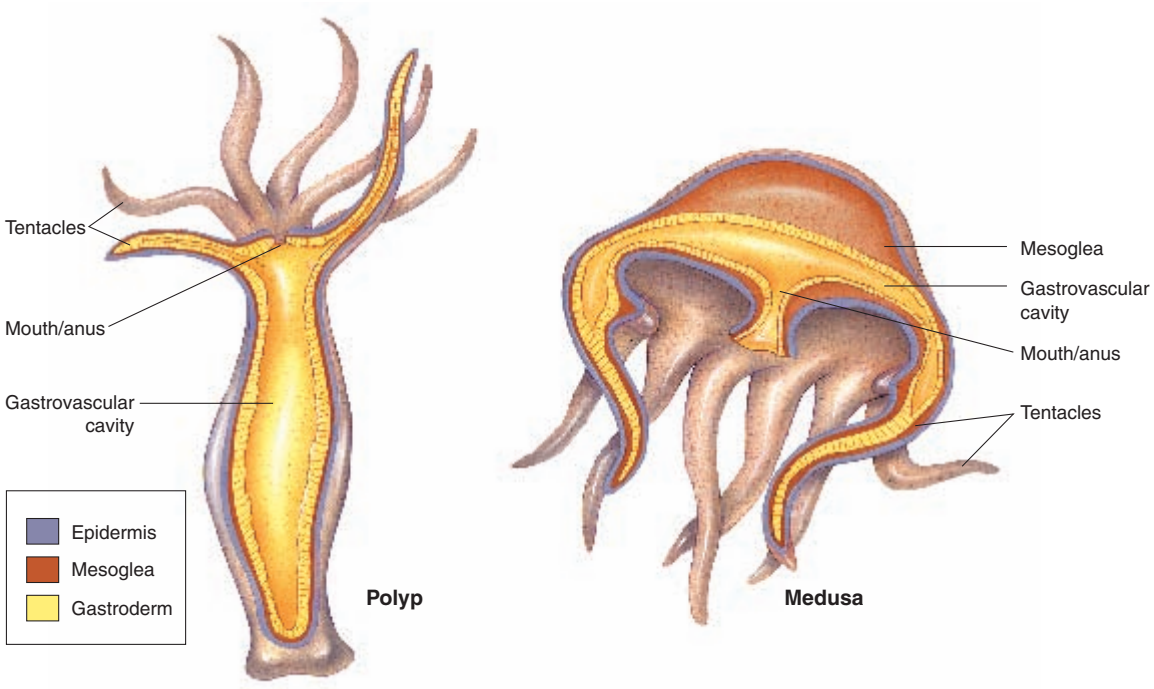
Using Models To reinforce the body plan of cnidarians, have students search for objects around the school that exhibit radial symmetry. Ask students to make a list of such objects, which might include an electric fan, a petri dish, a bicycle wheel, a trashcan, a basketball, a showerhead, a bowl, and a flowerpot. L2

Demonstration

Use two plastic cups, one clear and one colored, to demonstrate the difference between a cnidarian polyp and a medusa. Place the colored cup inside the clear cup, and explain that these two cups represent the two tissue layers of a cnidarian, the inside gastroderm and the outside epidermis. Then, display the double cup right side up and explain that this represents the polyp form of a cnidarian, with the mouth facing upward. Turn the double cup upside down, and explain that this represents the medusa form of a cnidarian, with mouth facing downward. L1 L2

Word Origins

Cnidarian medusas have long tentacles that are something like Medusa's snakes. L2



▲ **Figure 26–12** **Many cnidarians have both a polyp stage and a medusa stage.** Both stages have an outer epidermal tissue; a gastroderm tissue, which lines the gastrovascular cavity; and a mesoglea layer, which lies between the two tissues. (Note that a medusa's tentacles are much narrower than in the illustration.)

Word Origins

Medusa is the name of a monster in Greek mythology. In the myth, Medusa was once a beautiful woman, but she bragged about her beauty, causing a jealous goddess to change her into a hideous monster. Medusa had long, twisting snakes for hair. **In what way are cnidarian medusas similar to the monster named Medusa?**

Form and Function in Cnidarians

Cnidarians are only a few cells thick and have simple body systems. Most of their responses to the environment are carried out by specialized cells and tissues. These tissues function in physiological processes such as feeding and movement.

Body Plan Cnidarians are radially symmetrical. They have a central mouth surrounded by numerous tentacles that extend outward from the body. **Cnidarians typically have a life cycle that includes two different-looking stages: a polyp and a medusa.** Both forms are shown in **Figure 26–12.** A **polyp** (PAHL-ip) is a cylindrical body with armlike tentacles. In a polyp, the mouth points upward. Polyps are usually sessile. A **medusa** (muh-DOO-suh) has a motile, bell-shaped body with the mouth on the bottom.

Cnidarian polyps and medusas each have a body wall that surrounds an internal space called a gastrovascular cavity. The gastroderm is the inner lining of the gastrovascular cavity, where digestion takes place. The epidermis is the outer layer of cells. The mesoglea (mez-uh-GLEE-uh) is a layer that lies between these two tissues. It varies from a thin, noncellular membrane to a thick, jellylike material that contains cells.

CHECKPOINT *What are the three layers in cnidarians?*

TEACHER TO TEACHER

You can use the following materials to make a model of a jellyfish: gallon-size plastic bags (not resealable), twist tie, string, tape, marker, and scissors. Ahead of time, tape in the corners of the plastic bag so your jellyfish will be round. As students watch, blow into the bag and close with twist tie. Cut the second plastic bag into long, thin strips to represent tentacles, and tape the strips onto the bag. Draw the gonads with a marker. Tape the string on to represent the nerve net. As you construct the model, talk to students about the structure of a jellyfish.

—*Beverly Cea*
Biology Teacher
Grimsley High School
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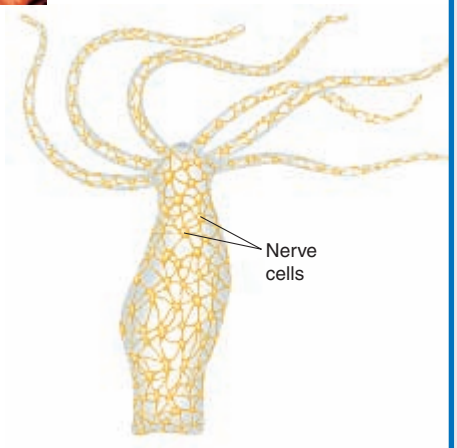
Before

After

Figure 26–13 Cnidarians have nerve nets that consist of many individual nerve cells, as shown in the hydra below. Many cnidarians respond to touch by pulling their tentacles inside their bodies. This response, shown at left in cup corals, is cued by nerve cells located in the tentacles. **Formulating Hypotheses** *How might a nerve net differ between motile and sessile cnidarians?*

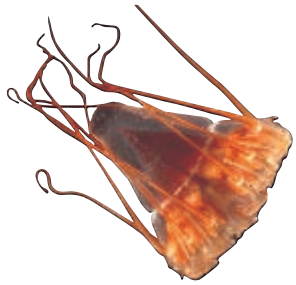


Feeding After paralyzing its prey, a cnidarian pulls the prey through its mouth and into its **gastrovascular cavity,** a digestive chamber with one opening. Food enters and wastes leave the body through that opening. Digestion—the breakdown of food—begins in the gastrovascular cavity. The digestion that occurs in the gastrovascular cavity is extracellular, meaning that it takes place outside of cells. Partially digested food is absorbed by the gastroderm. Digestion is completed intracellularly, within cells in the gastroderm. Any materials that cannot be digested are passed out of the body through the mouth.

Respiration, Circulation, and Excretion Following digestion, nutrients are usually transported throughout the body by diffusion. Cnidarians respire and eliminate the wastes of cellular metabolism by diffusion through their body walls.

Response Cnidarians gather information from their environment using specialized sensory cells. Both polyps and medusas have a nerve net, shown in **Figure 26–13.** A **nerve net** is a loosely organized network of nerve cells that together allow cnidarians to detect stimuli such as the touch of a foreign object. The nerve net is usually distributed uniformly throughout the body, although in some species it is concentrated around the mouth or in rings around the body. Cnidarians also have statocysts, which are groups of sensory cells that help determine the direction of gravity. Ocelli (oh-SEL-eye; singular: ocellus) are eyespots made of cells that detect light.

Movement Different cnidarians move in different ways. Some cnidarians, such as sea anemones, have a hydrostatic skeleton. The **hydrostatic skeleton** consists of a layer of circular muscles and a layer of longitudinal muscles that, together with the water in the gastrovascular cavity, enable the cnidarian to move. For example, if the anemone's circular muscles contract when the anemone's mouth is closed, the water inside the cavity can't escape. The pressure of the water makes the body become taller. In contrast, medusas move by jet propulsion. Muscle contractions cause the bell-shaped body to close like a folding umbrella. This action pushes water out of the bell, moving the medusa forward, as shown in **Figure 26–14.**



▲ **Figure 26–14** Jellyfishes move by means of jet propulsion. The body contracts to force water out, moving the jellyfish in the opposite direction. **Applying Concepts** ***Is the body plan of this jellyfish a medusa or a polyp?***

Build Science Skills

Comparing and Contrasting Ask students to write a paragraph that compares and contrasts sponges and cnidarians in how they carry out the seven essential functions. Students should suggest that there is great similarity between the two groups in respiration, circulation, and excretion. They should point to significant differences in feeding, response, movement, and reproduction. L2 L3

Demonstration

Use familiar objects to demonstrate the difference in the ways cnidarian polyps and medusas move. For the polyp, partially fill an oblong balloon with water and tie the opening closed. Tell students that the balloon represents a cnidarian gastrovascular cavity. Then, show by squeezing parts of the balloon how it can change shape, with one part growing larger while the other shrinks. Ask: **What kind of skeleton does this represent?** *(A hydrostatic skeleton)* Next, pick up an umbrella, and tell students that it represents the bell-shaped body of a medusa. Rapidly open and close the umbrella, and explain that medusas have muscles to contract and expand their bells in a similar way. Just as the umbrella pushes air backward, a medusa's bell pushes water backward, and the organism moves in the opposite direction. L1 L2

UNIVERSAL ACCESS

Less Proficient Readers
Help students relate the text to Figure 26–15 by reading the first paragraph on page 672 aloud and then asking a student to point out where the figure shows budding. Then, read the second paragraph aloud, and ask a student to point out where in the figure external fertilization is shown. L1

English Language Learners
Have students make a hierarchical graphic that shows the classification of the invertebrates discussed in Section 26–3. At the top should be phylum Cnidaria. Beneath that should be the classes Scyphozoa, Hydrozoa, and Anthozoa. Students can write examples of each class. L1 L2

Advanced Learners
After students have read about the ecology of corals, encourage interested students to prepare a report to the class about one of these aspects of coral reefs: where the world's largest reefs are found; the tremendous biodiversity associated with coral reefs; and the threat to coral reefs from human activity. L3

Answers to . . .

CHECKPOINT *The gastroderm is the inner lining of the gastrovascular cavity. The epidermis is the outer layer of cells. The mesoglea is a jellylike layer that lies between these two tissues.*

Figure 26–13 *Students might correctly infer that the nerve net is more extensive in a motile cnidarian. In many medusas, nerve cells are complex and concentrated around the margin of the bell, which is more likely to come into contact with objects and other organisms than are other parts of the medusa.*

Figure 26–14 *A medusa*

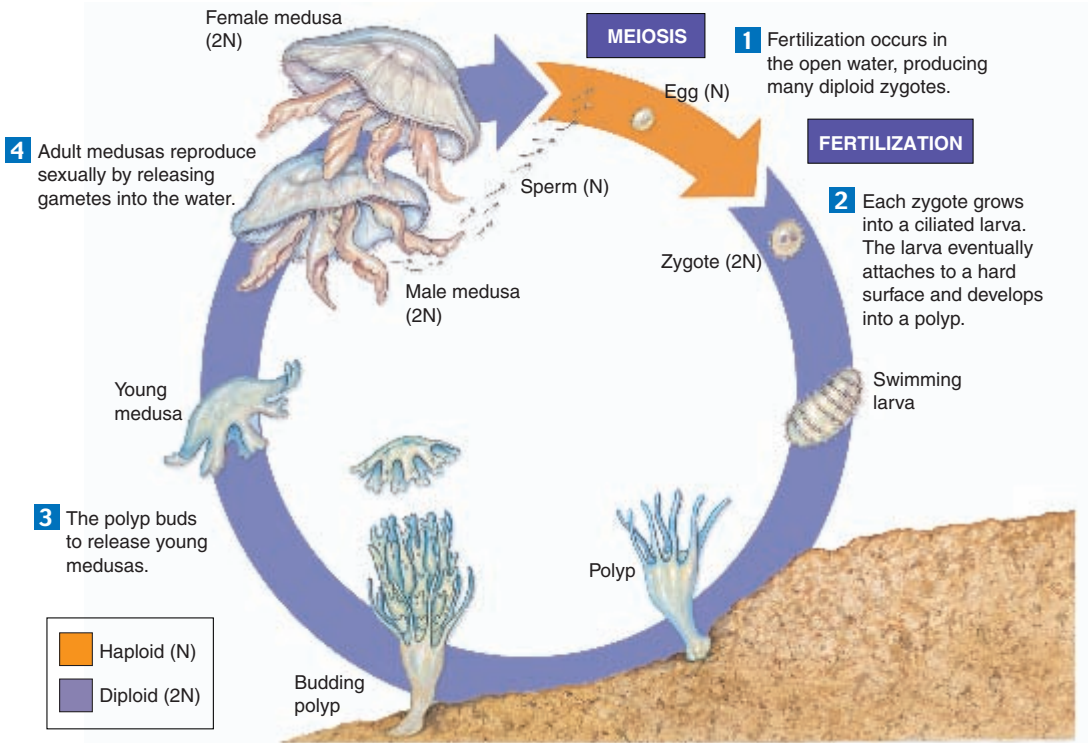
Use Visuals

Figure 26–15 Have students study the figure. Then, ask: **Is the jellyfish polyp haploid or diploid?** *(Diploid)* **Is the medusa haploid or diploid?** *(It also is diploid.)* **What process occurs that ensures both are diploid organisms?** *(The polyp is diploid because it grows from a zygote produced by the joining of haploid egg and sperm. The medusa is diploid because it is produced through the process of budding by a polyp.)* **How are polyps produced?** *(Male medusas release sperm, and female medusas release eggs. Fertilization occurs in open water. The resulting zygote grows into a larva, which becomes a polyp.)* L2

Groups of Cnidarians

Build Science Skills

Classifying Give students a better understanding of how cnidarians are classified by emphasizing which form, polyp or medusa, predominates in the life of the organism. Ask students: **In which form do hydrozoans live most of their lives?** *(They live most of their lives as polyps.)* **In which form do scyphozoans live most of their lives?** *(They live most of their lives as medusas.)* **In which form do anthozoans spend their lives?** *(They have only a polyp stage in their life cycle.)* L2



▲ **Figure 26–15** Jellyfishes reproduce sexually by producing eggs and sperm. Depending on the species, fertilization is either internal or external. In *Aurelia,* shown here, fertilization is external, occurring after eggs and sperm are released into the water. **Interpreting Graphics** ***What cells are formed by the process of meiosis?***

Reproduction Most cnidarians reproduce both sexually and asexually. Polyps can reproduce asexually by budding. The new animal is genetically identical to the parent animal. One type of budding begins with a swelling on the side of an existing polyp. This swelling grows into a new polyp. In another type of budding, polyps produce tiny medusas that separate and become new individuals.

In most cnidarians, sexual reproduction takes place with external fertilization in water. **External fertilization** takes place outside the female's body. The sexes are often separate—each individual is either male or female. The female releases eggs into the water, and the male releases sperm. The life cycle of *Aurelia,* a common jellyfish, is shown in **Figure 26–15.** Observe that the zygote grows into a free-swimming larva. The larva eventually attaches to a hard surface and develops into a polyp. Then, the polyp buds and releases a medusa that begins the cycle again.

Groups of Cnidarians

All cnidarians live under water, and nearly all live in the ocean. **Cnidarians include jellyfishes, hydras and their relatives, and sea anemones and corals.** Some of the most familiar cnidarians are the jellyfishes.

TEACHER TO TEACHER

When introducing the invertebrate phyla described in this chapter, I provide specimens of sponges and cnidarians as well as pictures, videos, or laser-disc examples. I also divide students into groups of four, and ask each group to develop questions about the various organisms. I then display these questions on the classroom walls. As students progress through the chapter, they answer the displayed questions, keeping a record of both questions and answers in their notebooks. In addition, I have the student groups make charts comparing the characteristics of sponges and cnidarians.

—Keith Orgeron
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Carencro High School
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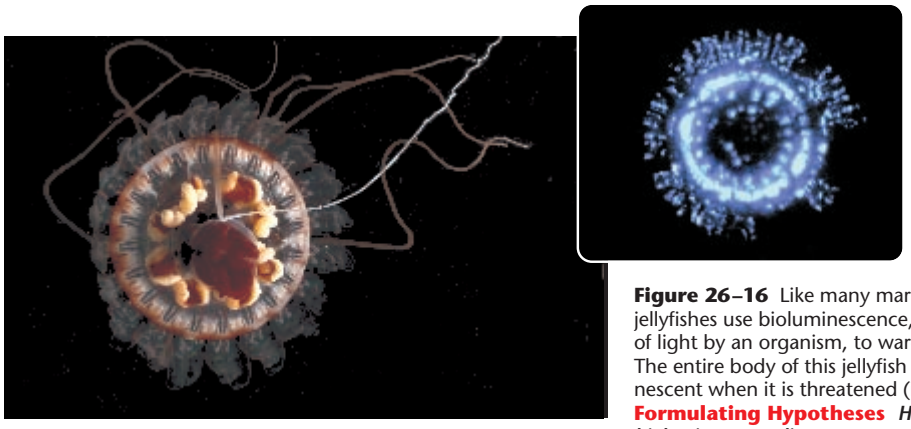


Figure 26–16 Like many marine organisms, jellyfishes use bioluminescence, or the production of light by an organism, to ward off predators. The entire body of this jellyfish becomes bioluminescent when it is threatened (inset).
Formulating Hypotheses *How might bioluminescence discourage potential predators?*

Jellyfishes The class Scyphozoa (sy-fuh-ZOH-uh) contains the jellyfishes, such as the jellyfish shown in **Figure 26–16.** Scyphozoans, which means "cup animals," live their lives primarily as medusas. The polyp form of jellyfishes is restricted to a small larval stage, and no elaborate colonies ever form. Jellyfishes can be quite large—the largest jellyfish ever found was almost 4 meters in diameter and had tentacles more than 30 meters long. Jellyfishes reproduce sexually.

Hydras and Their Relatives The class Hydrozoa (hy-druh-ZOH-uh) contains hydras and other related animals. The polyps of most hydrozoans grow in branching colonies that sometimes extend more than a meter. Within the colony, polyps are specialized to perform different functions. In the Portuguese man-of-war, shown in **Figure 26–17,** one polyp forms a balloonlike float that keeps the entire colony afloat. Other polyps in the colony produce long tentacles that hang several meters under water and sting prey (and humans!) using nematocysts. Some polyps digest food held by the tentacles, while others make eggs and sperm.

The most common freshwater hydrozoans are hydras. Hydras differ from other cnidarians in this class because they lack a medusa stage. Instead, they live only as solitary polyps. Hydras reproduce asexually, by budding, or sexually, by producing eggs and sperm in the body wall. Many hydras get their nutrition from capturing, stinging, and digesting small prey. Some hydras, however, get their nutrition from symbiotic photosynthetic protists that live in their tissues.

CHECKPOINT *How do hydras reproduce?*

Figure 26–17 **Jellyfishes, hydrozoans, sea anemones, and corals are all cnidarians.** The Portuguese man-of-war, shown here, is a colonial hydrozoan that is composed of many specialized polyps. A single polyp that is enlarged and full of air helps keep the animal afloat, while other specialized polyps below water function in feeding and reproduction.

BIO INSIGHTS

FACTS AND FIGURES

Animals with no middle tissue layer
Cnidarians only have two embryonic tissue, or germ, layers. The endoderm develops into the inner layer of the body wall, which is called the gastrodermis. The ectoderm develops into an outer layer of the body wall, called the epidermis. There is no middle germ layer, and as such, cnidarians are said to possess a diploblastic body plan, in contrast to the triploblastic body plan of more complex animals with three germ layers.

The middle layer in cnidarians is a thick, jellylike mixture called mesoglea, which usually contains some cells and fibers. In the hydrozoans, the middle layer has virtually no cells. This jellylike middle layer is more abundant in the medusa form than in the polyp form, which explains the name *jellyfish* for scyphozoan medusas. Without a middle germ layer, cnidarians never possess the complex organs of triploblastic animals.

Use Visuals

Figure 26–17 Ask: **What cnidarian class does this Portuguese man-of-war represent?** *(The class Hydrozoa)* Emphasize that hydrozoans spend most of their lives as polyps. Then, ask: **Are you looking at one individual polyp or many?** *(Many, since a Portuguese man-of-war is a colonial hydrozoan)* Explain that the enlarged polyp at the top is called a float, and the colony has mechanisms that can regulate the gas in the float, which keeps the colony at a particular depth. The feeding tentacles at the bottom can be as long as 13 meters in some Atlantic species. L1 L2

Build Science Skills

Comparing and Contrasting
Have students make a compare/contrast table that organizes the information they learn about the three classes of cnidarians. Column heads might include Cnidarian Class, Description, Reproduction, and Examples. After students have completed the task, divide the class into small groups, and encourage students to compare information included in their tables, revising where they think they have left out important information. L2 L3

Answers to . . .

CHECKPOINT *Hydras reproduce asexually by budding or sexually by producing sperm and eggs.*

Figure 26–15 *Sperm and egg*

Figure 26–16 *Bioluminescence makes the jellyfish seem larger and more threatening.*

26–3 (continued)

Make Connections

Chemistry Explain that the "stony" substance associated with stony corals is limestone, or calcium carbonate. To help explain the formation of a coral reef, write the formula of calcium carbonate on the board: $CaCO_3$. Point out that this compound contains the elements calcium, carbon, and oxygen. Explain that a coral animal derives the calcium from seawater that flows into its gastrovascular cavity. The carbon and oxygen are from carbon dioxide, a product of the photosynthesis carried out by algae symbionts. One of the products of a chemical reaction at the base of a coral is calcium carbonate, which precipitates. The result is a buildup of a stony exoskeleton and the coral reef. L2 L3

Ecology of Corals

Analyzing Data

BIIE 1.d

Coral reefs are the "rain forests" of the ocean, a place where life is most varied and abundant. If the reefs are lost, then life on Earth will be changed dramatically. Overexploitation of marine resources includes everything from overfishing to even more destructive practices. For instance, fisheries in Indonesia sometimes use dynamite to stun reef-dwelling fish, making the take easier. Perhaps more troubling is the threat of global warming, which may eventually destroy almost all coral reefs. L2 L3

Answers

1. The order, from greatest to least high threat, is exploitation of marine resources, inland pollution, coastal development, and marine pollution.

2. The high threat of overexploitation is almost four times greater than the high threat of coastal development.

3. A typical generalization will suggest that human activities threaten the destruction of the world's coral reefs.

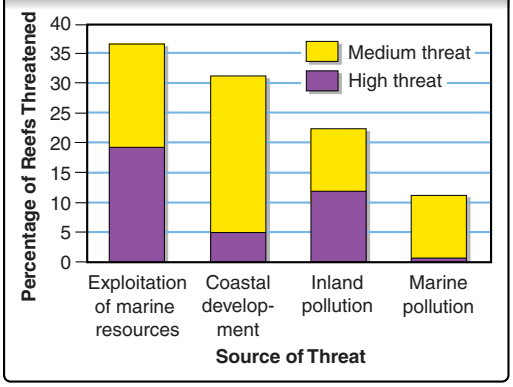
4. A typical response might propose limits on the exploitation of marine resources, either by amount of catch or by restrictions on where fisheries can harvest resources.

Analyzing Data

Coral Vanishing Act

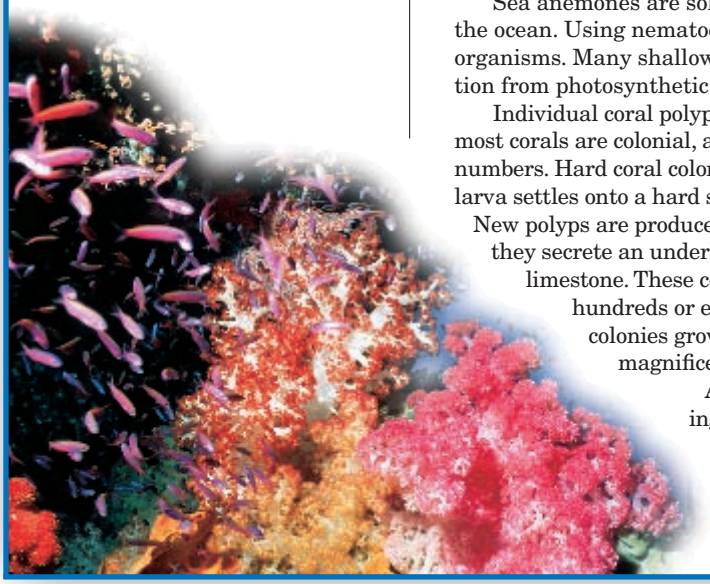
The World Resources Institute, an organization that examines global environmental problems, has announced that 58 percent of the world's coral reefs are in danger of dying. Threats to coral reefs fall into four broad categories shown in the graph. The graph indicates the percentage of reefs that are threatened by each of these categories. It also rates the threat as medium or high, based on the distance between the coral reef and the source of the threat. Use the information in the graph to answer the following questions.

1. **Classifying** Place the four categories of risk in order from greatest high threat to least high threat.
2. **Using Tables and Graphs** Approximately how much greater is the high threat of overexploitation than the high threat of coastal development?
3. **Inferring** Based on the graph, write a generalization about the effect of human activities on the destruction of coral reefs.
4. **Making Judgments** Assume that you are a legislator drafting a law to protect coral reefs. Choose one of the threats shown in the graph, and outline a law that you would propose to counter the threat.



BIIE 1.d

▼ **Figure 26–18** Coral reefs are home to many types of organisms. Each flowerlike form shown in this photograph is an entire colony made of thousands of individual coral polyps.



Sea Anemones and Corals The class Anthozoa (an-thuh-ZOH-uh) contains sea anemones and corals, animals that have only the polyp stage in their life cycle. Anthozoans all have a central body surrounded by tentacles—a form that gave them their name, *anthozoa,* which means "flower animal." Many species are colonial, or composed of many individual polyps. The appearance of an entire reef can include varied forms, as shown in **Figure 26–18.**

Sea anemones are solitary polyps that live at all depths of the ocean. Using nematocysts, they catch a variety of marine organisms. Many shallow-water species also depend on nutrition from photosynthetic symbionts.

Individual coral polyps look like miniature sea anemones. But most corals are colonial, and their polyps grow together in large numbers. Hard coral colonies are usually founded when a motile larva settles onto a hard surface and develops into a single polyp. New polyps are produced by budding, and as the colonies grow, they secrete an underlying skeleton of calcium carbonate, or limestone. These colonies grow slowly and may live for hundreds or even thousands of years. Many coral colonies growing near one another produce the magnificent structures known as coral reefs.

Anthozoans reproduce sexually by producing eggs and sperm that are released into the water. The zygote grows into a ciliated larva that becomes a new polyp. Some species can also reproduce asexually by budding or splitting into two halves.

BIO INSIGHTS — BIOLOGY UPDATE

Too late to save the world's coral reefs?

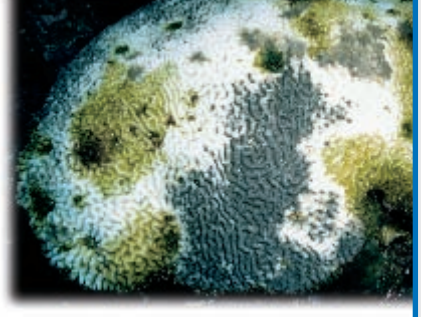
At the International Coral Reef Symposium in 2000, scientists reported that over 25 percent of the world's coral reefs have already been destroyed and warned that in the coming decades the rest might perish. Experts cited a number of causes of the destruction, including pollution, overfishing, and, most significantly, global warming, which causes bleaching. As the sea temperature rises, the symbiotic algae produce more oxygen. The corals begin to suffer from oxygen poisoning and so expel the algae. With the loss of algae, the corals lose their primary source of energy. In response to grave concerns about reef destruction, in 2000 President Clinton created the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, the country's largest marine nature preserve. The preserve encompasses over 65 percent of coral reefs within U.S. boundary waters.

Ecology of Corals

The worldwide distribution of corals is determined by a few variables: temperature, water depth, and light intensity. The "stony" or "hard" corals that build coral reefs require high levels of light. Why should light be a requirement for an animal? Light is necessary because these corals rely on mutualistic relationships with algae that capture solar energy, recycle nutrients, and help corals lay down their calcium carbonate skeletons. Symbionts provide as much as 60 percent of the energy that corals need. This arrangement allows coral reefs to live in water that carries few nutrients.

Many coral reefs are now suffering from human activity. For example, recreational divers sometimes damage coral reefs. Silt and other sediments from logging, farming, mining, and construction can wash onto reefs and smother corals. Chemical fertilizers, insecticides, and industrial pollutants can poison the corals. Overfishing can upset the ecological balance of coral reefs. Even when human-caused problems do not kill corals, they can cause stress that makes the coral reefs susceptible to other threats.

Meanwhile, a problem called coral bleaching has become common. High temperatures can kill the algae that usually live in the tissues of corals, leaving behind only transparent cells atop ghostly white skeletons. The results of coral bleaching are shown in **Figure 26–19.** In the past, bleaching was a rare and short-term event from which many corals recovered. Over the last 20 years, however, bleaching has become more common and more severe, causing many corals to die. Researchers fear that rising ocean temperatures, produced by global warming, may be contributing to this problem. If this is the case, many reefs around the world could soon be in serious danger.



▲ **Figure 26–19** Under normal conditions, algae live within coral tissues, carrying out photosynthesis and giving the coral its green appearance. However, when stressed by pollutants or increasing temperatures, these algae can die, so only the clear cells of the coral remain. **Inferring** ***What effect might the loss of symbiotic algae have on the coral?***

26–3 Section Assessment

1. **Key Concept** Describe three characteristics that all cnidarians share.
2. **Key Concept** How do the two body plans of cnidarians differ?
3. **Key Concept** Describe the three groups of cnidarians and give an example from each.
4. Describe how the digestion and absorption of food take place in cnidarians.
5. How has human activity affected coral reefs?
6. **Critical Thinking** **Inferring** A medusa typically has more specialized organs for movement and response than a polyp does. Why might this be the case? *Hint:* How does the lifestyle of a medusa differ from that of most polyps?

Writing in Science

Descriptive Writing
Write a paragraph describing the body of a hydra. Assume that your readers know nothing about hydras. *Hint*: First, list all the details you want to include in your paragraph. Then, decide how you want to organize those details—for example, from the outside of the hydra to the inside.

3 ASSESS

Evaluate Understanding

Display a picture of an organism from each of the three classes of cnidarians. Ask students to identify the class of each and explain how it carries out the seven essential functions of animals.

Reteach

To help students remember the meanings of Vocabulary terms, ask them to write a story of a year in the life of a jellyfish in which they use these terms: *polyp, medusa, nerve net, nematocyst, gastrovascular cavity,* and *hydrostatic skeleton.* Students should strive to be both creative and scientifically accurate.

Writing in Science

Before students begin, you may want to allow them to observe the hydras they will use in the Exploration Lab near the end of this chapter. Then, students should use the details about hydras described on page 673. In their descriptions, students should emphasize that each hydra is an individual, solitary polyp.

Interactive Textbook

If your class subscribes to the iText, use it to review the Key Concepts in Section 26–3.

26–3 Section Assessment

1. All cnidarians are soft-bodied, are carnivorous, and have stinging tentacles arranged in circles around the mouth.
2. A polyp has a cylindrical body with armlike tentacles; the mouth points upward. A medusa has a bell-shaped body with the mouth pointing downward.
3. Hydrozoans, such as hydras, spend most of their lives as polyps. Scyphozoans, such as jellyfishes, live their lives primarily as medusas. Anthozoans, such as corals, have only the polyp stage in their life cycle.
4. Extracellular digestion takes place in the gastrovascular cavity. Digestion is completed intracellularly.
5. Many coral reefs are suffering due to human activity.
6. A polyp is sessile and, thus, does not move around. A medusa is motile and, thus, needs a more complex nervous system.

Answer to . . .

Figure 26–19 *The corals might die from lack of oxygen and nutrients supplied by the algae.*