

LESSON 3 How Do Animals Grow Back Lost Parts? =====

Objectives

When students have completed this lesson, they will be able to:

- describe how some animals can regenerate lost parts;
- identify regeneration as a kind of asexual reproduction in some animals.

Exploring Science / Historical Steps

Generally, the more complex and highly differentiated an animal, the more limited are its powers of regeneration. Among vertebrates, an unusual example of a body part that can regenerate is the tail of a lizard, such as the anole or skink. From their reading of the story, the survival value of this ability should be clear to the students.

Time permitting, you might share with students an amazing example of regeneration: In 2021, **Sayaka Mitoh**, a woman working on her doctorate at Nara Women's University in Japan, reported observing a detached head of a sea slug in an aquarium. The head was circling its own headless body. Mitoh continued to observe the head, assuming that it would die. Instead, within three weeks it regrew its entire body! To add to the remarkable slug's abilities, its survival was assisted by chloroplasts that the slug's cells had stolen from algal cells that live in its skin. Yes, the slug head was carrying out photosynthesis to make its own food - at least for a short time. Why do members of this slug species actually "remove" their own head, and then regenerate their entire body? One hypothesis is that the feat may be a reaction to the body becoming invaded by parasites. Research continues.

In discussing the inference question, students should respond that skinks have a way to store energy in their tails, since the tails need a source of energy in order to remain active long enough to let the animal escape its predator.

Growing Back Lost Parts

Have students compare parts **A** and **B** of the illustration of starfish regeneration. Ask: When is regeneration a form of asexual reproduction? (When a whole animal grows from a part, such as the arm of the starfish).

The topic of stem cells is both exciting and controversial, so care must be taken during a discussion of these cells. You might point out that some researchers use stem cells taken from human embryos, while others use stem cells obtained from adults.

To Do Yourself

Planarians should be kept in an opaque container, since they respond negatively to light. Keep them in aquarium water, which should be changed often. Feed them once a week with bits of raw beef liver (being sure to remove uneaten parts, to avoid fouling the water). Better yet, give them live food (*Tubifex* worms). You might use planarians to demonstrate responses to tapping on the container and to light, before starting the regeneration experiment.

Questions

1. When a new organism is the result. (In planarians, each of two or even three or four parts of an animal can grow into a whole new animal).
2. Asexual.

Review

Please note: I have not made the answers available online, on the small chance that a student might discover them. Of course, the answers to these questions will be included in the version of the Teacher's Guide provided to teachers who purchase the text

Reinforce / Enrich

The following brief video provides a good introduction to stem cells. Note that, beginning at the 1:11 mark, the narrator states that “Somatic cells ... cannot divide,” and then elaborates on this statement. The point being, that a type of “limited” stem cell is responsible for the production of each type of new body cell. Most sources (including this textbook on page 249) report that somatic cells replace each other via mitosis. This discrepancy can be an opportunity to share that many topics in science are still being studied, and perhaps even that authors of textbooks for young people sometimes must opt not to go “too deep” in order to avoid confusing the intended audience.

- [Science ABC / Stem cells: explained in simple words](#) [6:29]