

Adaptation and Speciation

Reflecting Questions

- What determines a species?
- How do new species arise?
- What is the relationship among adaptation, natural selection, and the formation of new species?

Prerequisite Concepts and Skills

Before you begin this chapter, review the following concepts and skills:

- understanding the mechanisms that result in genetic variety, such as mutations and gene flow (Chapter 9, section 9.1), and
- understanding the process of natural selection (Chapter 10, section 10.1).

From the bacteria that thrive in your digestive tract, to a species of algae that survives on glaciers, to the elephants in the forests of Asia, there are millions of species on Earth inhabiting vastly different habitats. As well, there are innumerable species that once thrived and are now extinct. The formation of most new species takes thousands of years, but as you read this page, there are forces at play that are affecting populations. These forces may ultimately lead to the creation of a new species. The bacterial species shown here (*Staphylococcus aureus*), for example, is common in hospitals. For years, the antibiotic penicillin was highly effective in killing this bacteria and others. In fact, the discovery of penicillin meant that World War II was the first war in which fewer soldiers were killed by disease than by bullets or other shells. But today, just over 60 years since the discovery of penicillin, this wonder drug is virtually unable to fight off *S. aureus*. The ability of populations (such as bacteria) to adapt rapidly to changes in their environment is just part of the story of speciation in bacteria.

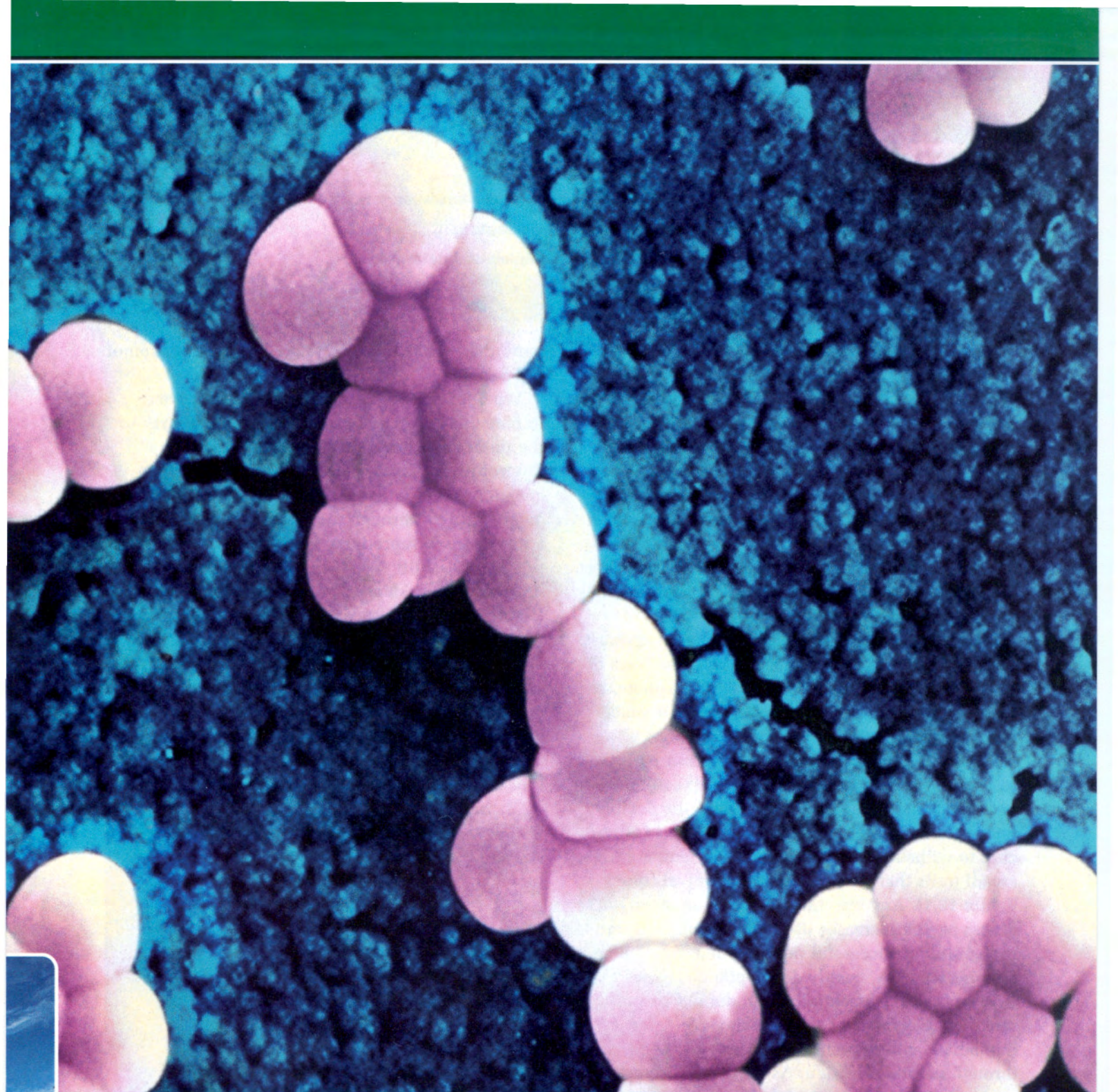
Defining a species is an ever-present challenge for biologists. For example, speciation differs in sexually reproducing species and in microorganisms. In the past, biologists measured and recorded differences between individuals and noted their habitat and behaviour. However, this is not a practical approach for all species. With new advances and discoveries in microbiology and the

unearthing of new fossils, we are learning more about how and when species form. Through experimentation and observation, a biologist can determine differences between populations and also determine the evolutionary lineage of a species. What criteria would you use to distinguish the eastern maple shown here from maple trees in western Canada or Europe?

In this chapter, you will investigate adaptation and speciation. What are the situations needed for new species to form? How quickly do species form? How do populations adapt to new environments? How do we distinguish one species from another? These are some of the questions that you will explore in this chapter.

What determines whether this Ontario maple is a different species from maple trees that grow in other parts of Canada?





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