

## CONCEPT 2

# Scientists debate about whether viruses are living things or not.

### Activity

#### Know-Want To Know-Learn (KWL) Chart

Use a KWL chart to organize the ideas you have about viruses. How many different viruses can you name? What roles do they play in ecosystems? How do viruses interact with humans and with other organisms? Record the answers to these questions or anything else you know or want to know about viruses. After you finish Concept 2, fill in the "What I Learned" column of your chart.



**virus** a strand of genetic material surrounded by a protein layer that can infect and reproduce in a host cell

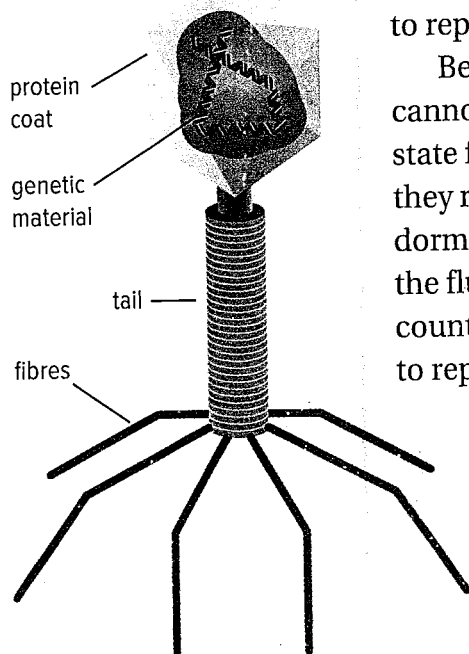
**A virus** is a strand of genetic material surrounded by a layer of protein that can infect and reproduce in a host cell.

**Figure 1.8** shows the basic structure of a virus. The genetic material is surrounded by a protein coat. Some viruses have a tail-like structure and fibres. Others have a fatty membrane that surrounds the protein coat.

### How Viruses Work

Viruses do not contain the cell parts that plant and animal cells do. So viruses cannot take in nutrients, use energy, or produce wastes like cells do. They cannot even reproduce on their own. Viruses must be inside the cell of another organism, called a host, to reproduce.

Before they enter a host, viruses are dormant (inactive). They cannot carry out any life functions. Viruses can exist in a dormant state for hours, days, and in some cases even months before they reach a host. For example, viruses that cause colds can stay dormant for up to 7 days on indoor surfaces. Viruses that cause the flu can stay dormant for 24 hours on a hard surface, such as a countertop. If these viruses do reach a host, they will use its cells to reproduce. That is all viruses do inside the host: reproduce.

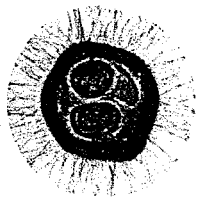


**Figure 1.8** This is one type of virus called a bacteriophage. It infects bacteria.

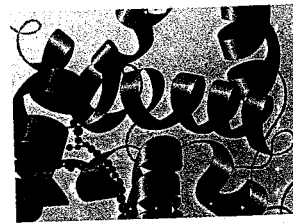
## How Recent Evidence Has Changed How Scientists View Viruses

Most scientists do not consider viruses to be alive, because they do not have the characteristics of living things. They cannot even reproduce without hijacking the structures and processes of host cells. However, in the last few decades, scientists have made discoveries that support the idea that viruses could be considered living things. The timeline in **Figure 1.9** describes some of these discoveries and what they mean.

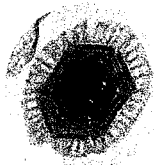
**Figure 1.9** The timeline shows some of the discoveries that provide evidence that viruses were once living things and may be more complex than previously thought.



**2011:** Scientists discover another large virus called the Megavirus. It has even more genetic material than Mimivirus. After comparing the genetic material of these two viruses, scientists believe that they may have evolved from a common ancestor that was able to make its own proteins.



**1992–2008:** Scientists discover and research the largest and most complex virus to date: the Mimivirus. It is up to 10 times as large as most viruses. It also has up to 5 times as much genetic material as other viruses. Some of the genetic material had never been seen before in viruses.



**2015:** Scientists trace the evolutionary history of more than 3000 viruses by comparing the folds in their proteins. Results show that more than 400 protein folds are shared between viruses and cells from other organisms and that 66 folds are unique to viruses. Based on these results, scientists infer that viruses once, long ago, had the same properties as cells. This could mean that viruses at some time in the past were alive and that they evolved as separate “organisms” at some later time.

### Activity

#### Are Viruses Alive?

Hold a class debate on whether viruses are living things or not. Your teacher will assign your group to a position. Do research to prepare and strengthen your arguments. Then hold your debate. Afterwards, write a summary of your own opinion about whether viruses should be considered alive or not.

#### Before you leave this page . . .

1. Why do many scientists consider viruses to be non-living?
2. What new evidence is most convincing to you that viruses should be considered living things?
3. A number of fish farms raise salmon on the east and west coasts. A deadly flu virus that infects farm-raised salmon in the east is of concern in B.C. How could such a virus affect people and B.C. culturally and economically?

