



ACTIVITY 3

# Scientific Advancement

CARD-BASED INVESTIGATION

# 3 : SCIENTIFIC ADVANCEMENT

## GUIDING QUESTION

What role does new technology play in the development of scientific ideas over time?

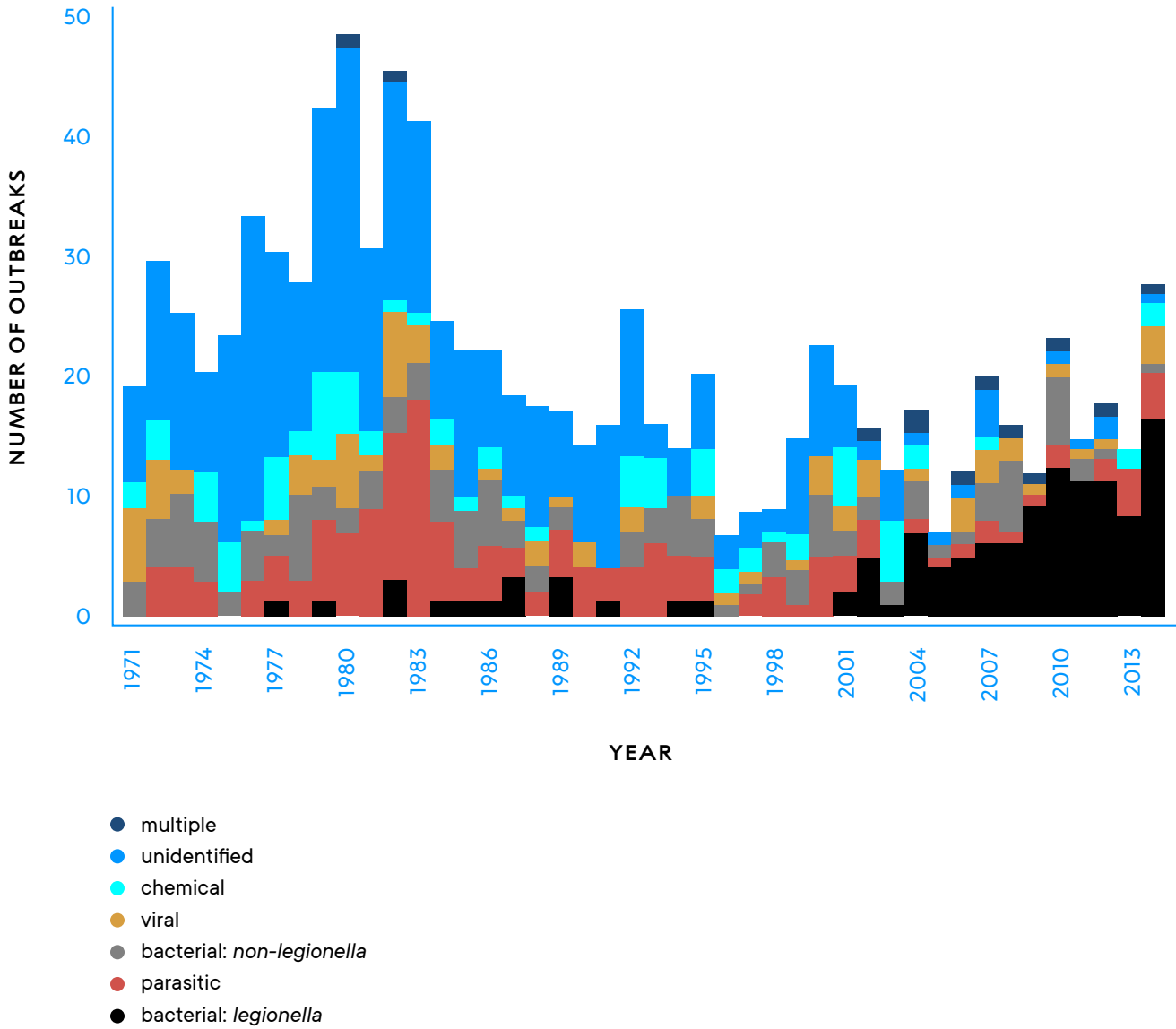
## INTRODUCTION

In the case of Skipton, the only indicator of something unusual in the drinking water was its turbidity. Outbreaks due to drinking water contamination can be a result of many different factors, as shown in the following graph. The field of science has made progress in identifying the cause of such outbreaks as well other scientific discoveries about water, as shown in Figure 3.1. In this activity, you will explore how technological advances have contributed to the development of scientific knowledge over time.

CONCEPTUAL  
TOOLS



**FIGURE 3.1**  
 Causes of Drinking Water Outbreaks in U.S.  
 1971-2014





Mars rover *Curiosity* explores the surface of the planet Mars, gathering data and sending it back to Earth.

## PROCEDURE

### PART A: DEVELOPING TIMELINES OF SCIENCE

- 1 Your group will investigate two separate timelines that address the development of scientific thinking: (1) about water on the planet Mars and (2) about imaging. You and your partner will investigate one of these timelines. You will start by receiving 3 Timeline cards from your teacher.
  - a Work together to determine the sequence of these three events.
  - b Describe why you think these events happened in this sequence.
  - c Record your ideas in your science notebook.
- 2 Ask your teacher for the rest of the cards for your timeline. Work with your partner to read and sort these events in the order you think they occurred. Record the sequence in your science notebook.
- 3 Discuss with your partner why you think these events happened in this sequence and record your ideas in your science notebook.
- 4 Ask your teacher for Student Sheet 3.1a or 3.1 b, “Timeline Dates,” and compare your sequence with the historical sequence. Reorder your cards as needed and correct your sequence in your science notebook.

### MATERIALS LIST

FOR EACH GROUP  
OF FOUR STUDENTS

— 2 SETS OF  
TIMELINE CARDS

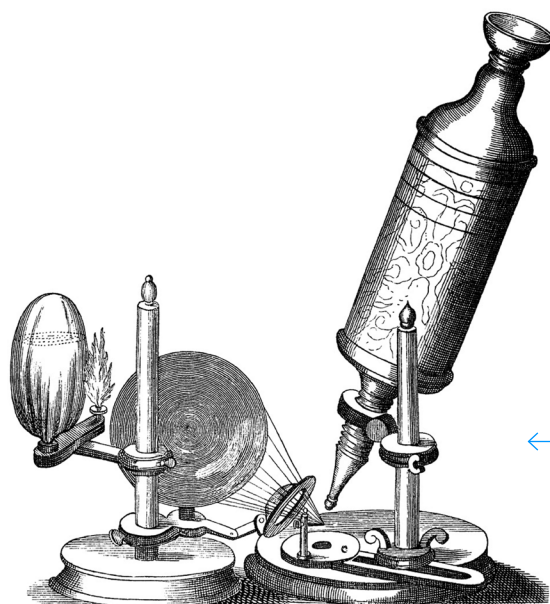
FOR EACH STUDENT

— STUDENT SHEET  
3.1A OR 3.1B  
“Timeline Dates”

— STUDENT SHEET 3.2  
“Timeline Analysis”

## PART B: ANALYZING TIMELINES OF SCIENCE

- 5 Work with your partner to identify a sequence in the timeline where a new scientific tool or experiment led to a new observation. Record this information on Student Sheet 3.2, “Timeline Analysis.”
- 6 Work with your partner to:
  - a identify a sequence in the timeline where an observation led to a new idea. Record this information on Student Sheet 3.2.
  - b discuss what previous observations were also required for this new idea to be developed.
- 7 Work with your partner to identify a sequence in the timeline where an explanation was revised based on new evidence. Record this information on Student Sheet 3.2.
- 8 Work with your partner to identify a sequence in the timeline where an idea was later rejected or updated by the scientific community. Record this information on Student Sheet 3.2.
- 9 Discuss with your partner how science has advanced human understanding of this topic over time. Use the information from your Timeline cards as evidence for your thinking.
- 10 You and your partner will share your work with another pair who has a different set of Timeline cards. Share the most important aspects of your timeline with the rest of your group.



English scientist Robert Hooke helped design this early microscope. The light from the oil lamp was diffused by the water to provide better illumination for the specimen.

## BUILD UNDERSTANDING

① Consider the following ways in which scientific ideas are revised:

- introduction of new evidence
- improved methods of data collection and experimentation
- collaboration with others
- trial and error

Which of these were represented in the timeline you investigated? Support your answer with examples from your timeline.

② Explain how new scientific tools and techniques can lead to new insights and questions.

③ **Scientific advancement** is the progress of science toward more accurate, reliable, and complete explanations of phenomena. Did the timeline you investigated represent scientific advancement? Support your response with at least three examples from your timeline.

## CONNECTIONS TO EVERYDAY LIFE

④ Today, people and teams around the world are able to easily communicate. What impact do you think this has on the speed of scientific discovery and technological innovation? Explain your thinking.

### KEY SCIENTIFIC TERMS

**scientific advancement**