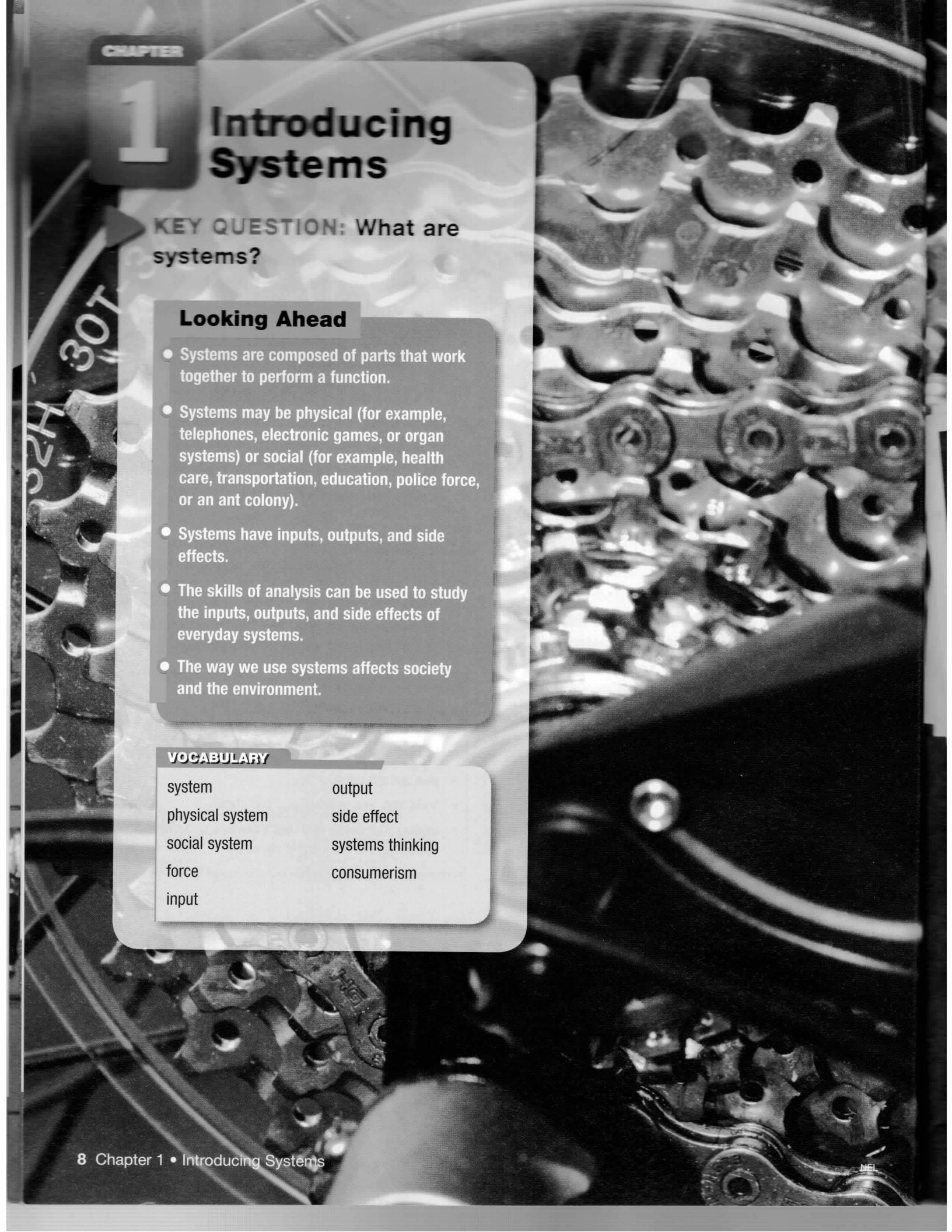


CHAPTER 1

Introducing Systems

KEY QUESTION: What are systems?

Looking Ahead

- Systems are composed of parts that work together to perform a function.
- Systems may be physical (for example, telephones, electronic games, or organ systems) or social (for example, health care, transportation, education, police force, or an ant colony).
- Systems have inputs, outputs, and side effects.
- The skills of analysis can be used to study the inputs, outputs, and side effects of everyday systems.
- The way we use systems affects society and the environment.

VOCABULARY

system	output
physical system	side effect
social system	systems thinking
force	consumerism
input	

More Than Meets the Eye

Pictures always tell a bigger story than seems to be the case at first glance. Like the BMX race that Zara and Ryan observed, the objects and scenes shown here are not unique or isolated; they contain smaller parts that work together and are connected to other things in their environment.

Excavators are large machines that do a lot of work.

Courts perform an important function in society.

Cameras are used to take pictures.

Blue boxes are used to help reduce the amount of garbage in landfills.

Ambulances are used to quickly and safely transport people who are sick or injured.

LINKING TO LITERACY

Inferring from Pictures

When we read, we use clues from the text and figures to determine or "infer" information that is not directly stated. Sometimes the information we get from figures helps us more clearly understand what we are reading.

1. Analyze each picture by asking yourself, "What is the main purpose of the object or scene illustrated in the picture? What smaller components does the object or scene contain that helps it fulfill its purpose? What connections may there be between the object or scene and other objects (including people) in its environment?" Record your thoughts in point form. Discuss your ideas with a partner.

1.1 Types of Systems

system: a group of parts that work together to perform a desired task

A handheld can opener is a device that makes life easier (Figure 1). The task of a can opener is quite simple—it must safely remove the lid of a can. A can opener is an example of a system. A **system** is a group of parts that function together to perform a specific task—in this case the safe removal of a can's lid.

LINKING TO LITERACY

Scanning

Scanning is a way of previewing the section to get a general idea of what it is about. Look at the title. Scan for highlighted words and definitions in the margin. Look for any figures and captions. Ask yourself, "What is this section about?"

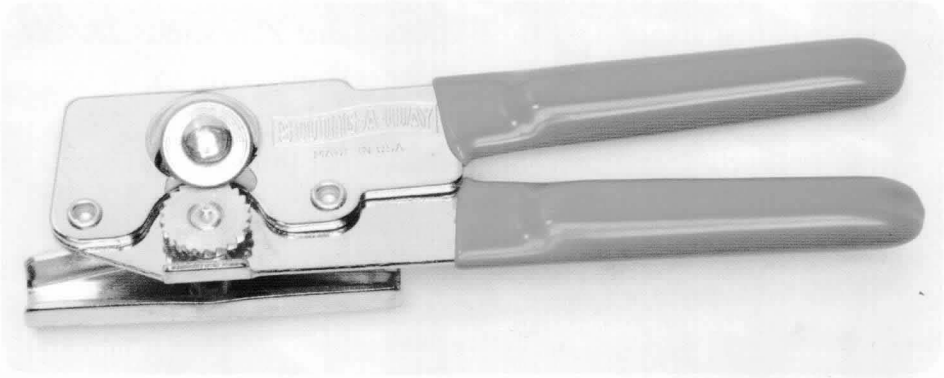


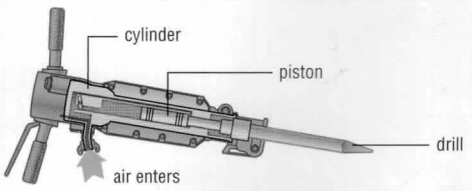
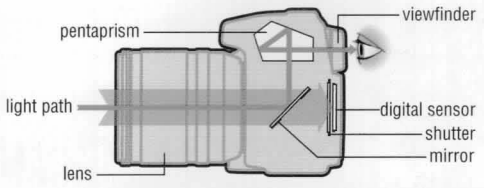
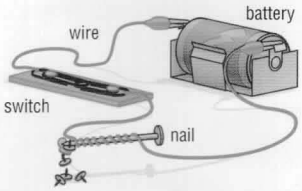
Figure 1 The parts of a can opener work together to hold the can and remove the lid.

Physical Systems

physical system: a group of physical parts that need to work together to perform a function

Physical systems refer to systems that rely on a group of physical parts to perform a function. Physical systems may be natural or human-made. Natural physical systems include the solar system and an animal's digestive system. Human-made physical systems include mechanical systems, optical systems, electrical systems, and combinations of these. The names of these systems come from the type of energy they use. Table 1 describes some human-made systems.

Table 1 Some Human-Made Physical Systems

Type of system	Example	Type of energy used	
mechanical	jackhammer (pneumatic drill)	energy stored in pressurized air	
optical	camera	light energy	
electrical	electric circuit	electrical energy	

Human-made physical systems are called tools, appliances, devices, instruments, gadgets, or utensils. These systems help us accomplish tasks faster than we normally would or even help us accomplish tasks that we normally would not be able to do. Many of the devices we use everyday are combinations of the systems described in Table 1. For example, a car is a combination of systems containing an engine, which is largely a mechanical system; brakes, which are usually hydraulic systems; and a radio, starter, lights, and computer chips that are mainly electrical systems.

Social Systems

A group of organisms working together to perform a task is a **social system**. Social systems may be natural or human-made. Examples of natural social systems are ant colonies, bee colonies, and a wolf or coyote pack (Figure 2). Human-made social systems include health care, education, and waste management systems, symphony orchestras (Figure 3), and rock bands. Social systems establish ways that people or other organisms interact and relate to one another.

social system: a group of people, or other organisms, joining together to perform tasks and establish relationships

To learn more about the honeybee social system, Go to Nelson Science

Figure 2 Coyotes have a well-defined social order within each pack.

Figure 3 Every performer in an orchestra has a specific part to play. However, they function together to perform a symphony.

Aboriginal Clan Systems

Human social systems have existed for thousands of years. The clan systems of traditional First Nations' peoples are social systems. For example, the Ojibwe (Figure 4) believe that the clan system was determined by the Creator and each clan was named in honour of an animal *doodem*, or totem. According to legend, six beings came out of the sea—the Bullhead (fish), Crane, Bear, Little Moose, Marten, and Thunderbird. These beings were used as the basis for the original clans. There are now at least 20 different clans among the Ojibwe bands.

Figure 4 Woodland Raven by Mark Seabrook. In Ojibwe First Nation, the Raven is a bringer of news. Animals represent many things, including clans, in First Nations.

Table 2 lists some of the common Ojibwe clans. Clan systems are used as a form of government and as a way of determining the tasks that people in the clan perform.

Table 2 Some Ojibwe Clans and Their Traditional Roles

Clan	Ojibwe name	Role/occupation
Crane and Loon	*Ajejauk* (Crane)	• share chieftainship • conduct communication with outsiders • assist with communication within the band
Fish	*Giigo*	• teachers and scholars • help settle arguments between the leaders of the Crane and Loon clan
Bear	*Makwa*	• police and guardians • have knowledge of the environment and learn of natural medicines available in the environment
Hoof	*Waawaashkeshi* (Deer), *Adik* (Caribou)	• gentle caregivers • look after housing and recreation
Marten	*Waabizheshi*	• hunters, gatherers, and warriors
Bird	*Maang*	• spiritual leaders

Communities are traditionally governed by a band council made up of leaders from the various clans. The clan system also governs relations between tribes and helps provide guidance about marriages. In the Ojibwe Nation, clans are passed down the generations through the male family line. The Mohawk clans follow the mother's bloodline. Clan Mothers choose chiefs, raise leaders, record names, and advise partnerships. The clan continues to be an important element of First Nations identity.

To learn more about Canada's First Nations, Go to Nelson Science

CHECK YOUR LEARNING

1. Give two examples of each of the following systems:
   - **(a)** mechanical system
   - **(b)** optical system
   - **(c)** hydraulic system
   - **(d)** electrical system
2. What do physical systems and social systems have in common? How are they different?
3. Give two examples of each of the following:
   - **(a)** physical systems designed by people
   - **(b)** naturally occurring physical systems
   - **(c)** social systems that you are a part of
   - **(d)** naturally occurring social systems
4. Why are Aboriginal clan systems considered human social systems?