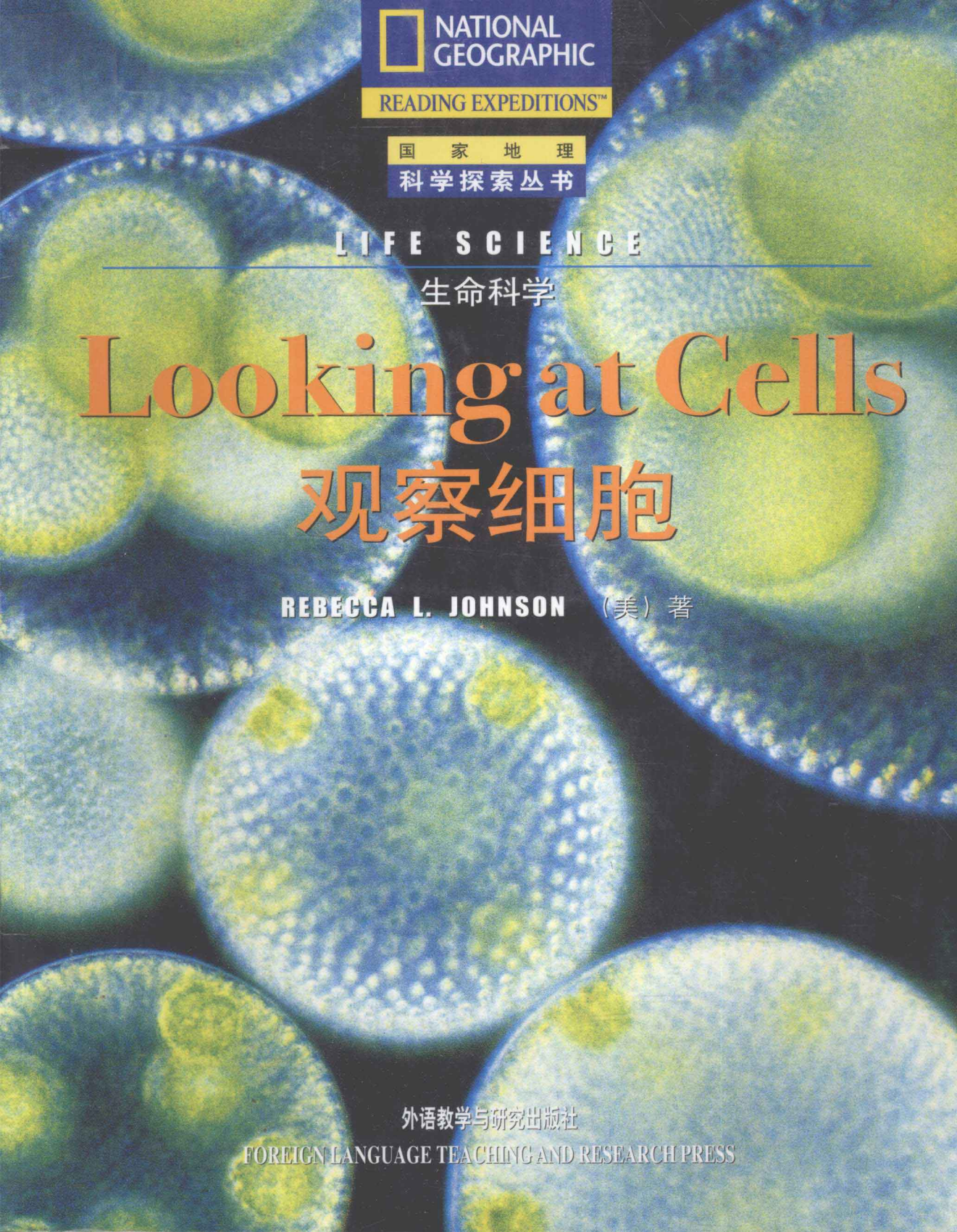
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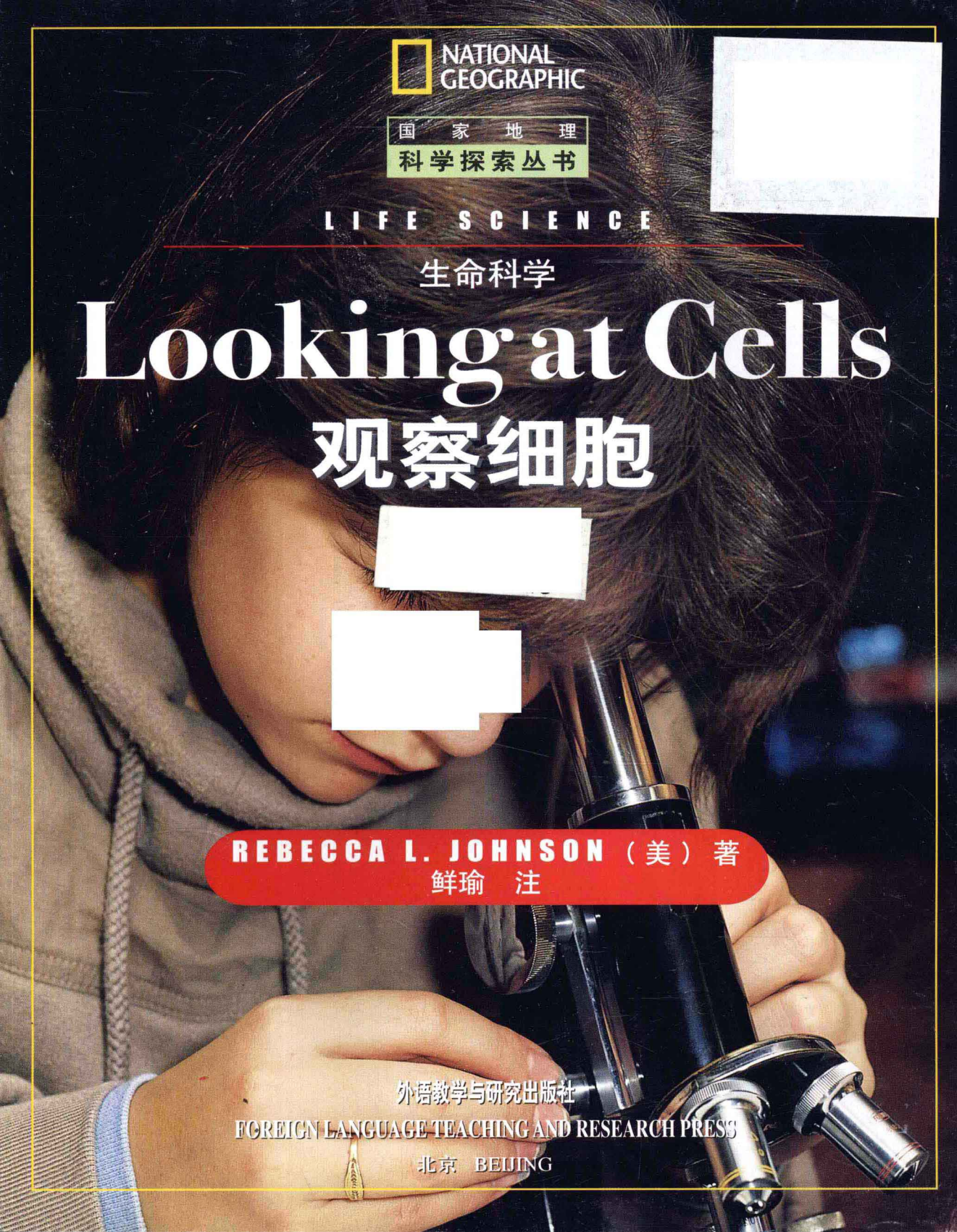
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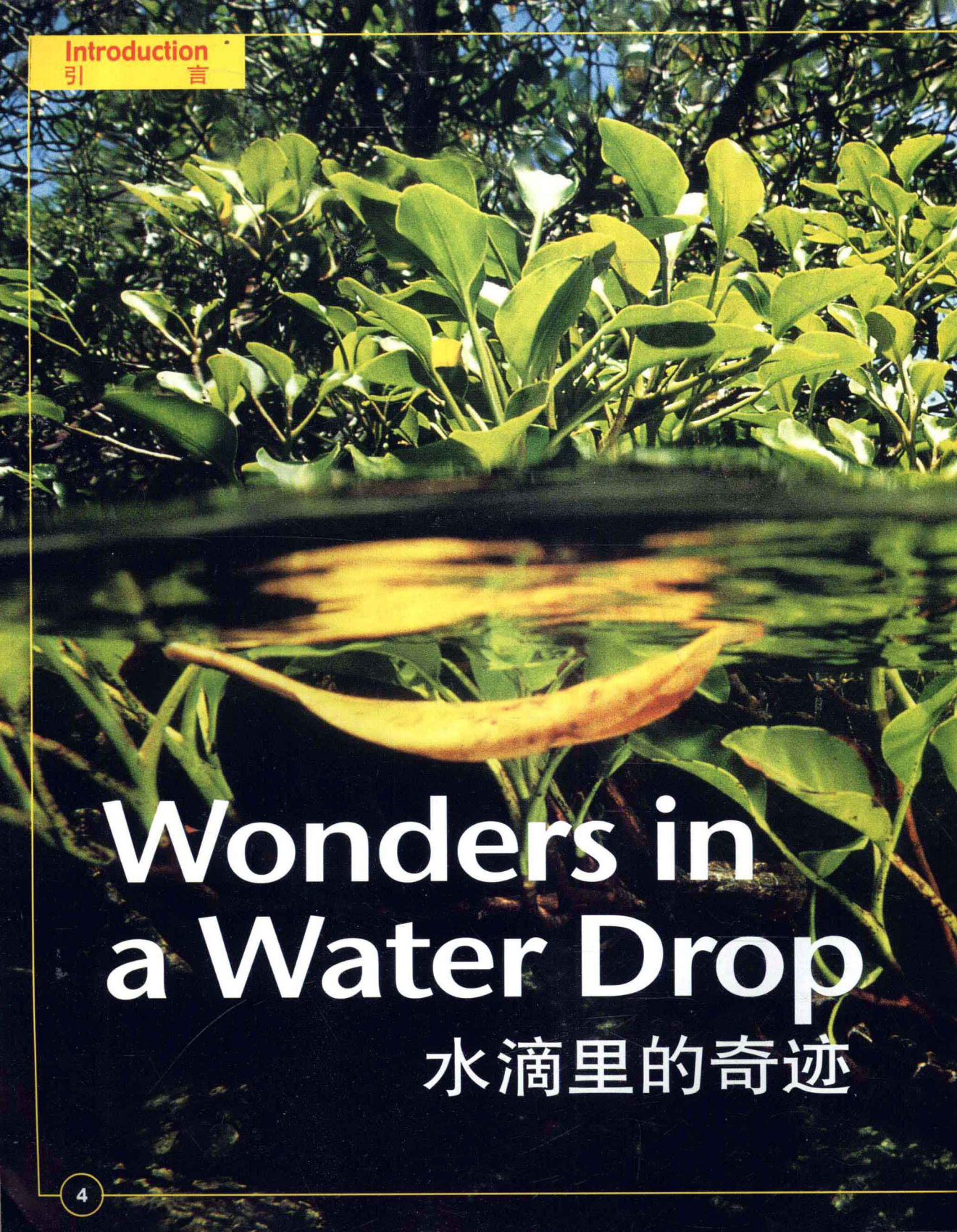
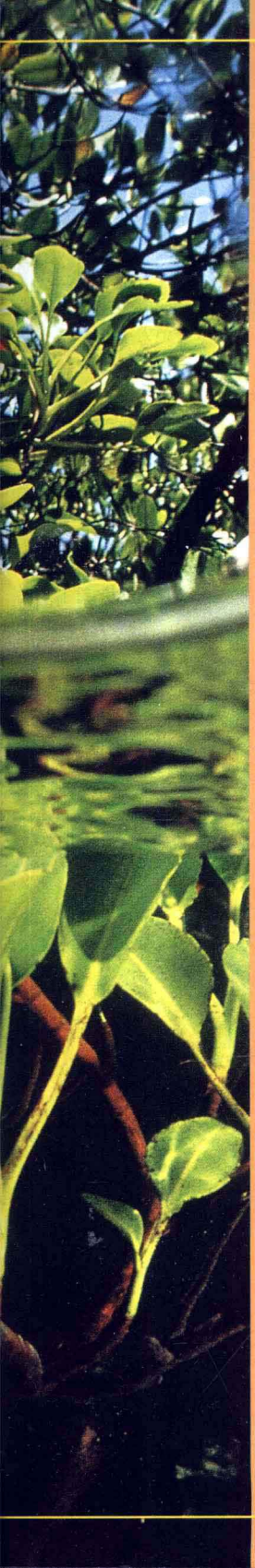
A greatly enlarged photograph of mitochondria—small structures inside cells



Wonders in a Water Drop

水滴里的奇迹

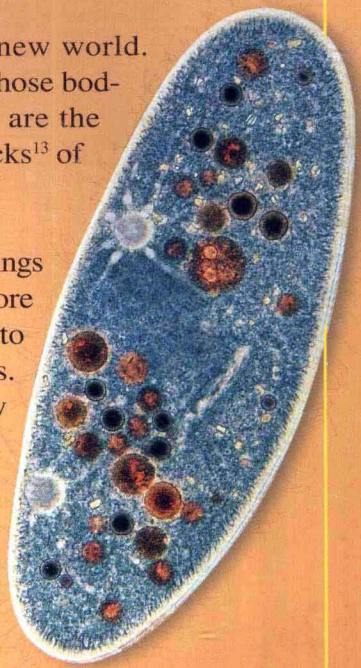


In the late 1600s a Dutch[1] shopkeeper named Antonie van Leeuwenhoek[2] (LAY-vuhn-hook) put a drop of pond[3] water on one of his homemade microscopes[4]. He held the device[5] up to his eye—and gasped[6]. Inside the drop, weird[7] little creatures[8] were swimming and spinning[9] and bumping[10] around. He hadn't seen anything like them. In fact, no one had!

Leeuwenhoek had discovered a whole new world. The water was home to tiny creatures whose bodies consisted of[11] just one cell[12]. Cells are the smallest units of life. They are the building blocks[13] of all living things.

Like the creatures in the water drop, some living things go through their entire[14] lives as single cells. More complex[15] organisms[16], from apples and apes[17] to zebras and zinnias[18], are made up of many cells. Your body is made up of trillions[19] of cells. Many different kinds of cells live in your body, and each kind has a different job to do.

At first glance[20], cells might seem simple. Just the opposite[21] is true. We've been studying cells for several hundred years. Yet we're just beginning to understand all the amazing[22] things they do.



A *Paramecium*[23] (greatly magnified[24], above) is a single-celled organism often found in pond water.

1. Dutch	*adj.*	荷兰的	
2. Antonie van Leeuwenhoek		安东尼·范·列文虎克（荷兰生物学家，显微镜学家）	
3. pond	*n.*	池塘	
4. microscope	*n.*	显微镜	
5. device	*n.*	装置	
6. gasp	*v.*	倒抽气	
7. weird	*adj.*	神秘的，不可思议的	
8. creature	*n.*	生物	
9. spin	*v.*	旋转	
10. bump	*v.*	撞击	
11. consist of		由……组成	
12. cell	*n.*	细胞	
13. building block		基础材料	
14. entire	*adj.*	整个的	
15. complex	*adj.*	复杂的	
16. organism	*n.*	生物体	
17. ape	*n.*	类人猿	
18. zinnia	*n.*	百日菊	
19. trillion	*n.*	万亿	
20. at first glance		乍看上去	
21. opposite	*adj.*	相反的	
22. amazing	*adj.*	令人惊异的	
23. Paramecium	*n.*	草履虫	
24. magnify	*v.*	放大	

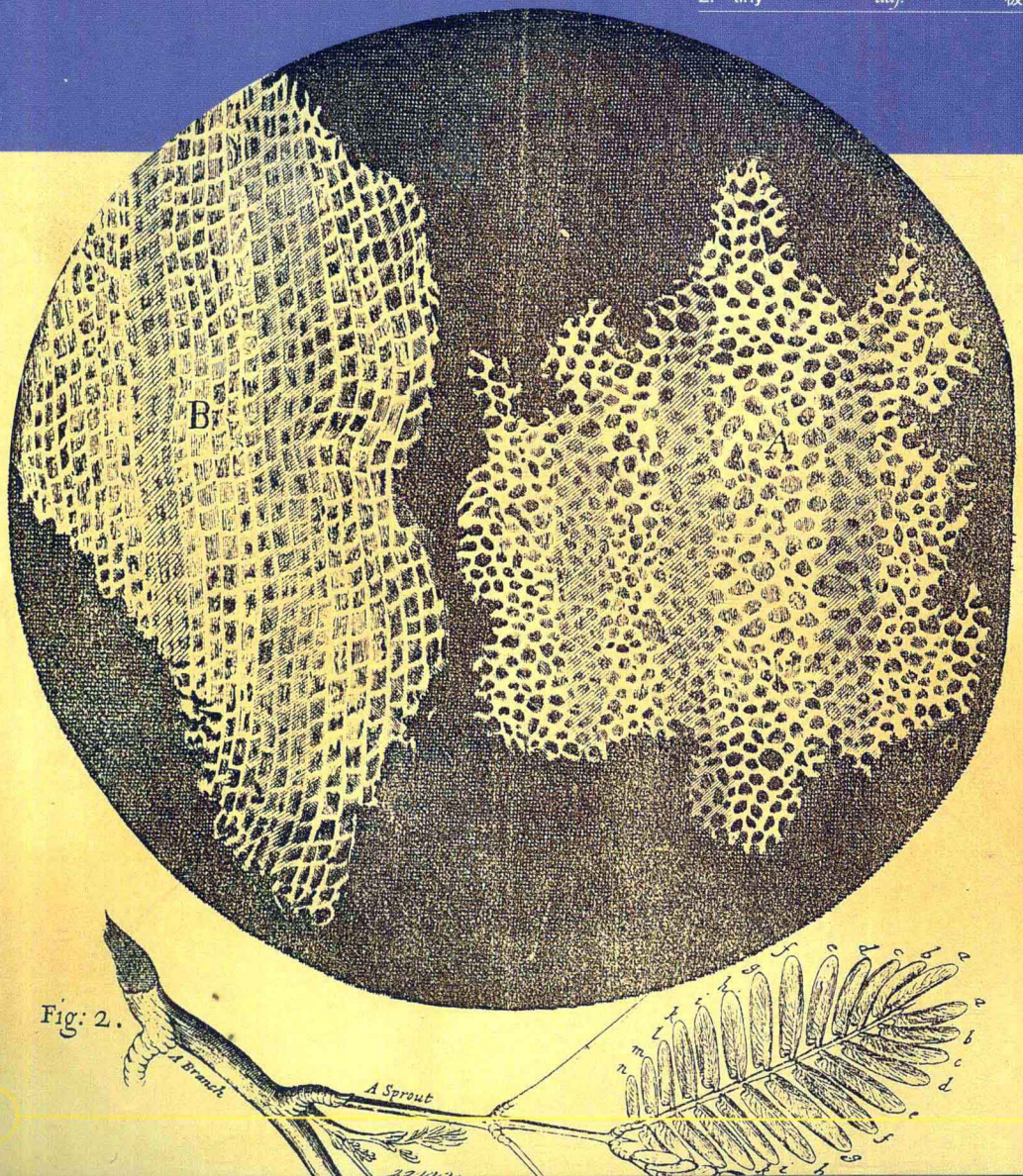
Chapter 第一章 1

Not-So-Simple Cells

细胞不简单

Most cells are too small to be seen with the naked eye[1]. In fact, people didn't even know cells existed—until someone invented a way to see very tiny[2] things up close.

1. naked eye 肉眼
2. tiny *adj.* 极小的；微小的



The tool that allowed people to peer into[1] the world of cells is the microscope. Leeuwenhoek's microscopes had just one lens[2], a small, round piece of polished[3] glass shaped so that it would magnify objects.

Other people were using microscopes that had two flatter lenses, one at each end of a long tube[4]. In about 1665 English scientist Robert Hooke used such a microscope to look at thin slices[5] of the cork[6] plant. To Hooke, the magnified cork seemed built of little compartments[7]. He called them cellulae, which is Latin[8] for "small rooms." That's how cells got their name.

As years passed, microscopes improved. Scientists used them to study parts of many plants and animals in great detail[9]. By the 1800s, people realized[10] that all living things were made up of one or more cells. Scientists saw many different kinds of cells under their microscopes. Most of those cells shared three basic features[11]—a membrane[12], a nucleus[13], and cytoplasm[14].

17th-century microscope

How do you think scientists studied living things before microscopes were invented?

The Cell Membrane

Surrounding[15] every cell is a cell membrane. At first scientists thought this membrane simply held the cell together and kept everything inside from leaking out[16]. Today we know that the cell membrane does much more. It allows some things, like certain chemicals[17], to pass into or out of the cell; it keeps others out.

1.	peer into		凝视
2.	lens	*n.*	透镜；镜片
3.	polished	*adj.*	磨光的
4.	tube	*n.*	管子
5.	slice	*n.*	薄片；切片
6.	cork	*n.*	木栓
7.	compartment	*n.*	分隔间；小间
8.	Latin	*n.*	拉丁语
9.	in great detail		非常详细地
10.	realize	*v.*	认识到
11.	feature	*n.*	特征；特点
12.	membrane	*n.*	膜
13.	nucleus	*n.*	细胞核
14.	cytoplasm	*n.*	细胞质
15.	surround	*v.*	包围；围绕
16.	leak out		渗漏
17.	chemical	*n.*	化学物质
18.	compare	*v.*	比较
19.	honeycomb	*n.*	蜂巢

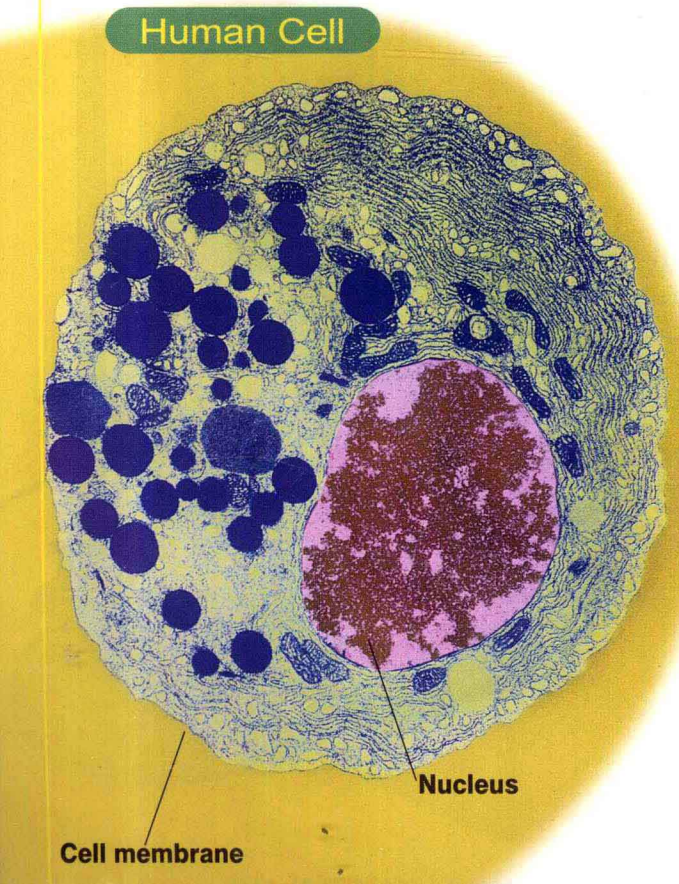
◀ Robert Hooke's drawings compare[18] the structure of honeycomb[19] (right) with cork.

The cell membrane is very choosy[1]. It has places that work like little doors. If the right kind of chemical comes along, the "door" will open and let the chemical in or out.

Plant cells and one-celled organisms called bacteria[2] have another layer[3]—a cell wall[4]—surrounding their cell membrane. The cell wall makes a cell strong and tough.

The Control Center

The users of early microscopes also noticed that most cells have a dark spot[5] inside, usually near the center. This spot came to be called the nucleus. Later scientists discovered that the nucleus is a tiny sac[6] full of thread-like[7] structures called chromosomes[8]. Chromosomes, in turn, are made up of genes[9]. A cell's genes control much of what the cell does—how and when to grow, how to change. Because the nucleus houses the genes, it is the major control center for the cell.



The Cytoplasm

The stuff that fills the cell and surrounds the nucleus is the cytoplasm. It's thicker than water. It's more like a just-made gelatin[10] dessert[11] that's not yet firm[12] enough to jiggle[13]. Floating[14] around in the cytoplasm are all sorts of chemicals. Some of these chemicals come in through the choosy cell membrane. Other chemicals are manufactured[15] by the cell itself.

Wait a minute! Manufactured? By what? You guessed[16] it—there's more to cells than just a membrane, nucleus, and cytoplasm. As people invented better and different kinds of

1.	choosy	*adj.*	慎重选择的；好挑剔的
2.	bacteria	*n.*	细菌
3.	layer	*n.*	层
4.	cell wall		细胞壁
5.	spot	*n.*	点
6.	sac	*n.*	囊
7.	thread-like	*adj.*	线状的
8.	chromosome	*n.*	染色体
9.	gene	*n.*	基因
10.	gelatin	*n.*	果冻
11.	dessert	*n.*	甜(尾)食；甜点心
12.	firm	*adj.*	稳固的；结实的
13.	jiggle	*v.*	轻摇；微动
14.	float	*v.*	漂浮
15.	manufacture	*v.*	制造
16.	guess	*v.*	猜测

A researcher uses a scanning[13] electron microscope.

microscopes, they discovered that the cytoplasm of most cells is packed with all sorts of structures called organelles[1]. Some of what we know about cell organelles has come from studying them using very powerful electron[2] microscopes. Some of these microscopes can magnify cells up to 300,000 times.

Some organelles look like long tubes. Others are shaped like peas or beans. Still others resemble[3] stacks[4] of pancakes[5]. Organelles, or "little organs[6]," inside cells all have different jobs to do.

Think about how a factory that manufactures cars or computers works. In a way, cells are factories. Their organelles work together to make, package[7], and ship chemical "products." So grab[8] a hardhat[9] and let's check out this factory.

Little Organs, Big Jobs

As you already know, the nucleus is the cell's control center. It's like the factory's main office, where the engineers[10] and architects[11]—the genes—are found. Genes are in charge of[12] planning and directing what goes on inside the cell.

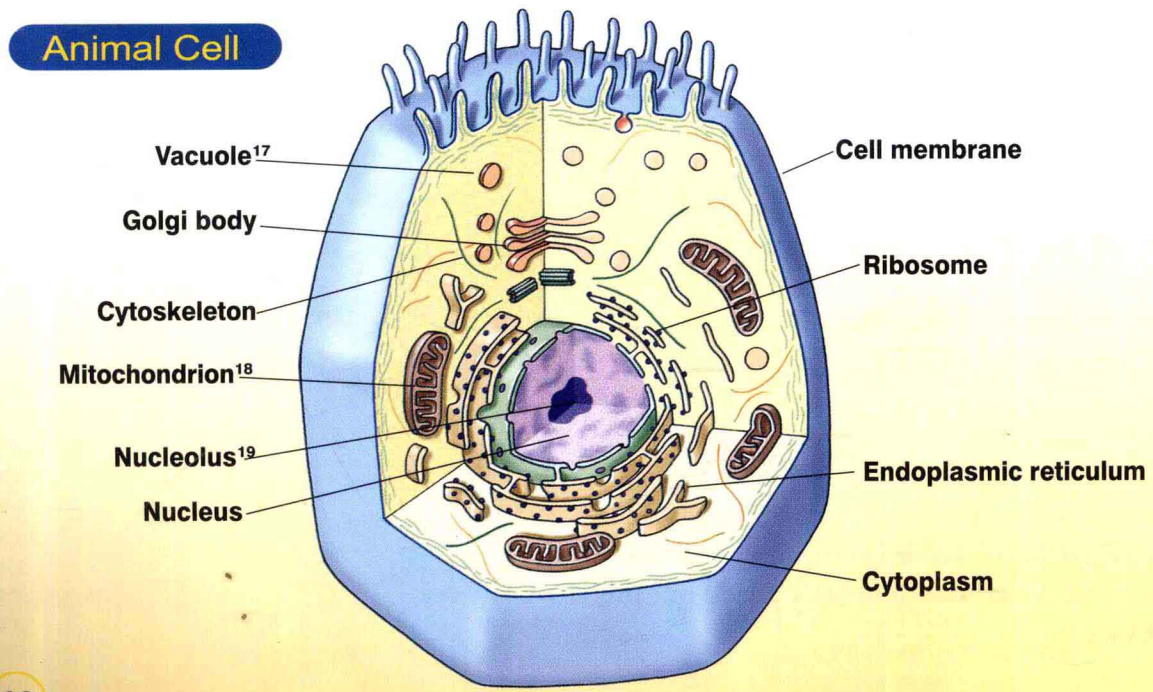
1.	organelle	*n.*	细胞器
2.	electron	*n.*	电子
3.	resemble	*v.*	像；类似
4.	stack	*n.*	叠
5.	pancake	*n.*	薄饼
6.	organ	*n.*	器官
7.	package	*v.*	包装
8.	grab	*v.*	抓取
9.	hardhat	*n.*	安全帽
10.	engineer	*n.*	工程师
11.	architect	*n.*	建筑师
12.	in charge of		负责
13.	scan	*v.*	扫描

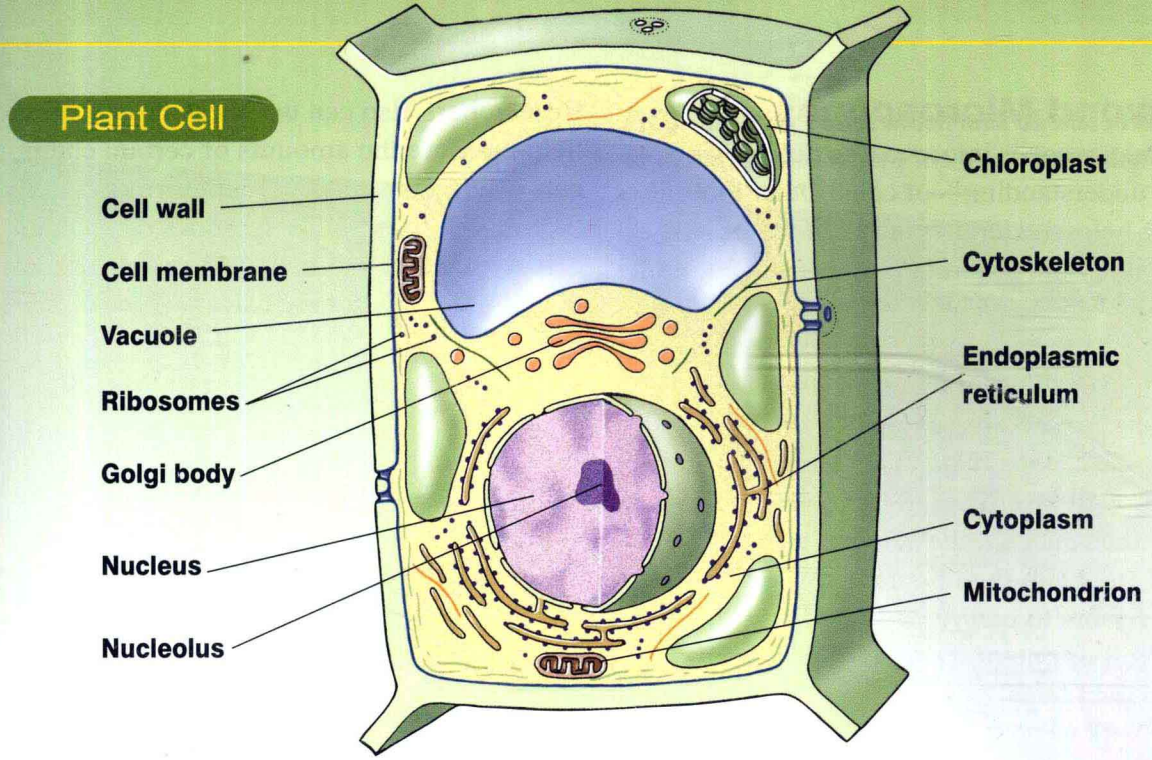
The Factory

Step out of the main office and you'll practically[1] run right into ribosomes[2]. These tiny, rounded organelles are like factory robots[3]. Ribosomes make chemicals called proteins[4]. They use plans sent from the nucleus to build different kinds of proteins. They build proteins by putting together small chemicals found in the cytoplasm. Inside the nucleus, there's a dark spot—the nucleolus—that helps make ribosomes.

Some ribosomes are plastered[5] onto the sides of the endoplasmic reticulum[6], or ER for short. The ER is a maze[7] of tiny curving[8], branching[9] tubes. It's the "assembly line[10]" in the cell factory. Newly made proteins enter at one end. As they move along, as if on a conveyor belt[11], they are tweaked[12] here and changed a bit there. When "finished" proteins reach the end of the ER, the tip pinches off[13] to form a little sac. This little sac cruises[14] through the cytoplasm and bumps into the Golgi body[15]. The Golgi takes in the proteins, changes them a bit more, and then sends them off in another little sac. Many of these protein packages move to the cell membrane and are released[16] to the outside.

1.	practically	*adv.*	<口>几乎；差不多
2.	ribosome	*n.*	核糖体
3.	robot	*n.*	机器人；自动装置
4.	protein	*n.*	蛋白质
5.	plaster	*v.*	贴附
6.	endoplasmic reticulum		内质网
7.	maze	*n.*	曲径；迷宫
8.	curving	*adj.*	弯曲的
9.	branching	*adj.*	分枝的
10.	assembly line		(工厂产品的)装配线
11.	conveyor belt		传送带
12.	tweak	*v.*	扭；拧
13.	pinch off		修剪
14.	cruise	*v.*	漫游；缓慢地移动
15.	Golgi body		高尔基体
16.	release	*v.*	释放
17.	vacuole	*n.*	液泡
18.	mitochondrion	*n.*	线粒体
19.	nucleolus	*n.*	核仁





The Power Plant[1]

All factories have a power plant to provide the energy[2] to run the equipment[3]. Mitochondria are the power plants inside cells. They contain[4] the chemical machinery needed to break down[5] sugars. The energy that is released makes the work going on in a cell possible.

In addition to[6] a power plant, some factories also have solar panels[7] that make electricity from sunlight. In a cellular[8] factory, chloroplasts[9] have a similar job. These organelles are found in the cells of plants and other living things that use sunlight to make their own food.

The Storage[10] Rooms

Every factory has storage rooms, where products and materials are stored. Vacuoles are the storage rooms inside cells. They are filled with chemical products the cells have made.

The cell's cytoskeleton[11] is a framework[12] that supports the cell, like the beams[13] and walls that support a factory building. Unlike a factory's framework, the cytoskeleton can flex[14] and change shape.

How are plant and animal cells alike and different?

1.	power plant		发电站
2.	energy	*n.*	能量
3.	equipment	*n.*	设备；装置
4.	contain	*v.*	包含
5.	break down		分解
6.	in addition to		除……之外
7.	solar panel		太阳能电池板
8.	cellular	*adj.*	细胞的
9.	chloroplast	*n.*	叶绿体
10.	storage	*n.*	贮藏
11.	cytoskeleton	*n.*	细胞骨架
12.	framework	*n.*	框架结构
13.	beam	*n.*	梁；横梁
14.	flex	*v.*	收缩；折曲

Beyond Microscopes

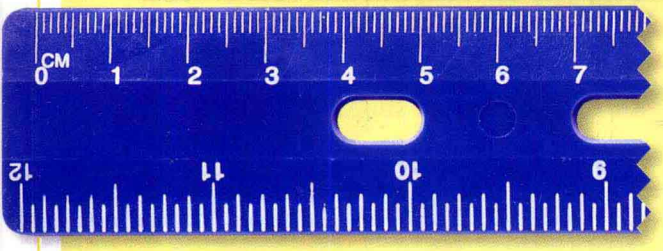
As microscopes improved, so did our view[1]—and understanding—of cells. Other tools also have helped scientists take cells apart so they can study the different parts, one at a time.

Two of the newest tools for studying cells are "laser tweezers[2]" and "laser scissors[3]." Lasers are beams[4] of pure light. Scientists now can focus[5] fine laser beams on living cells. One laser is used like tweezers. When it strikes the cell, the cell can't move. A second laser can then be used like a tiny knife or scissors to carry out delicate[6] surgery[7] on the cell or one of its organelles.

Researchers also can use these laser tools to help measure the amounts of certain chemicals inside living cells. That information tells them a lot about what is going on inside a cell at any given moment. Lasers help us look at cells in entirely new ways.

1.	view	*n.*	观点；见解
2.	laser tweezer		激光钳
3.	laser scissors		激光剪刀
4.	beam	*n.*	光束
5.	focus	*v.*	聚焦；集中
6.	delicate	*adj.*	精细的
7.	surgery	*n.*	手术
8.	tricky	*adj.*	难处理的；棘手的
9.	object	*n.*	物体
10.	millimeter	*n.*	毫米
11.	micrometer	*n.*	微米
12.	centimeter	*n.*	厘米

Thinking Like a Scientist: Measuring



Measuring is an important science skill. Most cells are very, very small, so measuring them can be tricky[8]. Microscopic objects[9] usually are measured in millimeters[10] (mm) or micrometers[11] (μm). A millimeter is 1/1000th of a meter. A micrometer is 1/1000th of a millimeter, or 1/1,000,000th of a meter.

To get a better idea of just how small cells are, look at the ruler pictured here. The longest lines along the top mark centimeters[12]. The shorter lines in between the centimeter lines are millimeter marks. Use the ruler to answer the following questions.

A frog egg cell is a pretty big cell; it's about 1 mm wide.
How much space on your ruler would a frog egg cover?

Frogs lay their eggs, which lack shells, in water or moist[4] places where the eggs won't dry out.

A human egg cell is about ten times smaller than a frog egg cell, or about 100 μm wide.
How many human egg cells would fit in the same space that a frog egg takes up[1] on the ruler?

A common type of bacterium that can be found in our intestines[2], *E. coli*[3], is just 1 μm in size. In other words, it's 1,000 times smaller than a frog egg.

So how many *E. coli* bacteria would fit in the same space that a frog egg takes up on the ruler?

If there are a thousand bacteria in just 1 millimeter, can you imagine how there can be a billion bacteria in just one handful of soil?

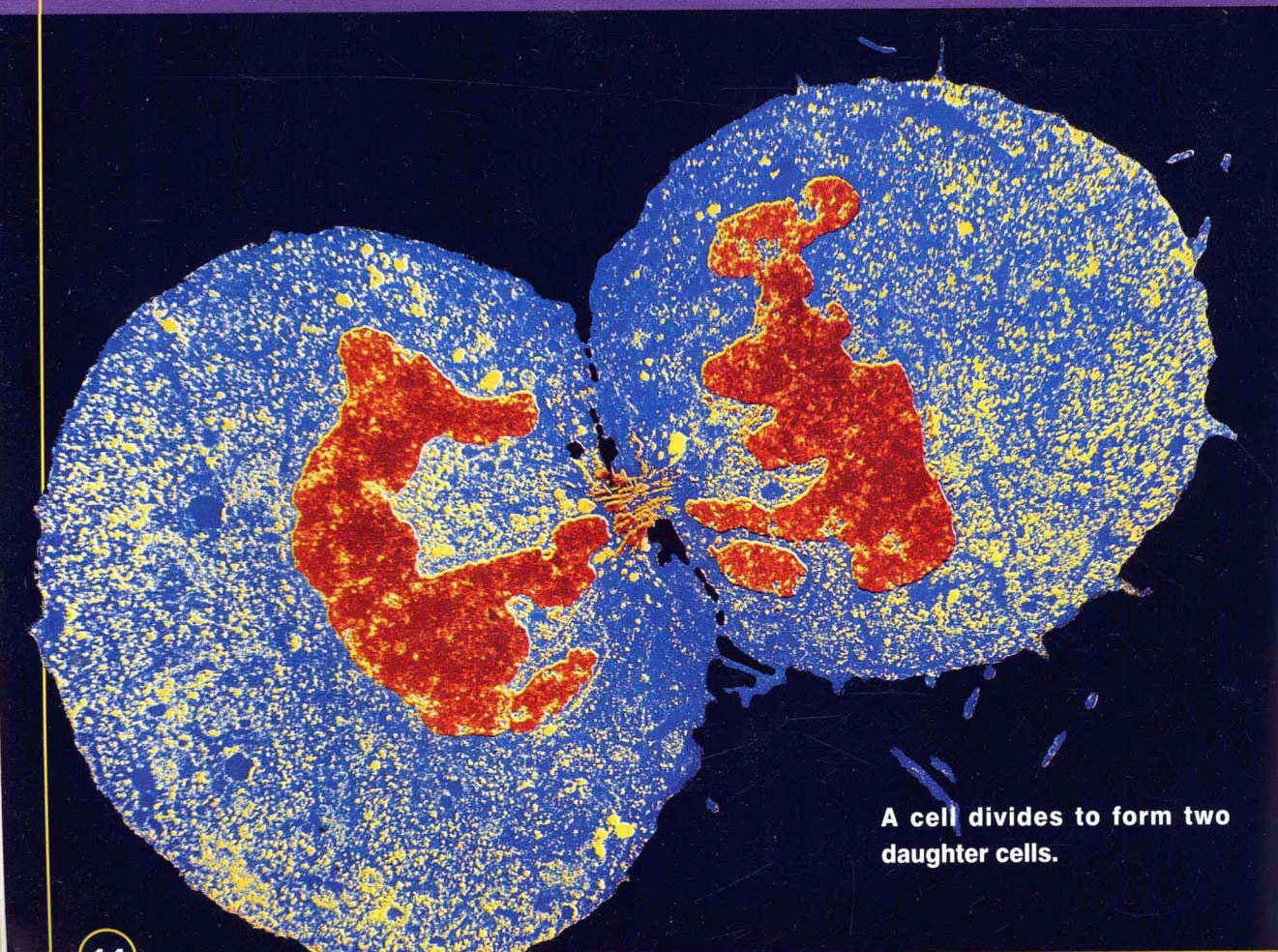
1.	take up		占据
2.	intestine	*n.*	肠
3.	*E. coli*		大肠杆菌
4.	moist	*adj.*	潮湿的

Chapter 2
第二章

How Cells Divide and Change

细胞的分裂与繁殖

You began life as a single cell. When you were born some nine months later, that single cell had become more than a trillion cells. How did this happen?



A cell divides to form two daughter cells.