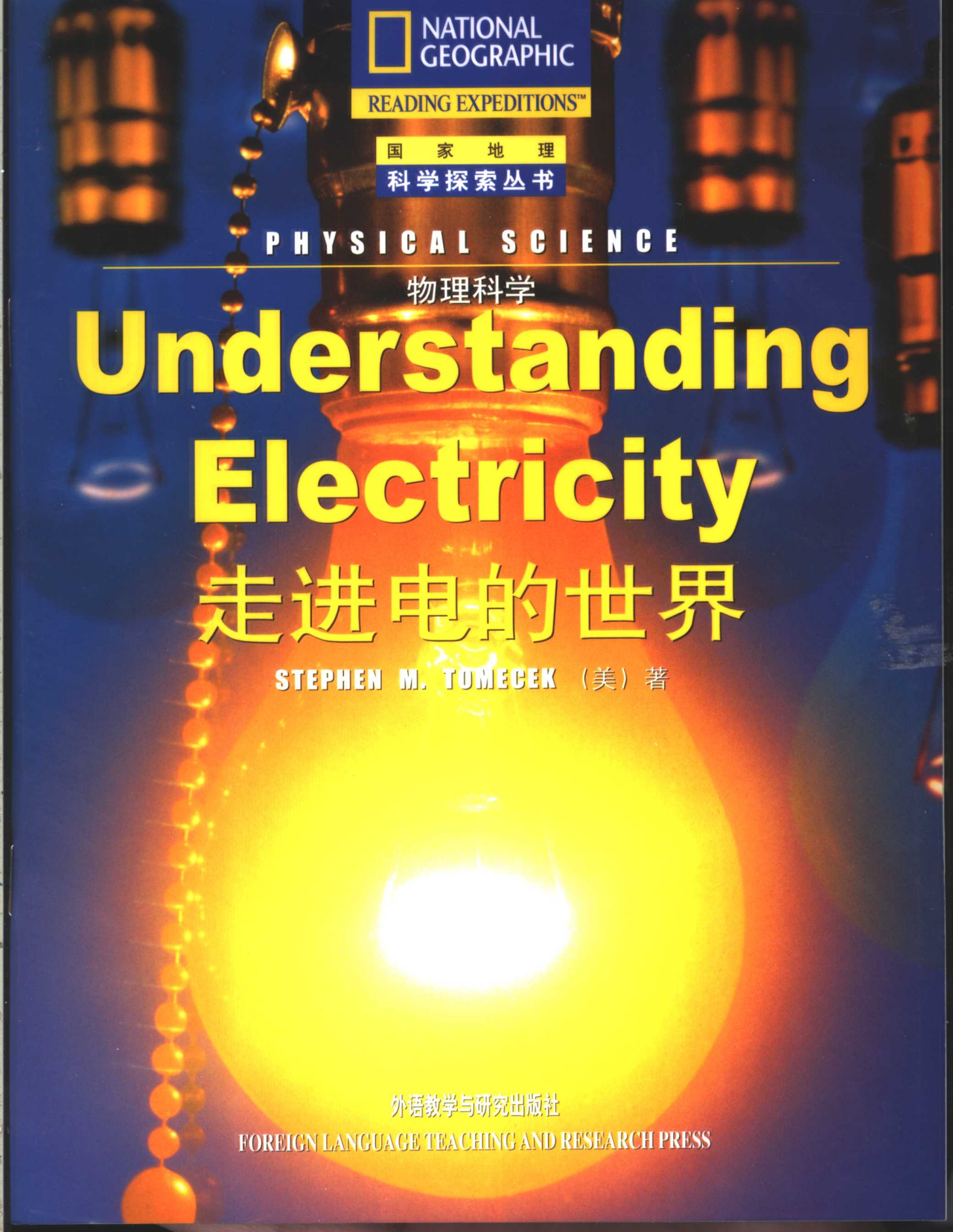

NATIONAL GEOGRAPHIC
READING EXPEDITIONS™
国 家 地 理
科学探索丛书
PHYSICAL SCIENCE
物理科学
Understanding Electricity
走进电的世界
STEPHEN M. TOMECEK （美）著
外语教学与研究出版社
FOREIGN LANGUAGE TEACHING AND RESEARCH PRESS

(京)新登字 155 号

京权图字：01－2003－3243

图书在版编目(CIP)数据

物理科学 走进电的世界/(美)托梅切克(Tomecek, S. M.)著;李文平注.—北京：外语教学与研究出版社,2003.9
(国家地理科学探索丛书·自然科学系列)
ISBN 7－5600－3662－7

Ⅰ.物… Ⅱ.①托… ②李… Ⅲ.英语—语言读物,物理学 Ⅳ.H319.4:O

中国版本图书馆 CIP 数据核字(2003)第 074191 号

物理科学
走进电的世界
STEPHEN M. TOMECEK (美) **著**
李文平 **注**

* * *

责任编辑：余 军
执行编辑：周 晶
出版发行：外语教学与研究出版社
社 址：北京市西三环北路 19 号 (100089)
网 址：http://www.fltrp.com
印 刷：北京瑞宝画中画印刷有限公司
开 本：740×975 1/16
印 张：2
版 次：2003 年 11 月第 1 版 2003 年 11 月第 1 次印刷
书 号：ISBN 7－5600－3662－7/H·1837
定 价：5.90 元

* * *

致读者

如果你希望读到地道的英语，在享受英语阅读乐趣的同时又能增长知识、开拓视野，这套由外语教学与研究出版社与美国国家地理学会合作出版的“国家地理科学探索丛书”正是你的选择。

“国家地理科学探索丛书”分为9个系列，内容涉及自然科学和社会研究，秉承《国家地理》杂志图文并茂的特色，书中配有大量精彩的图片，文字通俗易懂、深入浅出，将科学性和趣味性完美结合，称得上是一套精致的小百科。

这套丛书以英文注释形式出版，注释由国内重点中学教学经验丰富的英语教师完成。特别值得推荐的是本套丛书在提高青少年读者英语阅读能力的同时，还注重培养他们的科学探索精神、动手能力、逻辑思维能力和沟通能力。

本丛书既适合学生自学，又可用于课堂教学。丛书各个系列均配有一本教师用书，内容包括背景知识介绍、技能训练提示、评估测试、多项选择题及答案等详尽的教学指导，是对课堂教学的极好补充。

本套丛书是适合中学生及英语爱好者的知识读物。

国家地理科学探索丛书

自然科学系列

地球科学

火山与地震

环绕我们的大洋

天气与气候

地球历史揭秘

探索太空

人体

人体机器

了解大脑

战胜疾病

保持健康

健康的选择

物理科学

物质无处不在

神奇的光和声

机械运动

走进电的世界

力与运动

生命科学

神奇的动物

植物的力量

你和你的基因

观察细胞

保护地球母亲

今日科学聚焦

让全世界人都吃饱

全球变暖

濒危物种

能源利用

漫游因特网

实地科学探索

探索古代文明

水下探宝

恐龙探究

保护灵长类动物

保护海洋

社会研究系列

文明的进程

中国

埃及

希腊

墨西哥

罗马

美国之旅

东北部

东南部

西南部

中西部

西部

别小看孩子

孩子关心地球

孩子理财

孩子是消费者

孩子掌握信息沟通

NATIONAL GEOGRAPHIC

国家地理
科学探索丛书

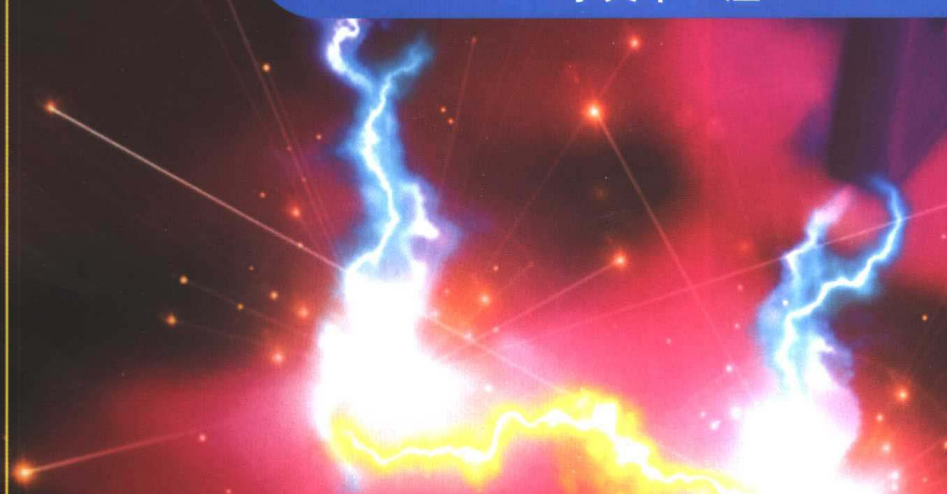
PHYSICAL SCIENCE

物理科学

Understanding Electricity

走进电的世界

STEPHEN M. TOMECEK（美）著
李文平 注



外语教学与研究出版社
FOREIGN LANGUAGE TEACHING AND RESEARCH PRESS
北京 BEIJING

Contents
目　录

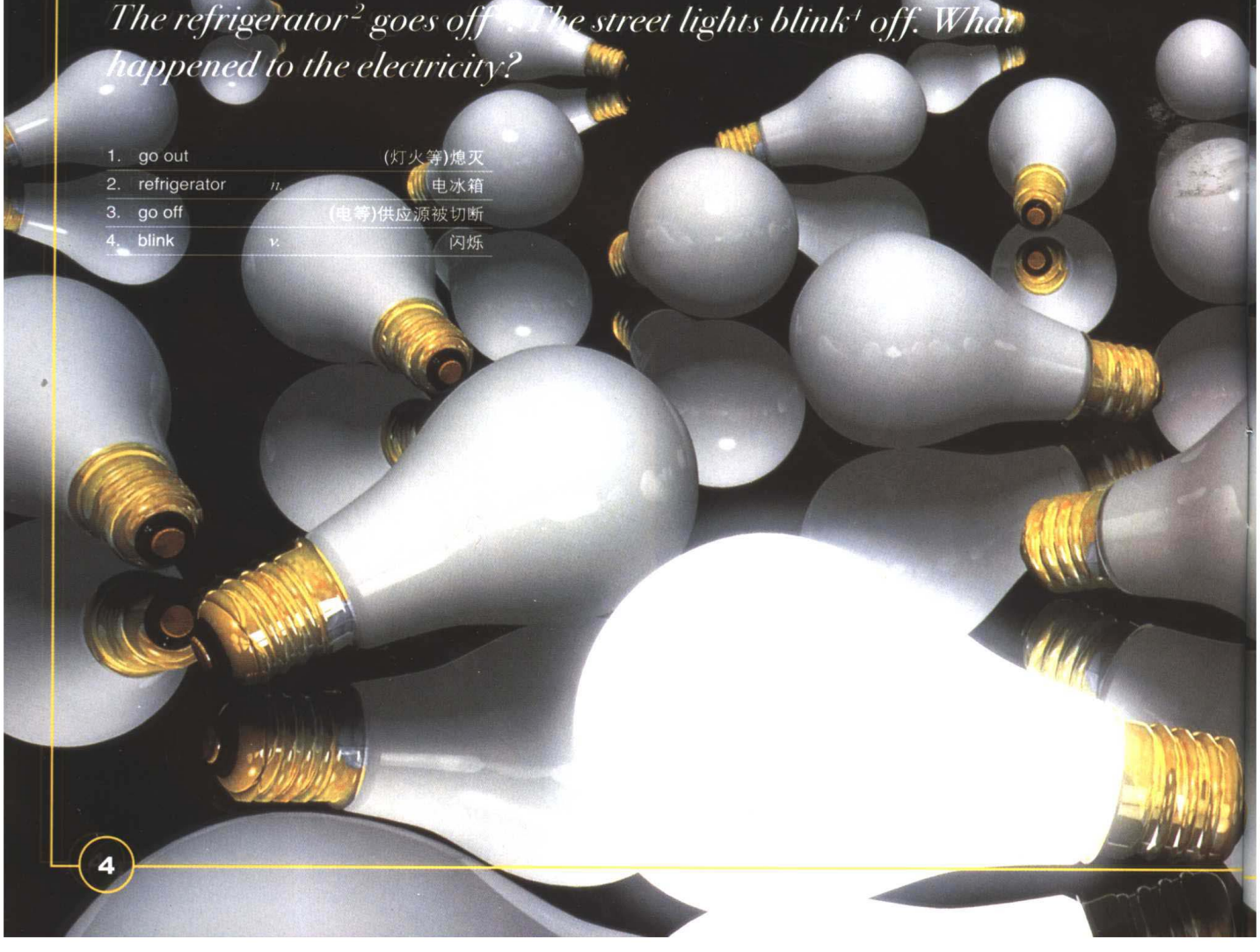
A tourist strolls through a tunnel of neon lights at Epcot Center in Orlando, Florida.

Who Turned Out the Lights?

谁关了灯？

You're sitting at home eating dinner and suddenly—the lights go out[1]. The refrigerator[2] goes off[3]. The street lights blink[4] off. What happened to the electricity?

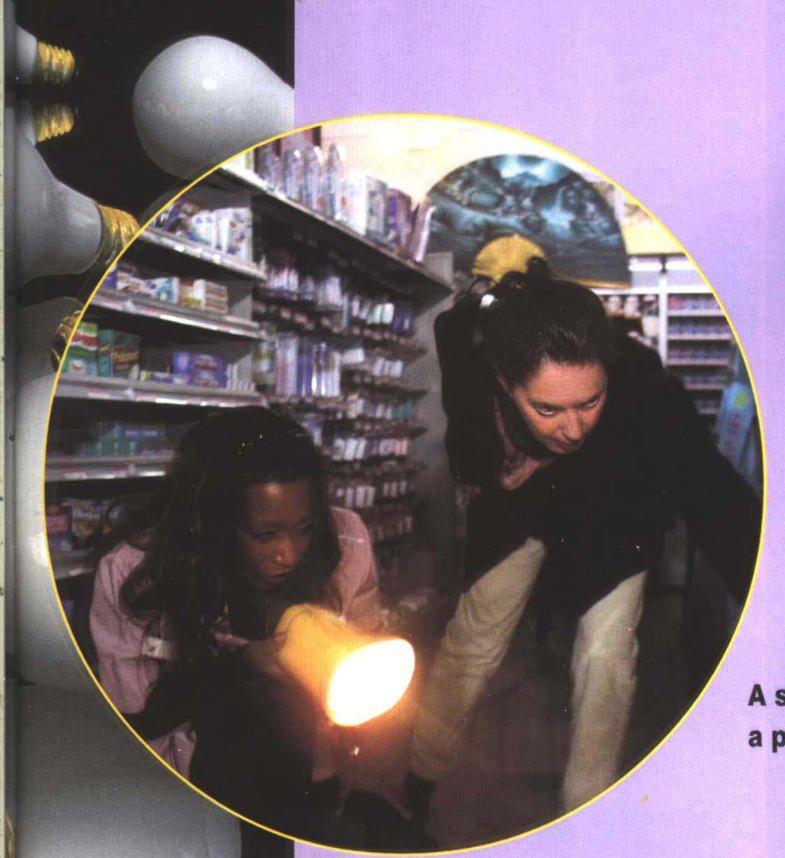
1. go out　　(灯火等)熄灭
2. refrigerator　*n.*　电冰箱
3. go off　　(电等)供应源被切断
4. blink　*v.*　闪烁



On March 21, 2001, situations[1] like this happened all over the state of California[2]. It was the first full day of spring and the weather was unusually warm. People turned on air conditioners[3] and fans to cool off. These devices[4] run on[5] electricity—and they added to the electrical demand created[6] by the computers, lights, and other equipment[7] already running. Suddenly there wasn't enough electricity to meet the demand. So power[8] companies cut power to some areas. This caused many problems—but a statewide power failure would have been far worse.

Will this happen in California again? Can it happen in other parts of the country? To understand the answers to these questions, you have to understand how electricity works. This is a book about electrical power and how it affects[9] all of us. So get ready to explore[10]. You may find the experience quite shocking[11]!

1.	situation	*n.*	情况
2.	California		加利福尼亚州
3.	air conditioner		空调
4.	device	*n.*	装置
5.	run on		靠(某种动力或燃料)运转
6.	create	*v.*	引起；造成
7.	equipment	*n.*	设备
8.	power	*n.*	电力
9.	affect	*v.*	影响
10.	explore	*v.*	探究；探索
11.	shocking	*adj.*	令人震惊的



A store in California during a power failure

Chapter 1
第一章

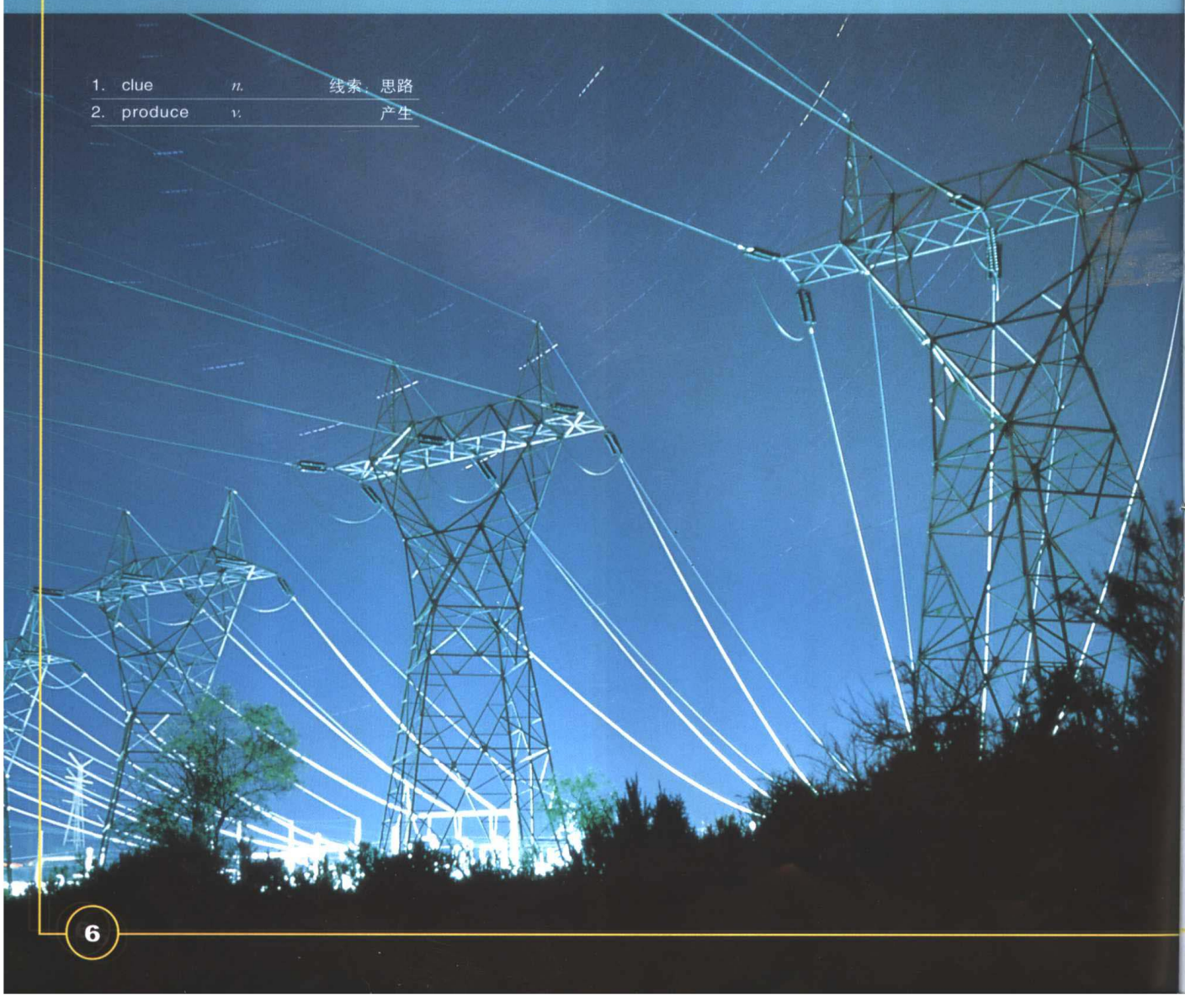
Making Electricity:

Going with the Flow

电的产生：电流

Do you know where electricity comes from? Even though most of us use it all the time, many people don't have a clue[1] how electricity is produced[2].

1. clue *n.* 线索；思路
2. produce *v.* 产生



Simply put, electricity is a form of energy[1]. Energy at work, or power, makes things move. You need energy to live and grow. The energy to run your body comes from food. Most cars get their energy from the gasoline[2] they burn. Most of the energy that powers[3] living things on Earth comes from our sun.

Using Electricity

Of all the different types of energy we use in our daily lives, electricity is one of the most important. What makes electricity special? It can be used to power many different things. It can give us light. It can keep us cool in the summer and warm us in the winter. You can use it to make popcorn[4] or watch your favorite movie. You can even use electricity to talk to your friends.

Today most people on Earth use electrical power. Electricity is used in homes, schools, businesses, and cars. In fact, people come up with new uses for electricity every day. It's hard to believe that a little more than 200 years ago nothing ran on electricity. While people of the past knew about electricity, they didn't know how to tap[5] into its power.

Electricity powers CD players and brings music to your ears.

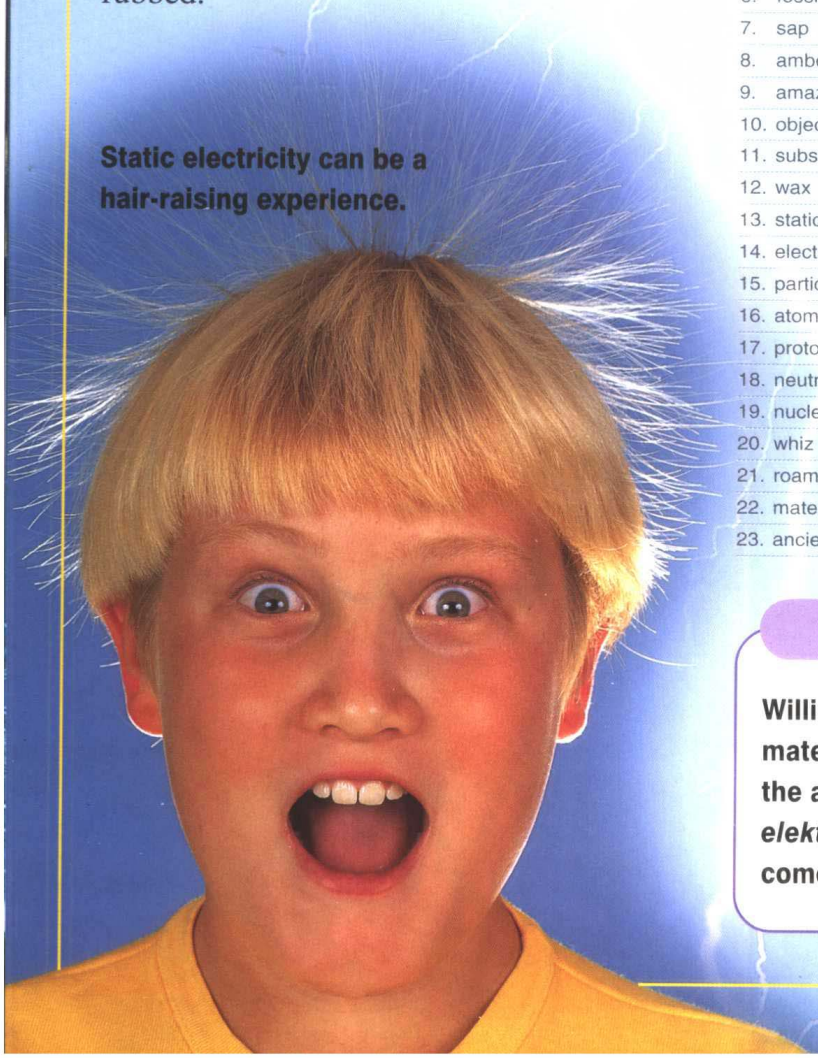
1. energy *n.* 能量，能源
2. gasoline *n.* 汽油
3. power *v.* 赋予……动力
4. popcorn *n.* 爆米花
5. tap *v.* 接通(电源总线)

How many of the things that you have used today run on electricity?

Simple Attractions[1]

One of the first people to record experiments with electricity was Thales[2] of Miletus[3], a philosopher[4] who lived more than 2,500 years ago in ancient Greece. Thales discovered that if he rubbed[5] a piece of fossilized[6] tree sap[7] called amber[8] with sheepskin, something amazing[9] happened. When he brought the amber near dried grass or feathers, these objects[10] would jump up and stick to the amber.

In the year 1600, an English doctor named William Gilbert discovered that amber wasn't the only thing with this strange power. He found that other substances[11] like rubber, glass, and wax[12] also attracted things when rubbed.



Static electricity can be a hair-raising experience.

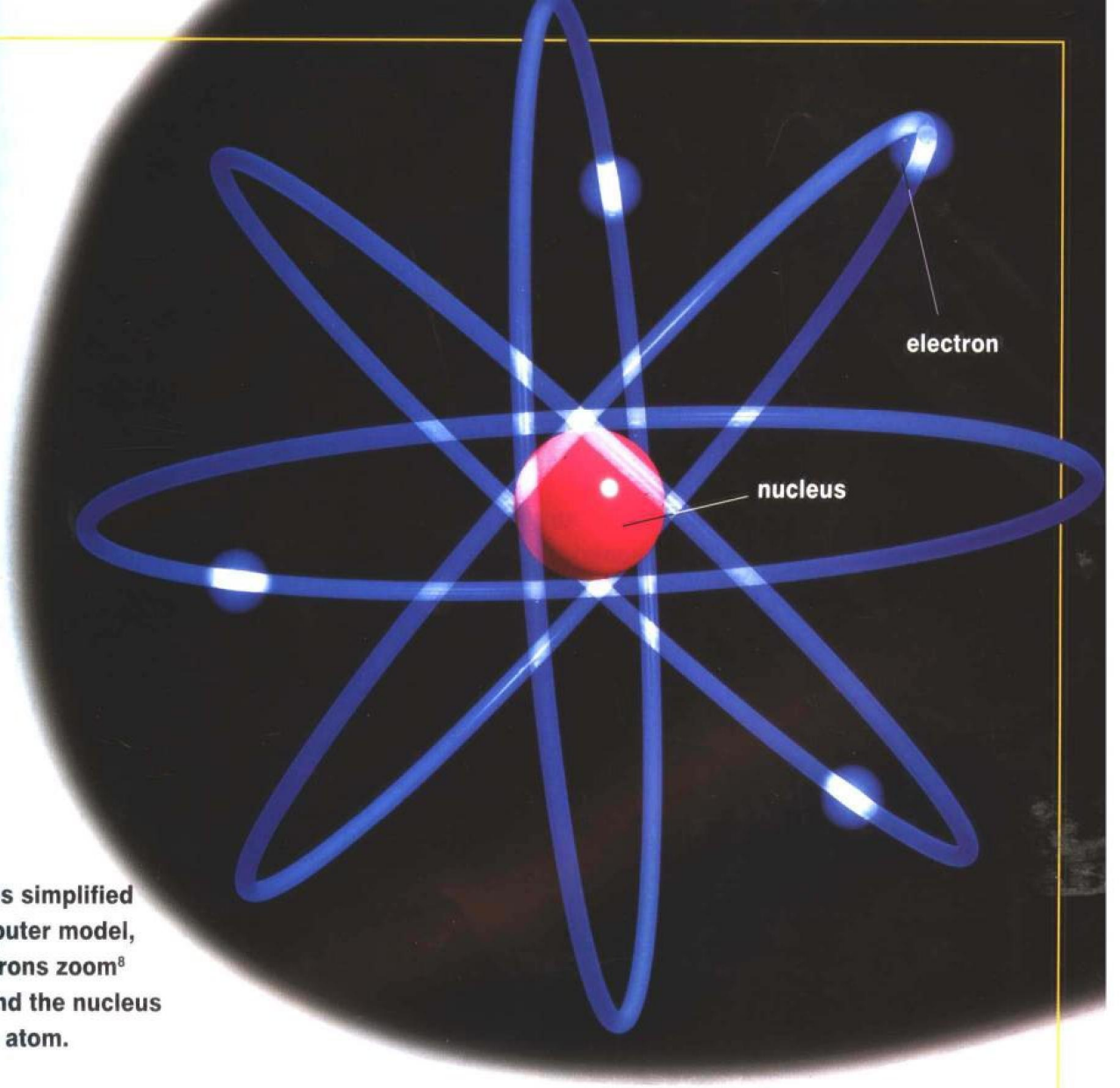
Static Electricity[13]

Did you know that it is electrons[14] that make electric power possible? Everything on Earth is made of very small particles[15] called atoms[16]. Atoms are made of protons[17], neutrons[18], and electrons. The protons and neutrons are packed together to form what's called the nucleus[19] of the atom. Whizzing[20] around the outside of the nucleus are electrons that can roam[21] from atom to atom. The movement of these tiny electrons is electricity.

1. attraction	*n.*	引力
2. Thales		泰利斯(古希腊哲学家)
3. Miletus		米利都学派
4. philosopher	*n.*	哲学家
5. rub	*v.*	摩擦
6. fossilize	*v.*	变成化石
7. sap	*n.*	树液
8. amber	*n.*	琥珀
9. amazing	*adj.*	令人惊奇的
10. object	*n.*	物体
11. substance	*n.*	物质
12. wax	*n.*	蜡
13. static electricity		静电
14. electron	*n.*	电子
15. particle	*n.*	颗粒；微粒
16. atom	*n.*	原子
17. proton	*n.*	质子
18. neutron	*n.*	中子
19. nuclear	*n.*	(*pl.* nucleus) (原子)核
20. whiz	*v.*	(使)嗖嗖移动(或飞驰)
21. roam	*v.*	漫游
22. material	*n.*	材料
23. ancient	*adj.*	古代的

Word Power

William Gilbert called all the attracting materials[22] he tested "electrics" because the ancient[23] Greek word for *amber* was *elektron*. The modern word "electricity" comes from this word.



In this simplified computer model, electrons zoom[8] around the nucleus of an atom.

Static is one form of electricity. For example, when Thales rubbed amber with sheepskin, some of the electrons from atoms on the sheepskin were rubbed off onto the amber. When many electrons collect on a surface[1], they crowd together. Eventually[2] some of them can jump off the surface, or discharge[3].

Sometimes you can get a shock from this static discharge. When you walk across a rug[4] in dry weather, electrons rub off the rug and collect on you. As you get close to an object like a doorknob[5], the electrons can jump to it. Ouch! You get a zap[6] and see a little spark[7]. If you want to see static big time, just look at lightning. It is a static discharge, too.

1.	surface	*n.*	表面
2.	eventually	*adv.*	最后，终于
3.	discharge	*v.*	放电
4.	rug	*n.*	小地毯
5.	doorknob	*n.*	(门上的)球形把手
6.	zap	*n.*	击，袭击
7.	spark	*n.*	火花，火星
8.	zoom	*v.*	飞快地掠过

Current Electricity[1]

Ever hear of a volt[2]? When you buy a battery, you might look to see how many volts it has. The voltage[3] of a battery tells something about its power. A volt is a unit of electrical pressure[4]. It is named for the Italian scientist Alessandro Volta[5]. Volta discovered a type of electricity called current electricity. Current electricity is a constant[6] stream[7] of electrons.

In 1800 Volta did experiments[8] with metal disks[9] and fabric[10] that had been soaked[11] in acid[12]. He found that if he connected the metal disks with a wire, electrons would flow from one disk to another. This stack[13] of metals, fabric, and acid was the very first battery.

The Electricity-magnetism Connection

During the early 1800s, scientists discovered a link[14] between magnetism[15] and electricity. Scientists had known for years that magnets attracted metals. Then scientists learned that when electricity flows through a wire, the wire attracts other metals, such as iron and steel. In other words, the wire becomes magnetized. When the current is turned off, however, the wire no longer acts like a magnet. Wrapping[16] a current-carrying coil[17] of wire around a piece of iron causes the iron to become magnetized as well. When a metal is magnetized by electricity, it is called an electromagnet[18].

Volta used a stack of metal disks, fabric, and acid to make the first battery.

1.	current electricity		电流
2.	volt	*n.*	伏特
3.	voltage	*n.*	伏特数；电压
4.	pressure	*n.*	压力
5.	Alessandro Volta		亚历山德罗·伏特(意大利物理学家，发明了电池等)
6.	constant	*adj.*	不断的，经常的
7.	stream	*n.*	流动 一连串
8.	experiment	*n.*	实验
9.	metal disk		金属盘
10.	fabric	*n.*	纺织品，织物
11.	soak	*v.*	浸湿
12.	acid	*n.*	酸
13.	stack	*n.*	组；套
14.	link	*n.*	联系
15.	magnetism	*n.*	磁
16.	wrap	*v.*	缠绕
17.	coil	*n.*	(一)卷，(一)圈
18.	electromagnet	*n.*	电磁体，电磁铁

The real breakthrough[1] came in 1831 when English scientist Michael Faraday[2] asked a simple question. If electricity could make wire and metal act like a magnet, could a magnet be used to make electricity flow in a wire? After many experiments, he discovered that the answer was yes! To get electrons to flow through a wire, Faraday moved a strong magnet past a coil of wire. He built the first electric generator[3]—a machine that uses a magnet to produce current electricity. Why was this such an important discovery? Well, without a generator, almost none of today's power plants would be able to make electricity.

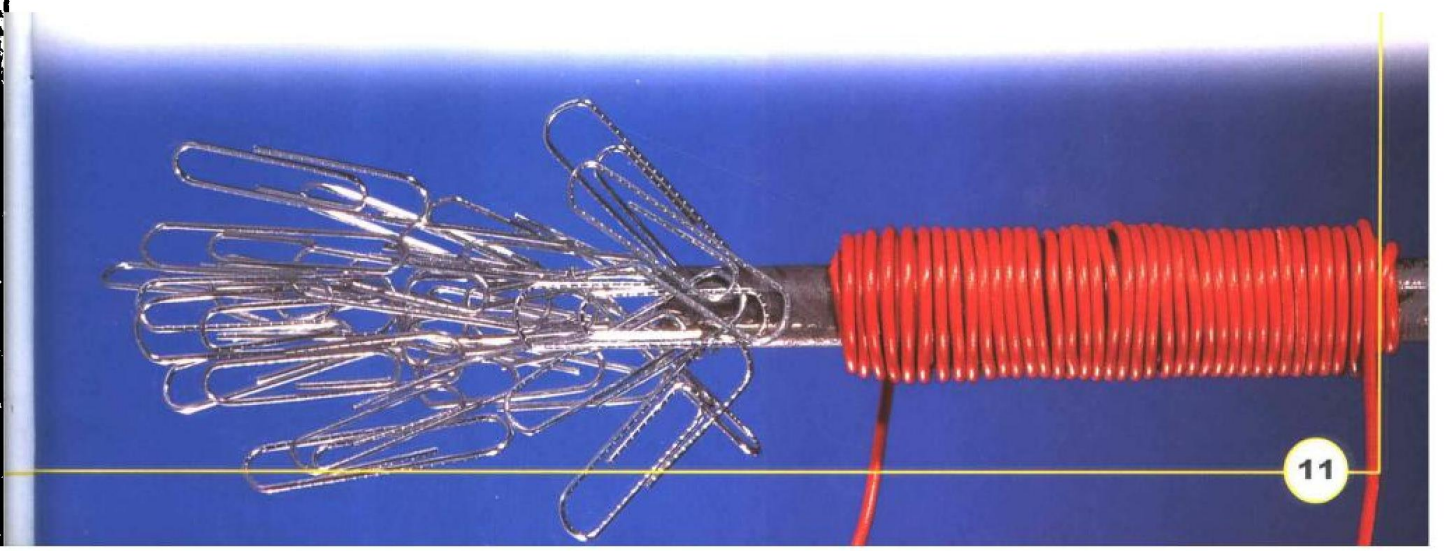
How did Faraday's electric generator change our lives?

Thinking Like a Scientist: Making a Model

Models are representations[4] of real-life things. When scientists want to try out new ideas, they often use models to help test the ideas. By using small models, scientists can get answers without spending time and money on huge experiments.

This nail[5] is an electromagnet. The coils of current-carrying wire make the nail act like a magnet and attract the paper clips[6].

1. breakthrough *n.* 突破，重大进展
2. Michael Faraday 迈克尔·法拉第(英国物理学家和化学家，发现电磁感应现象)
3. generator *n.* 发电机
4. representation *n.* 代表
5. nail *n.* 钉子
6. paper clip 回形针



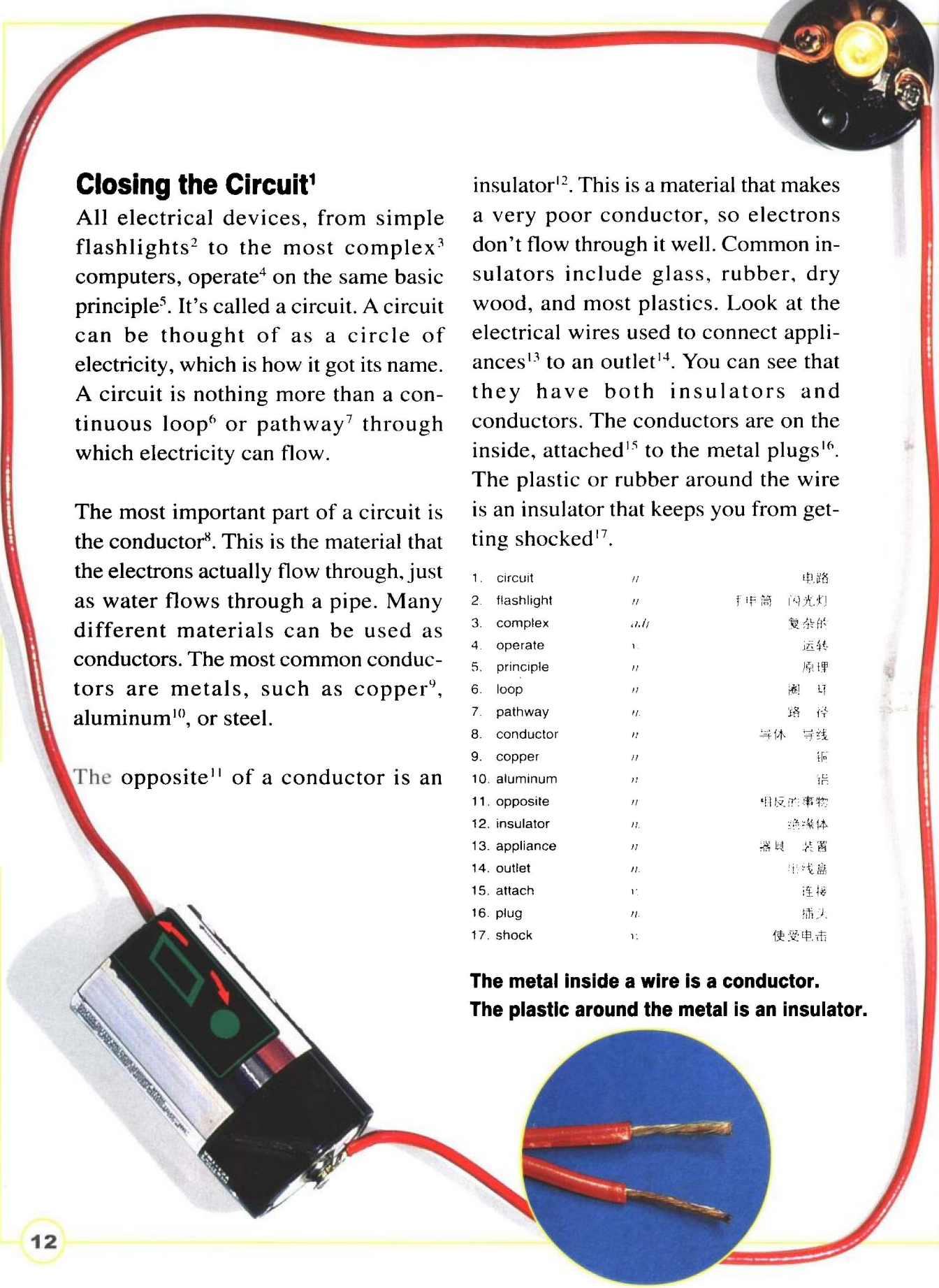
Closing the Circuit[1]

All electrical devices, from simple flashlights[2] to the most complex[3] computers, operate[4] on the same basic principle[5]. It's called a circuit. A circuit can be thought of as a circle of electricity, which is how it got its name. A circuit is nothing more than a continuous loop[6] or pathway[7] through which electricity can flow.

The most important part of a circuit is the conductor[8]. This is the material that the electrons actually flow through, just as water flows through a pipe. Many different materials can be used as conductors. The most common conductors are metals, such as copper[9], aluminum[10], or steel.

The opposite[11] of a conductor is an insulator[12]. This is a material that makes a very poor conductor, so electrons don't flow through it well. Common insulators include glass, rubber, dry wood, and most plastics. Look at the electrical wires used to connect appliances[13] to an outlet[14]. You can see that they have both insulators and conductors. The conductors are on the inside, attached[15] to the metal plugs[16]. The plastic or rubber around the wire is an insulator that keeps you from getting shocked[17].

1. circuit 电路
2. flashlight 手电筒 闪光灯
3. complex 复杂的
4. operate 运转
5. principle 原理
6. loop 圈 环
7. pathway 路 径
8. conductor 导体 导线
9. copper 铜
10. aluminum 铝
11. opposite 相反的事物
12. insulator 绝缘体
13. appliance 器具 装置
14. outlet 电线盒
15. attach 连接
16. plug 插头
17. shock 使受电击



The metal inside a wire is a conductor. The plastic around the metal is an insulator.

A video game[1] electrifies[2] a boy's free time.

1. video game 电视游戏
2. electrify *v.* 使兴奋，使激动