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英文注释

EARTH SCIENCE

地球科学

Stars and Galaxies

恒星与星系

ELLEN FRIED （美）著

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

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如果你希望在享受英语阅读乐趣的同时又能增长知识、开拓视野，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”（英文注释版）正是你的选择。

“国家地理科学探索丛书”（英文注释版）第二辑分为8个系列，共46本，内容涉及自然科学和社会研究，除对本套丛书第一辑已包含的“生命科学”、“物理科学”、“地球科学”和“文明的进程”4个系列进行了补充外，又推出了4个新的系列——“生活中的科学”、“科学背后的数学”、“专题研究”以及“站在时代前沿的科学家”。

这套丛书秉承《国家地理》杂志图文并茂的特色，在书中配有大量精彩的图片，文字地道易懂、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全书。特别值得一提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。

本套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。

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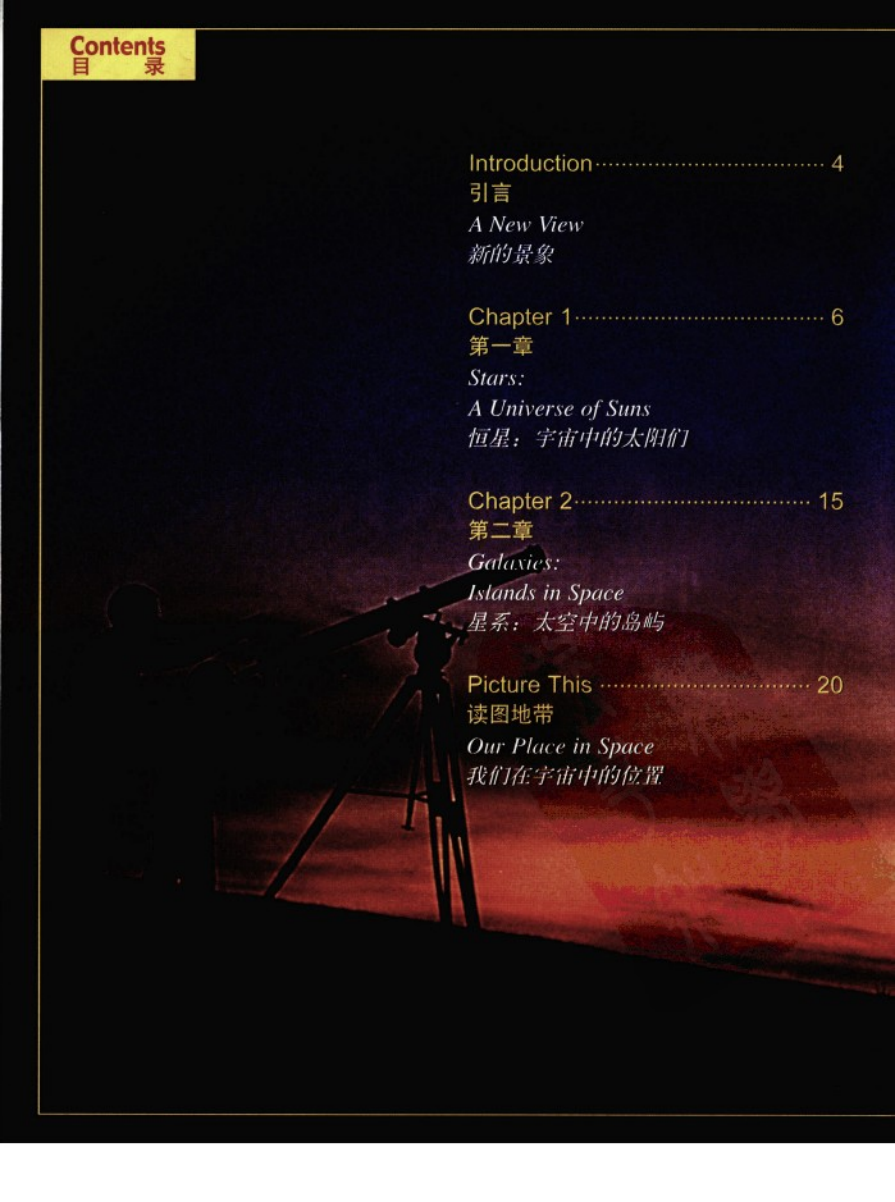
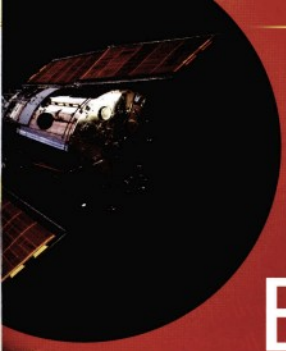


A New View
新的景象

Astronauts[1] F. Story Musgrave and Jeffrey Hoffman repair the Hubble Space Telescope[2] in 1993.

1. astronaut *n.* 宇航员
2. Hubble Space Telescope 哈勃太空望远镜



The Hubble Space Telescope before repairs

It was April 1990. The first space telescope had been sent into orbit[1]. Scientists waited eagerly for pictures better and clearer than any that could be seen from Earth.

By June, scientists realized there was a terrible problem with the Hubble Space Telescope. There was a flaw[2] in the telescope's main mirror, which reflects[3] and focuses[4] light. The pictures sent back from the telescope were fuzzy[5] and hard to read.

Some people thought the problem could not be fixed, but scientists and engineers got down to work. In 1993 the space shuttle[6] *Endeavor*[7] blasted[8] into space with a brave crew[9] and a clever tool—a kind of contact lens[10] for the space telescope's mirror. In a series of risky space walks, the shuttle astronauts installed[11] the new equipment[12] and made repairs.

Soon the first pictures from the repaired space telescope began to reach Earth. Astronomers[13] were able to see far-away objects more clearly than ever before.

Long ago, people could use only their eyes to study the sky. Over time, more powerful tools have allowed us to look farther and farther out into the universe. The universe is all space and matter. Earth and all the stars you can see are just a tiny part of the universe. We've learned much, but there's much more left to explore[14].

1. orbit *n.* 轨道
2. flaw *n.* 裂缝
3. reflect *v.* 反射
4. focus *v.* 聚焦
5. fuzzy *adj.* 模糊的
6. space shuttle 航天飞机
7. Endeavor "奋进"号
8. blast *v.* 猛力投掷（或推送）
9. crew *n.* （飞机或宇宙飞船的）全体机务人员
10. contact lens 隐形眼镜
11. install *v.* 安装
12. equipment *n.* 设备
13. astronomer *n.* 天文学家
14. explore *v.* 探索

Chapter 第一章 1

Stars:

A Universe of Suns

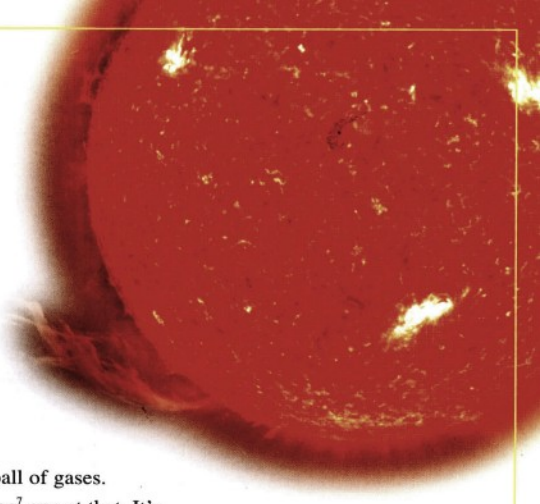
恒星：宇宙中的太阳们

The night sky seems like a huge black ceiling above Earth. The stars look like tiny diamonds fastened[1] to the ceiling. They seem peaceful, timeless[2], unchanging.

1. fasten v. 钉牢，固定
2. timeless adj. 永恒的
3. Orion n. 猎户星座
4. Arizona 亚利桑那州

Orion[3] (a group of stars) seen from near Flagstaff, Arizona[4]

Close-up[16] view of the sun



In reality, stars are huge. They're not fastened to a ceiling, but scattered[1] through vast[2] distances[3] in space. They're not timeless, but always changing. And some of those changes can be violent[4].

Each star is a giant[5], blazing[6] ball of gases. Our sun is a star, and an average[7] one at that. It's made mostly of hydrogen[8] and helium[9] gases heated to temperatures up to millions[10] of degrees Celsius[11] at the sun's middle. Huge plumes[12] of gas sometimes leap[13] from the surface. The sun is so big, a million Earths could fit inside it. And more than a hundred Earths could stretch[14] side by side across it.

Why do other stars look so much smaller than our sun? Because they are hundreds of thousands of times farther away from us than the sun is.

How does distance affect[15] how large an object looks to us?

1. scatter	v.	散开		9. helium	n.	氦	
2. vast	adj.	广阔的，广大的		10. million	n.	[~s] 许多，无数	
3. distance	n.	距离		11. Celsius	adj.	摄氏的	
4. violent	adj.	猛烈的		12. plume	n.	羽状物	
5. giant	adj.	巨大的		13. leap	v.	迅速射出	
6. blazing	adj.	燃烧的		14. stretch	v.	展开	
7. average	adj.	一般的		15. affect	v.	影响	
8. hydrogen	n.	氢		16. close-up	adj.	特写镜头的	

Yardstick[1] for the Universe

Distances in space are so great that scientists use a special unit to measure[2] them. This unit of measurement is based on how fast light travels.

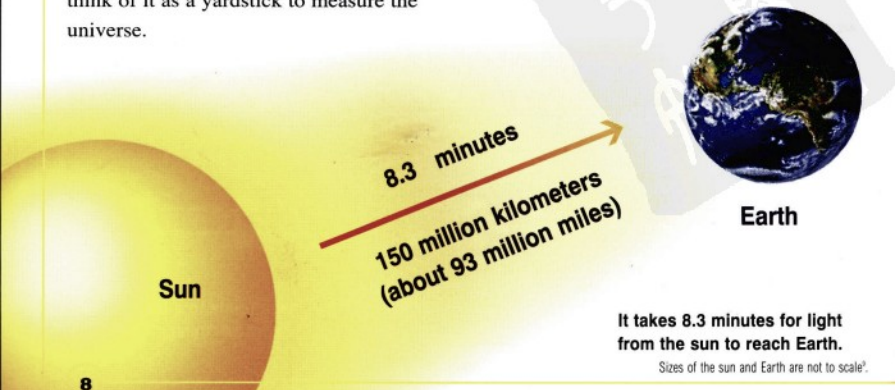
Light is the fastest moving thing we know. Light from the sun takes only about 8.3 minutes to cross the 150 million kilometers (about 93 million miles) between the sun and Earth! You might say that the sun is 8.3 light-minutes[3] from Earth.

All other stars are so far away that their light takes years to reach us. So we measure their distance with a unit called the light-year[4]. A light-year is the distance light travels in a year—about 9.5 trillion[5] kilometers (about 6 trillion miles). Even though the term contains[6] the word "year," it's important to note that a light-year is a unit of *distance*, not of time. You can think of it as a yardstick to measure the universe.

The closest star to our sun is 4.2 light-years away. That's 266,000 times farther than the sun is from Earth. All other stars are even farther away.

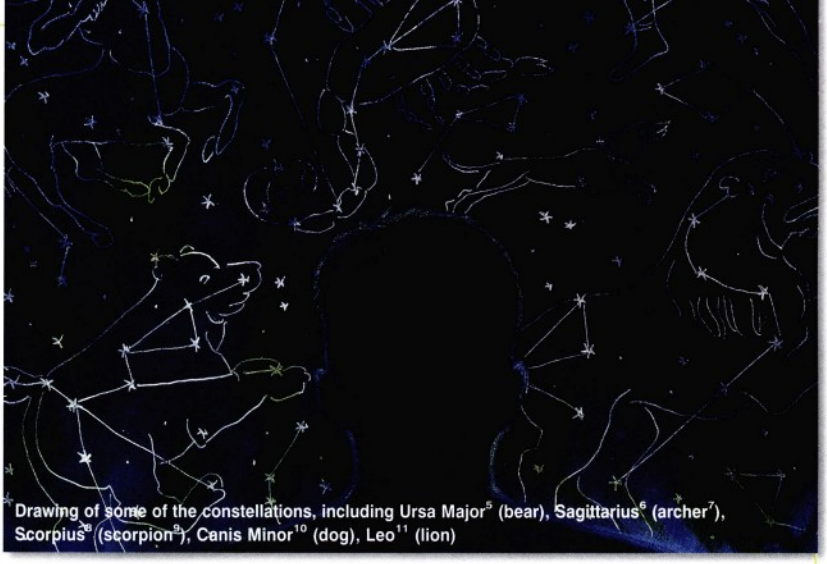
How do we learn about things that are so far from us? We can't travel to the stars. We can't even send space probes[7] across such distances. Scientists have to rely on[8] studying the light and other energy that travels through space and reaches us on Earth.

1. yardstick	*n.*	衡量标准
2. measure	*v.*	计量，度量
3. light-minute	*n.*	光分
4. light-year	*n.*	光年
5. trillion	*n.*	万亿，兆
6. contain	*v.*	包含
7. space probe		航天探测器
8. rely on		依靠，依仗
9. to scale		按比例



It takes 8.3 minutes for light from the sun to reach Earth.

Sizes of the sun and Earth are not to scale[9].



Drawing of some of the constellations, including Ursa Major[5] (bear), Sagittarius[6] (archer[7]), Scorpius[8] (scorpion[9]), Canis Minor[10] (dog), Leo[11] (lion)

Seeing Patterns

For most of human history, the eye was the only tool available for collecting and studying starlight. The stars were hard to understand.

All around the world, people made up "connect-the-dot" pictures to explain patterns of stars they saw in the sky.

These imaginary pictures are known as constellations[1]. They represent[2] people, animals, and things.

Constellations are interesting and fun, but they don't tell us much about the many differences among stars—or about the exciting life stories of stars.

1.	constellation	*n.*	星座
2.	represent	*v.*	象征
3.	Latin	*adj.*	拉丁语的
4.	belong	*v.*	属于
5.	Uras Major		大熊星座
6.	Sagittarius	*n.*	人马星座
7.	archer	*n.*	弓箭手
8.	Scorpius	*n.*	天蝎星座
9.	scorpion	*n.*	蝎子
10.	Canis Minor		小犬星座
11.	Leo	*n.*	狮子星座

Word Power

The word *constellation* comes from the Latin[3] words *con*, meaning "together," and *stella*, meaning "star." So a constellation is a group of stars that seem to belong[4] together.

Scoping[1] the Sky

In the 1600s scientists started using telescopes to look at the sky. Since then, telescopes have grown more and more powerful, allowing us to see things that are farther and farther away. Other tools let us study the light that telescopes collect. So what have we learned by studying the light from the stars?

Star Variety

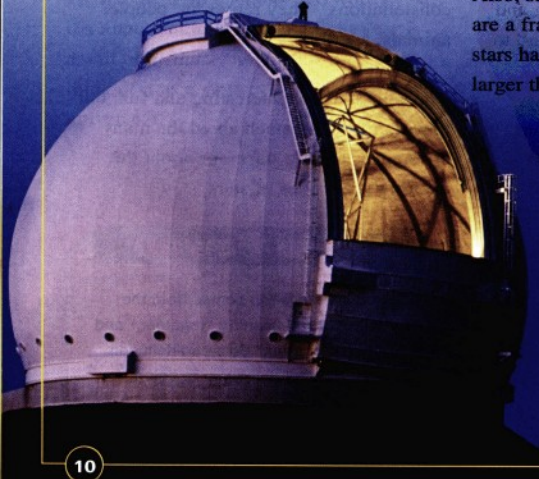
Stars vary greatly in how much light they give off[2]. Our sun looks bright to us because it's so close. But some stars give off thousands of times more light than the sun, while others give off much less.

Stars also give off different colors of light. Our sun gives off mostly yellow light. Some stars give off mostly red light. And other stars give off mostly white or blue light.

Different stars have different surface temperatures. The surface temperature of our sun is about 5,500°C (9,932°F). Some stars are only about half as hot as the sun. Others are more than four times as hot.

Stars vary widely in mass[3], or how much matter they contain. It would take about 333,000 Earths to equal the mass of the sun. Some stars have only one-tenth that mass, while others have the mass of ten or more suns.

Also, stars come in many sizes. Some stars are a fraction[4] of the sun's diameter[5]. Other stars have diameters hundreds of times larger than that of the sun.



1. scope	n.	仔细观察
2. give off		发出
3. mass	n.	质量
4. fraction	n.	一部分
5. diameter	n.	直径
6. observatory	n.	天文台，观象台
7. Hawaii		夏威夷州

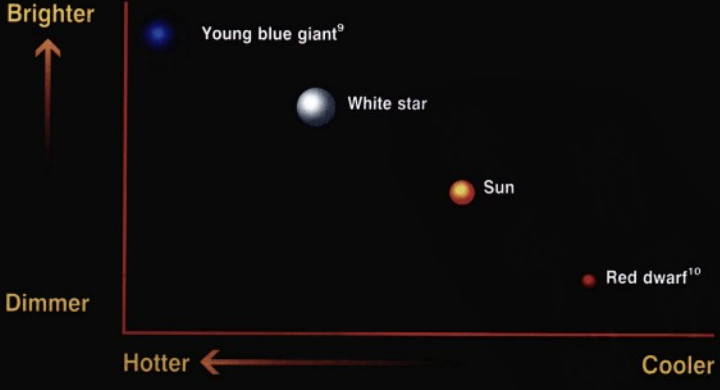
Observatories[6] contain high-powered telescopes. This is the W. M. Keck Observatory, in Mauna Kea, Hawaii[7].

Thinking Like a Scientist: Interpreting[1] Data[2]

When scientists interpret data, they identify[3] patterns and make sense of information. Graphs[4] can help scientists study information.

The graph below shows how the properties[5] of brightness and temperature relate[6] to each other for most stars. The graph also shows color and size, although sizes are not to scale. Scientists have found that most stars fall in a diagonal[7] line that runs across the graph. Use the data on the graph to answer the questions below.

1.	interpret	*v.*	解释，说明
2.	datum	*n.*	(*pl.* data) 数据
3.	identify	*v.*	鉴定，识别
4.	graph	*n.*	图表
5.	property	*n.*	性质
6.	relate	*v.*	有关联
7.	diagonal	*adj.*	对角线的
8.	dim	*adj.*	暗淡的
9.	giant	*n.*	巨星
10.	dwarf	*n.*	矮星



Which is hotter—a blue star or a red star?

For most stars, how does temperature relate to brightness?

For most stars, how does size relate to temperature?

As you saw on page 11, the properties of most stars relate to each other in an orderly way. For example, the hotter a star is, the brighter it usually is.

But some stars don't fit the pattern. For example, red giants[1] are cool and bright, and white dwarfs[2] are hot and dim. What's up with these oddballs[3]?

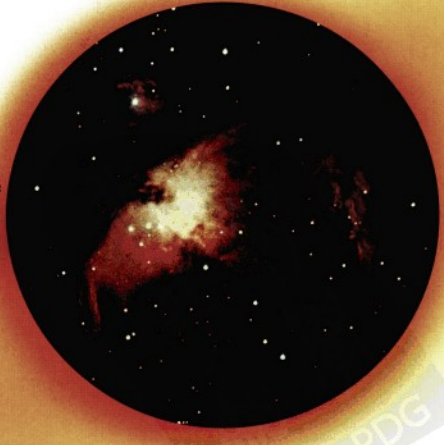
Life of a Star

Red giants and other oddballs are in the final stages[4] of their lives. Of course, stars are never really alive, but we describe them as being born, living, and dying. As stars age, their properties change. Most of these changes happen over millions or billions[5] of years—much too slowly for us to see. So astronomers study stars of many different ages to figure out[6] their life stories.

A star is born in a huge cloud of gas and dust called a nebula[7]. The gas is mostly hydrogen. In some places the gas and dust are dense[8]. This allows gravity[9] to pull material even closer together, forming a ball.

As the ball contracts[10], it heats up. When temperatures at the core[11] become hot enough, hydrogen atoms[12] come together to form helium. This process[13] gives off huge amounts of energy. The ball of gas and dust has become a star, releasing[14] its heat and light into space.

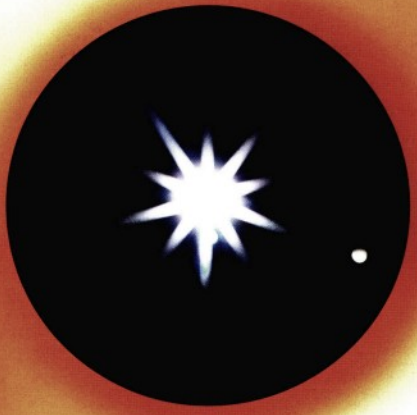
1. red giant		红巨星
2. white dwarf		白矮星
3. oddball	*n.*	古怪的人（这里指古怪的星球）
4. stage	*n.*	阶段
5. billion	*n.*	十亿
6. figure out		计算出
7. nebula	*n.*	星云
8. dense	*adj.*	密集的
9. gravity	*n.*	引力
10. contract	*v.*	收缩
11. core	*n.*	核心
12. atom	*n.*	原子
13. process	*n.*	过程
14. release	*v.*	释放



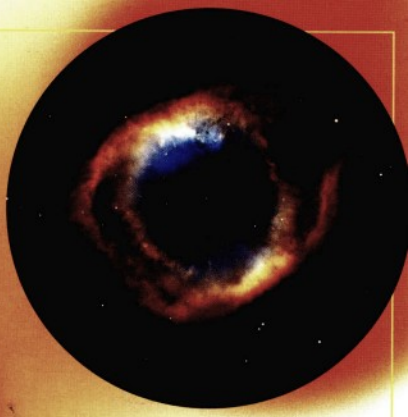
1. Birth

Star forms in cloud of gas and dust

The Life of an Average Star



2. Midlife
Star shines for billions of years



3. Death
Outer layers of red giant drift away

Death of a Star

The average star shines for billions of years. But finally the hydrogen in the core runs low, and the core contracts. The outer layers[1] of the star expand. As they expand, they grow cooler and redder. The star has become a red giant.

Eventually[2], the outer layers of the red giant drift[3] off into space. They leave behind the star's burned-out core. This is a small, dense, and slowly cooling object called a white dwarf.

That's how it all ends for a star of average mass, like our sun. But a more massive star doesn't go so peacefully. Instead, it dies in a huge explosion[4] called a supernova[5].

1. layer	*n.*	层
2. eventually	*adv.*	最终
3. drift	*v.*	漂移
4. explosion	*n.*	爆炸
5. supernova	*n.*	超新星