

BEIHOU DE GUSHI

背后的故事丛书

ZHONGLI
BEIHOU
DE
GUSHI

重力背后的故事

西恩·斯特沃德·普莱斯

看故事 学英语

反正好看

故事新鲜有味
英语道地纯正

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THE STORY BEHIND
GRAVITY

重力背后的故事

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重力是什么？

What is gravity?





▲ 在航天飞机里，重力非常小。这名宇航员梳头时，她的头发就漂浮在头部上方。
This astronaut's hair is floating above her head as she tries to brush it in a space shuttle where there is very little gravity.

你走进一个人挤人的房间，所有的人都浮在空中，一个人友好地对你挥手打招呼，然后翻着筋斗滑行过来跟你握手。

这种场景的不同寻常之处是什么呢？答案是房间里无重力。在地球上，人们不会浮在空中，重力把人们牢牢吸在地面。

这就是大多数人眼中的重力，重力就是把我们将向下拉的力。如果你能变魔术般地去掉地球上的重力，那么地球上大部分东西都要飞向太空。

可是重力的真正作用比这还要大。重力是任何两个物体之间的吸引力，物体的质量（大小或者体积）越大，它所产生的引力就越大。这就是说，整个宇宙（所有存在的东西）都受重力影响。它使月球围绕地球旋转，也使地球围绕太阳转，同时还使太阳和行星围绕我们星系的中心旋转。星系就是由重力聚集在一起的一大群恒星和行星。

You enter a room full of people. They are all standing in midair. One man waves at you in a friendly way. He turns a few somersaults as he glides over to shake your hand.

What is unusual about this scene? There is no gravity. On Earth, people don't stand in midair. Gravity keeps them firmly on the ground.

That is how most people think of gravity. It is the force that pulls us down. If you could magically switch off gravity, most things on Earth would float into space.

But gravity is even bigger than that. Gravity is the attraction between any two objects. The more mass (size or bulk) an object has, the bigger its gravitational pull. That means gravity affects the whole universe (everything that exists). It keeps the moon spinning around Earth. It also keeps Earth turning around the sun. It keeps the sun and planets moving around the centre of our galaxy. A galaxy is a large group of stars and planets held together by gravity.

重力是非常弱的作用力。举个例子，它没有磁力强。一块磁铁可以轻易地克服重力，拉起另一块磁铁。但是与磁力和其他自然力不同，重力的作用范围可以达到数十亿英里。事实上，在宇宙中，每一个物体对其他所有物体都有重力作用，但是这个作用力非常小，我们经常都感觉不到它的存在。

Gravity is a very weak force. For instance, it is not as strong as magnetism. A magnet can easily pull up another magnet, defeating gravity. But unlike magnetism and other natural forces, gravity's reach extends billions of miles. In fact, every object in the universe gives off a gravitational pull on every other object. But that pull is so slight that we usually don't feel it.

重力的神秘 The mystery of gravity



科学家们知道重力怎样作用，但是不知道为什么会存在重力作用。为什么大物体产生的重力要比小物体产生的大？这仍是科学上最大的未解之谜之一。

Scientists know all this about how gravity works. But they still don't know why gravity works. Why do larger objects attract things more than smaller objects? That remains one of science's greatest unexplained mysteries.



跳伞运动员在重力作用下飞向地面。

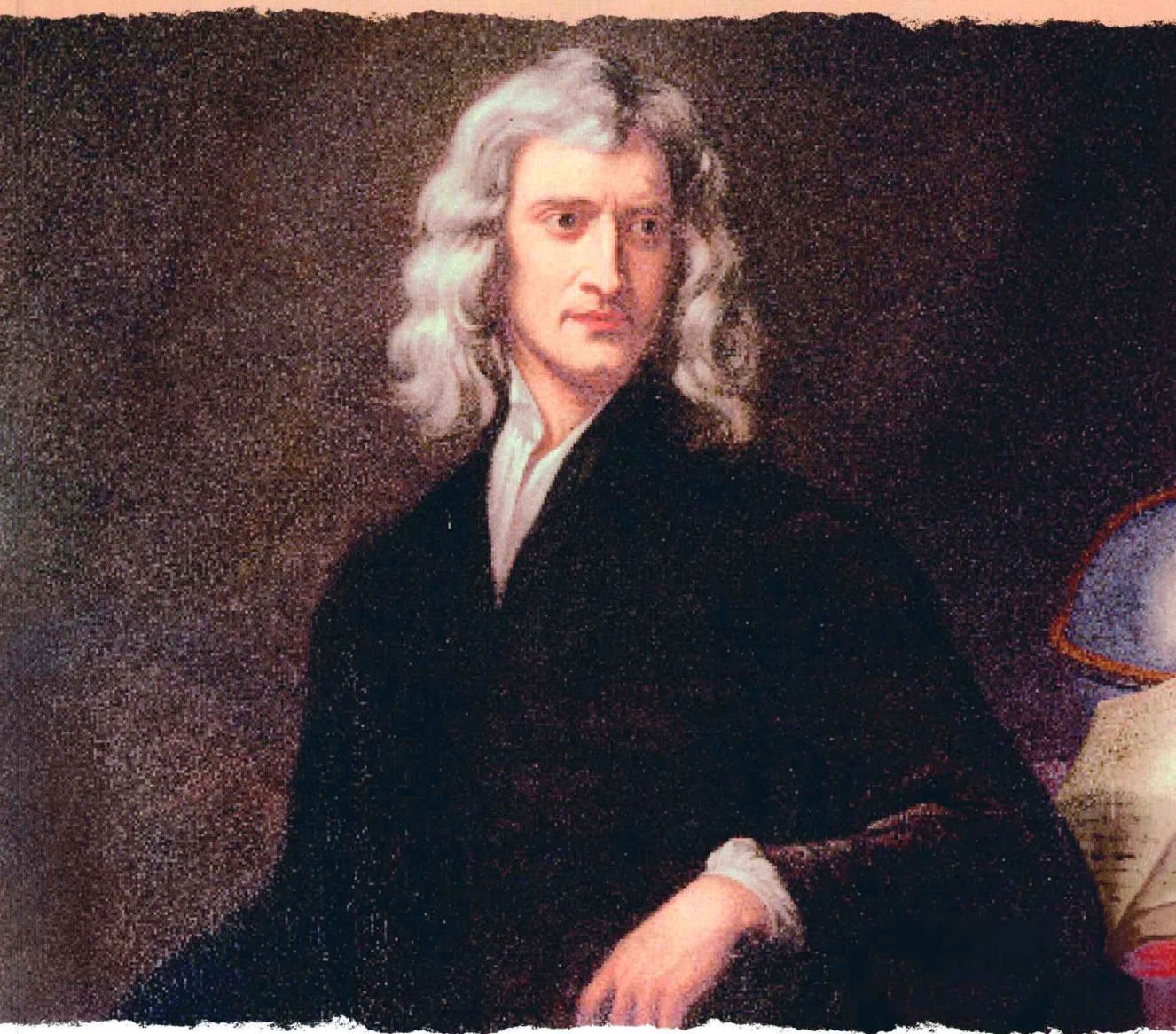
Skydivers float down to Earth because of the force of gravity.





牛顿的世界

Newton's world



1666年，英国科学家艾萨克·牛顿突然灵光一现。传说，一天牛顿碰巧看到一个苹果从树上落下。他意识到，是某种看不见的力把苹果拉向地面。他同时发现，是同样的力让月球围绕着地球旋转。事实上，正是这种力——重力——把整个宇宙聚为一体。牛顿不仅发现了这些道理，而且还给出了重力作用的数学表达式，因此人们相信他关于重力的想法是正确的。

In 1666, the English scientist Isaac Newton had a flash of insight. According to legend, it happened one day when he saw an apple fall from a tree. Newton realised that some invisible force had pushed the apple to the ground. He also discovered that the same force kept the moon spinning around Earth. In fact, this force – gravity – held the whole universe together. Newton not only saw these things. He also came up with a mathematical explanation for how they worked. This helped people to accept that he was correct.



牛顿的这幅肖像画完成于他的重力思想发表后不久。

This portrait of Isaac Newton was painted soon after he published his ideas about gravity.

公元前38—322年

古希腊科学家亚里士多德认为地球是宇宙的中心，太阳和星星在不同的巨大玻璃球上围绕着地球旋转。

Greek scientist Aristotle believes that Earth lies at the centre of the universe. He also thinks the sun and stars move around Earth on giant glass balls.



亚里士多德生活于公元前384—322年。这是一件复制品，公元四世纪制作的他的大理石雕像。

Aristotle lived from 384 to 322 BCE. This is a copy of a marble statue of him made during the 400s.

1666

英国科学家艾萨克·牛顿意识到，使苹果落地的力和使月亮围绕地球运动的力是同一种力。他用数学解释了重力和运动是如何起作用的。



牛顿VS亚里士多德

在牛顿之前，大部分人都不知道重力，他们相信的是古希腊科学家亚里士多德的观点。在公元前4世纪，亚里士多德宣称地球是宇宙的中心，太阳和星星是一些巨大玻璃球的一部分，这些玻璃球永远不变地围绕地球旋转。亚里士多德也提到，石头等重物之所以下落，部分原因是它们被宇宙的中心吸引。牛顿之前的一些科学家曾质疑过亚里士多德的理论，但是牛顿却彻底地驳斥了亚里士多德的错误。

Newton versus Aristotle

Before Newton, most people did not even know about gravity. Instead, many believed the ideas of a scientist from ancient Greece called Aristotle. In the 300s BCE, Aristotle declared that Earth was the centre of the universe. He said the sun and stars were part of giant glass balls. Those balls spun around Earth and never changed. Aristotle also said that part of the reasons that heavy stones fell was because they were attracted to the centre of the universe. Other scientists before Newton had challenged Aristotle's ideas. But Newton proved these ideas wrong for good.

艾萨克·牛顿与哲人石 Isaac Newton and the philosopher's stone

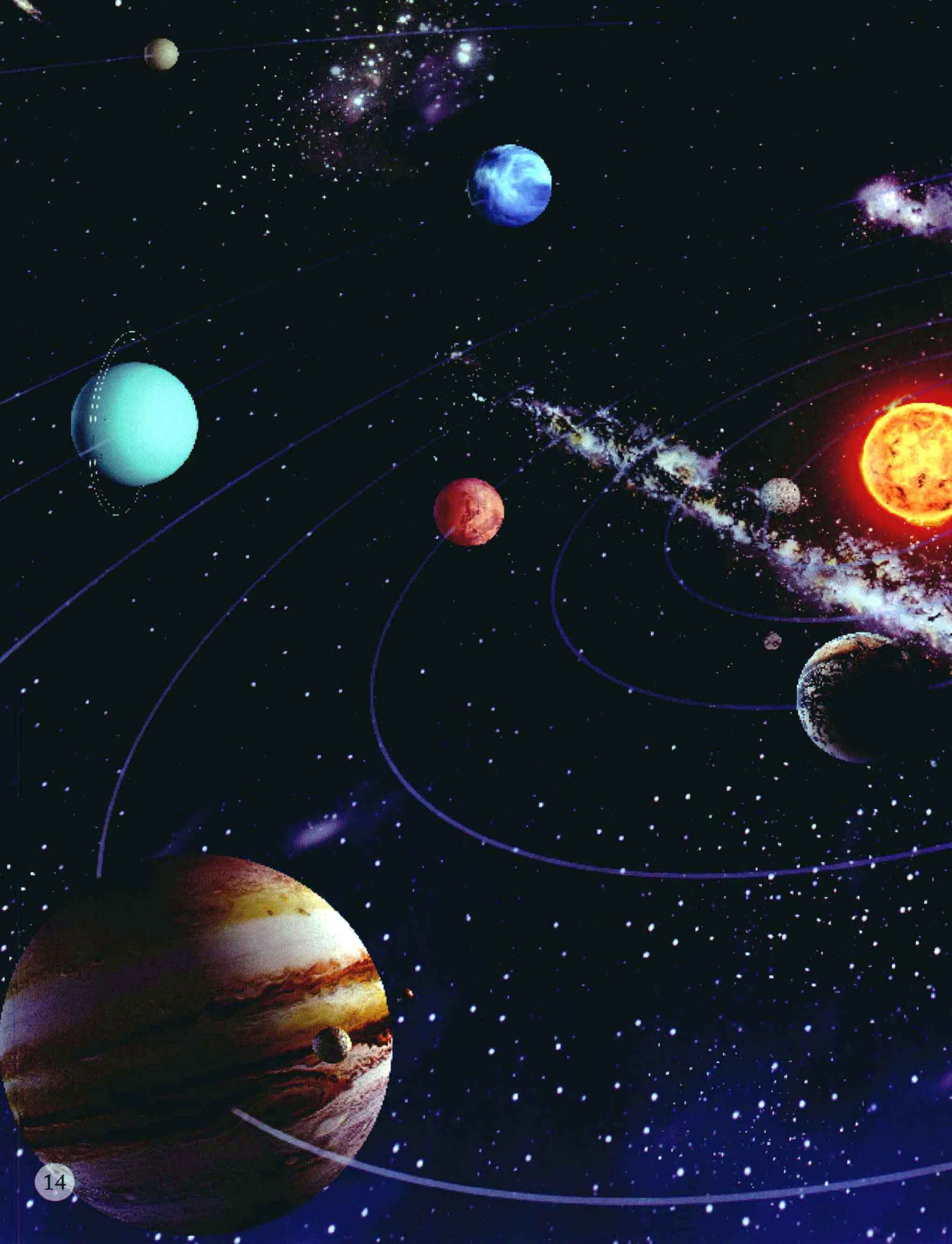


牛顿是一个伟大的科学家，但他却对炼金术更感兴趣。炼金术士们常常把科学同魔法结合起来，他们中的很多人（包括牛顿）试图创造“哲人石”，他们认为这种石头能使人长生不老。显然，牛顿错了。炼金术不是科学，但是炼金术士们的研究促生了化学这门学科。

Newton was a great scientist. But much of his interest lay with alchemy. Alchemists often combined science with magic. Many of them – including Newton – tried to create the “philosopher's stone”. This stone supposedly would give someone everlasting life. Of course, Newton was wrong. Alchemy was not a science. But discoveries made by alchemists helped create the science of chemistry.

English scientist Isaac Newton realises that the force that causes an apple to fall to the ground is the same one that causes the moon to go around Earth. He uses maths to explain how gravity and motion work.

1600 BCE





▲ 这幅图片显示了太阳系各大行星如何围绕太阳运行。

This picture shows how the planets in our solar system travel around the sun.

太阳与行星

要了解牛顿的理论，必须要了解太阳系。我们的太阳系由太阳和围绕它运行的行星组成。大约46亿年以前，太阳系是一个巨大的云团，由气体、尘埃和冰组成。云团在重力的作用下收缩，中间的部分变成了太阳，外面的部分形成了行星。

太阳是一颗恒星，它是太阳系中迄今为止最大的物体，大约相当于一百万个地球那么大。它的质量也远比任何行星都大，也就是说它产生的引力最大。

The sun and planets

To understand Newton's ideas, you must understand our solar system. Our solar system is made up of our sun and the planets that go around it. About 4.6 billion years ago, our solar system was a giant cloud of gas, dust, and ice. Gravity caused the cloud to shrink. The inner part became the sun. The outer pieces took shape as the planets.

The sun is a star. It is by far the biggest object in our solar system. About one million Earths would fit inside it. The sun has a much greater mass than any of the planets. This means that it also has the strongest gravity.

