



雨树洛洛

英国最具影响力的青少年科普读物之一

(英)梅森(Mason, P.) 著  
黄芙蓉 译

# Wackiest 古怪机器 Machines 大观园 Ever!

【能量】

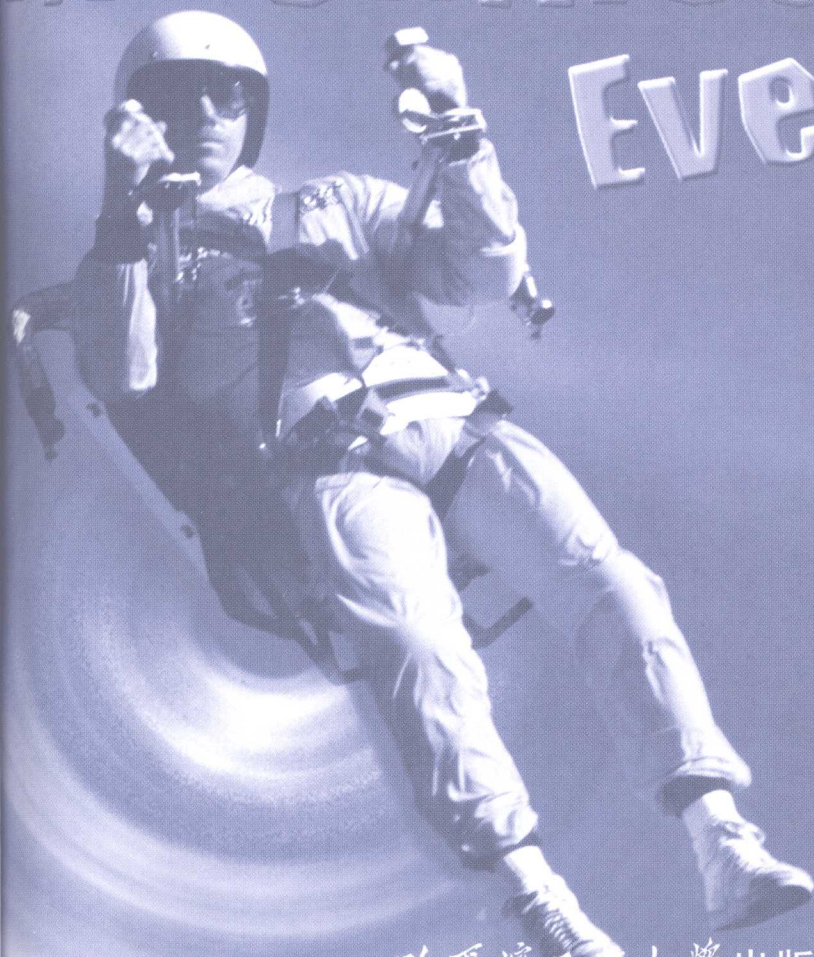


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有些单词被印刷成粗体，**就像这样**。你可以在第30页中找到它们的意思，还可以在单词第一次出现时，在相关书页下方的方框内发现它们的含义。

# How wacky does it get?

## 机器能有多古怪？

Welcome to the Museum of Wacky Machines. Some of these crazy machines actually moved. Others never got off the ground.

All the machines in this book need **energy** to make them move. Energy is the ability to make a change happen. You need energy to power a flying machine. You need energy to power a record-breaking car. You also need energy when you run for the bus!

欢迎来到古怪机器博物馆。实际上，这些千奇百怪的机器有的能移动，有的根本没有离开过地面。

本书中的所有机器都需要**能量**才能移动。能量就是引起变化的能力。飞行器飞行需要能量，赛车行驶需要能量，人们追赶公共汽车时也需要能量！



The people who made these wacky machines found some wacky ways to make them move. Read on to find out more!

那些古怪机器的设计者总能找出奇妙的方法让这些机器移动。继续读吧，有趣的故事还在后面呢！

▼ This crazy-looking machine is an ornithopter. You can find out more about it on page 20.

这个看起来怪怪的机器叫做扑翼机。把书翻到20页，会看到有关它的更多介绍。



# Forms of energy

## 能量的形式

It is helpful to think of **energy** in two forms. The first form is called **potential energy**. The second form is called **kinetic energy**.

为便于理解，能量被分成两种形式：势能和动能。

This man is taking part in a Birdman ► competition. In these competitions, people try to fly using wacky machines.

这个人参加的是鸟人竞赛。竞赛中，人们千方百计地借助各种古怪的飞行器飞行。



The birdman uses both forms of energy at different times. At first he is just standing on the pier. He is not moving. But he may possibly jump from the pier. This possibility for movement is called potential energy.

When the birdman steps off the pier he starts moving downwards. This is kinetic energy. It is the energy of movement. Kinetic energy always needs some sort of movement.

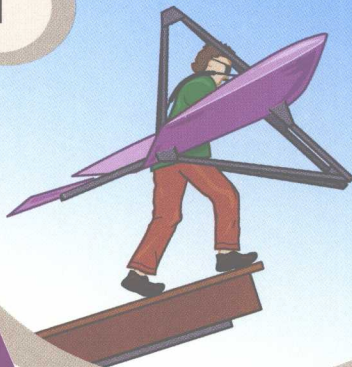
飞行过程中，鸟人利用了两种能量。一开始，他只是站在桥墩上，没有移动，但是他可能会跳下桥墩。这种运动的可能性叫做势能。

当鸟人离开桥墩，开始向下运动，他就具有了动能，这是运动具有的能量。动能总是在运动中产生。

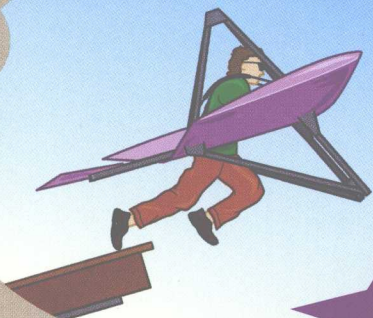
The birdman stands on the pier. He is not moving. But he has **potential energy**.

鸟人站在桥墩上，没有移动，具有**势能**。

1



2



◀ He jumps off the pier! His potential energy becomes **kinetic energy**.

他从桥墩上跳下来了！此时，势能变成了**动能**。

Oops! He hits the water! ▶

哎呀！他掉到水里了！

3





# The trebuchet

## 投石机

The trebuchet was used hundreds of years ago. It was a very powerful weapon. It could even break down the walls of a castle.

The trebuchet had a giant arm. It worked like a see-saw. At the short end of the arm was a heavy weight. At the long end of the arm was a basket, or cradle. The cradle held a heavy stone. The stone was thrown by the trebuchet.

投石机在几百年前就有了应用，这是一种非常强大的武器，它甚至可以撞破城堡的墙壁。

投石机有个巨大的手臂。它动起来就像跷跷板一样。在短臂的一端有很沉的配重。长臂的一端有个篮子，或者叫弹袋。篮子里装着沉重的石弹。投石机发动起来，投掷石弹。

weight  
配重

cradle  
弹袋

Soldiers used active, **kinetic energy** to raise the weight forwards and upwards. Then the weight was fixed in place. This meant that the kinetic energy could be stored as **potential energy**. The trebuchet's potential energy was stored until the soldiers were ready to attack!

利用**动能**，士兵把配重向上抬起。然后，固定在某一位置，此时动能以**势能**的形式被储存。投石机的能量蓄势待发，直到士兵们发动进攻！

## Kinetic energy 动能

1

weight  
配重

## Potential energy 势能

2

weight  
配重

▲ The weight is moved forwards and upwards.  
向上抬起配重。

▲ The weight is fixed in place. The trebuchet is ready for action!

固定配重，投石机准备就绪！



# Attack!

## 进攻!

The trebuchet's weight is pulled up and fixed in place. The machine is loaded with stored, **potential energy**. This means it is ready to be moved for an attack.

The attack begins! Soldiers release the trebuchet's weight. The weight drops downwards. The machine's potential energy has become moving, **kinetic energy**. The long arm swings upwards. The giant stone is thrown out of the cradle. It flies through the air towards the enemy!

投石机的配重被吊起并固定好，它储备好了**势能**，随时可以进攻了。

发动进攻！士兵们释放投石机的配重。配重落下，投石机的势能转变为**动能**。长臂扬起，巨石从弹袋中被发射出去，在空中呼啸而过直奔敌人！

## The trebuchet in action!

运行中的投石机!

1

cradle  
弹袋

weight  
配重

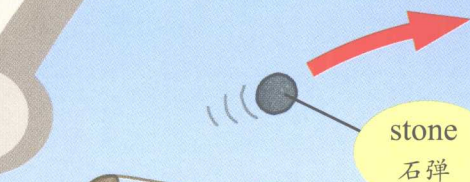
10

The weight drops downwards. ►  
The stored potential energy of the heavy weight becomes moving kinetic energy.

配重下落，储存的势能转化为动能。



2



stone  
石弹

▼ The long arm with the cradle swings over. It throws the stone into the air.

长臂带动弹袋摆动，将石弹投掷到空中。

cradle  
弹袋

weight  
配重

## Trebuchet fact file

### 投石机小档案

Date used: from about 300 BC to the 1500s

Purpose: attacking castles and other buildings

Ammunition: stones that weigh up to 135 kilograms (300 pounds)

使用时期：约公元前300年到公元16世纪

目的：攻击城堡或其他建筑

攻击物：135千克(300磅)重的石弹



# The rocket pack

## 推进器

The idea of a rocket pack first appeared in a 1920s comic strip. It was worn by a comic-book hero. His name was Buck Rogers. In the 1950s, pilots used real rocket packs.

Rocket packs were worn like backpacks. They lifted the pilots up into the air. But how did the amazing rocket packs work?

The rocket pack's **potential energy** was stored in its **fuel**. The fuel was burned to make hot gases. The burning fuel turned the stored potential energy into the **kinetic energy** of movement. Very hot gases have a lot of **heat energy**.

推进器的构思首次出现在20世纪20年代的一本漫画书里。书中有个叫巴克·罗杰斯的英雄就身背推进器。然而，直到20世纪50年代，才有了真正的推进器。

推进器可以像背包一样背在身上，把飞行员送入空中。那么这神奇的推进器的工作原理是什么呢？

推进器的**燃料**存储**势能**。燃料燃烧产生热气，将存储的势能转变成**动能**。炙热的气体中储存着充足的**热能**。

### Rocket pack fact file

#### 投石机小档案

First used: 1958

Speed: over 160 kilometres (100 miles) per hour

Fuel used: 1 gallon (4.5 litres) every 5 seconds

时间：最早用于1958年

速度：时速超过160公里(100英里)

燃料：5秒钟耗油1加仑(4.5升)

▼ The rocket pack first became famous when it was used in a James Bond film. The rocket pack in the film was not a special effect. It was real!

推进器在007系列电影中的出现使它广为人知。影片中的推进器不是特技，而是如假包换的真机器！





▼ The rocket pack did not become popular!  
This was because it used too much fuel.  
It used up 6 gallons (27 litres) of fuel in  
just 30 seconds!

推进器最终没能得到普及，这是因为它需要的燃料太多了。飞行30秒，就要消耗多达6加仑(27升)的燃料！





# How did the rocket pack work?

## 推进器的工作原理是什么？

The rocket pack's tanks contain **fuel**. Fuel can produce heat, or **thermal energy**, when it burns. When the fuel in the rocket pack burns, it makes heat and hot gases. The hot gases whoosh out of the tubes on the back of the rocket pack. This pushes the pack and the pilot up into the air.

推进器的燃料箱中装有**燃料**。燃料燃烧能够产生热(**热能**)。推进器内的燃料燃烧时，就会产生大量的热和炙热的气体。这些热气从推进器的尾喷管中喷出，将推进器和飞行员推向空中。

The fuel tanks contain fuel. Fuel has stored **potential energy**.

燃料箱中装有燃料，而燃料中存储着**势能**。

The fuel burns in the middle tank. It turns into hot gases.

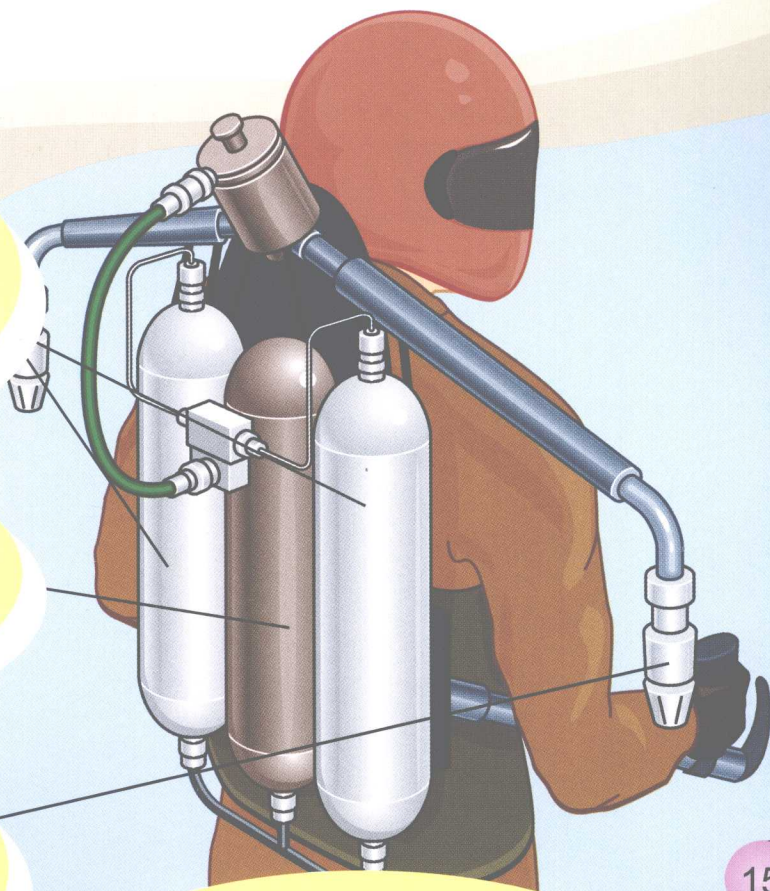
燃料在推进器中部的燃料箱中燃烧，产生炙热的气体。

A jet of hot steam shoots out of tubes on the back of the pack.

热气流从推进器的尾喷管中疾喷而出。

Stored potential energy is now active **kinetic energy**! The downwards force of the hot gases pushes the pilot upwards into the air.

燃料中存储的势能现在转化为**动能**！向下喷出的气流产生的动力将飞行员推向空中。





# The steam-powered car

## 蒸汽动力汽车

The Shearer was one of the first steam-driven cars. It was made in Australia a long time ago. It used wood and water as **fuel**!

The Shearer car could only move very slowly. Only a small amount of the stored **potential energy** in the car's fuel was turned into **kinetic energy** to move the wheels. The rest of the stored energy was "lost" in other ways.

西尔瑞汽车是最早的蒸汽动力汽车，很久以前产于澳大利亚，使用的**燃料**竟然是木头和水！

西尔瑞蒸汽动力汽车(简称西尔瑞汽车)移动十分缓慢，这是因为汽车燃料储存的**势能**中只有很小一部分转换成**动能**，用来驱动汽车。剩余的能量都以其他形式“散失”了。

### How machines lose energy

机器的能量哪儿去了？

Energy never disappears. It just changes its form. These are some of the forms of **energy** that machines often cannot use:

- **Thermal energy**, or heat energy, can escape into the air.

- The noise that machines make is caused by **vibrations** in the air. These vibrations are a form of energy called **sound energy**.

- When a machine's moving parts rub together, they use up energy.

- When a moving object pushes against air, it uses up energy.

能量永远不会消失，而只是发生形式转化。但是有些形式的**能量**机器无法利用。

- **热能**散失在空气中了。

- 人所听到的噪声是由机器周围空气振动引起的。振动是一种**能量——声能**。

- 机器的运动部件互相摩擦也会损耗能量。

- 运动部件受到空气阻力也要消耗能量。