ADDITIONAL SCIENTIFIC ENGLISH PRACTICE

英语科普文选

第六集

科学普及出版社

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（第六集）

陈庭珍　李汉康　宋启安　编译

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内 容 提 要

《英语科普文选》第六至十集选材将逐步过渡为高级科普英语。本集共收英语科普文章二十二篇，全部选自英美近期报刊杂志，经删改、注释和翻译，编成英汉对照读物。本集内容侧重于新技术革命潮流中有关的科技信息，在英语语言结构和现象方面较前五集均有所扩展，目的在于帮助读者锻炼独立阅读英语报刊科普文章的能力，为进一步学习高级科普英语打下基础。

本书配有录音磁带，由本社经理部发行处发行。

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科学普及出版社出版（北京海淀区白石桥路32号）

新华书店北京发行所发行 各地新华书店经售

外文印刷厂印刷

开本：787×1092毫米1/32印张：6.125 字数：135千字

1988年6月第1版 1988年6月第1次印刷

印数：1— 20,800册 定价：1.60元

ISBN 7-110-00604-2/H·19

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1 Water's Wondrous Talents[1]

Though we cook with it, clean with it — and largely consist of it — few of us truly understand the nautre of water. Justifiably so.[2] This odd compound is one of the most complex on earth.

It seems quite a simple substance, really. A clear, stable liquid, it freezes in the presence of cold, boils in the presence of heat and remains remarkably constant otherwise.[3] But while colorless, odorless and tasteless, water is hardly nondescript.[4] It is the most pervasive — and most essential — compound on earth.

Water is everywhere. In the oceans, in plants in the very air we breathe. Our bodies are 65 percent water. A frog's is[5] 78 percent. The undulating jellyfish, at 95 percent, is almost nothing but water.

Water integrates so easily into both organic and inert matter because of its unusual electrical properties. A water molecule's one oxygen and two hydrogen atoms are so arranged as to give[6] the cluster a slightly positive charge on one side and a slightly negative charge on the other. Since electrical positives attract electrical negatives, and vice versa, a water molecule, containing both, readily joins hands with any nearby molecule, regardless of its charge. It is this that allows so many types of matter to dissolve in water. When, any, a spoonful of salt is introduced into a beaker of water, the liquid's molecules invade the crystals, shattering existing bonds and creating new ones.

But by no means does water display its atomic eccentricity only[7] in the liquid states; one of its unique characteristics is demonstrated during freezing. Most matter contracts when temperatures drop, since cold quells molecular motion. Water, however, adheres to this rule only until it begins to solidify into ice. At that point, its molecules arrange themselves into a porous, space-consuming configuration, which cause the overall mass to swell. So insistent is this expansion that[8] sealed, quarter-inch-thick iron flasks have exploded violently during experiments when the water inside them was suddenly frozen. When ice thaws, its molecular structure collapses, allowing far more molecules to occupy far less room. Hence, while one pound of cold water is smaller and denser than one pound of hot water, one pound of ice is larger and less dense than both.

The very process of freezing and thawing[9] is surprisingly active. In order for water to freeze, it must release enormous amount of energy into its surroundings. Conversely, before water can boil, it must absorb vast quantities of heat from its surroundings. Thus can an automobile radiator normally cool an engine without itself overheating.

Water's ravenous ingestion of external heat is partly responsible for regulation of the earth's temperature. Much of the sunlight bombarding the planet is absorbed by the oceans before it can affect climate appreciably. And it's a good thing, too. Without such a liquid buffer, we might experience something closer to the 275 degrees Fahrenheit that frequently bake our arid moon.

Such a marked difference between the earth and its nearby neighbor is attribute to the diversity of the oxygen/hydrogen compound we call water. This talented substance helps to balance the planet's climate, run its machines and support its life forms. That it may also baffle those who try to unravel its secrets is merely[10] another example of its remarkable complexity.

Explanation of Words: 词解:

adhere [əd'hiə] remain faithful to, support firmly 忠于，坚持

arid ['ærid] dry, barren 干燥的，不毛的

baffle [bæfl] be too difficult to do, understand 难住，难倒

buffer ['bʌfə] apparatus for lessening the effect of a blow or collision 缓衝器

configuration [kən, figju'reiʃən] shape or outline, method of arrangement 形状，外貌，轮廓；排列方法

cluster ['klʌstə] number of things of the same kind growing closely togetner 一群，一组

diversity [dai'və:siti] the state of being diverse, variety 异样，不同

eccentricity [eksen'trisiti] strange or unusual act or habit 古怪的行动或习惯

ingestion [in'dʒestʃən] taking (food) into the digestive system 消化

integrate ['intigreit] combine into a whole 连接成一整体

jellyfish ['dʒelifiʃ] jelly-like sea-animal 水母

justifiably ['dʒʌstifaiəbli] reasonably 有理由地，情有可原地

nondescript ['nɔndiskript] not having a definite character 没有特征的

quell [kwel] suppress, subdue 扑灭，压服

ravenous ['rævinəs] very hungry, greedy 饥饿的，贪婪的

shatter [ʃætə] break suddenly and violently into small pieces 粉碎

swell [swel] (p.t. -ed [sweld], p.p. swollen ['swoulən]) become greater in volume 膨胀

thaw [θɔ:] become liquid or soft again 融化，融解

undulate ['ʌndjuleit] have a wave-like motion 波动，起伏

Comprehension Exercises: 理解练习:

1. Is water a simple or complex compound? Why?
2. Why can so many types of matter dissolve in water?
3. What is water's unique characteristic that is demonstrated during its freezing?
4. Is water's ravenous ingestion of external heat of any significance to our earth?
5. Is it easy to unravel water's secrets?

Notes: 注释:

1. 本文选自美国《科学文摘》月刊 (Science Digest) 1982年5月号。
2. Justifiably so. 这是一个单部句，等于 "That few of us truly understand the nature of water is justifiable". 此处 so 代表这句里主语从句中所表述的情况。译："这是情有可原的。"
3. ...and remains remarkably constant otherwise. 句中

otherwise 为副词，意为“在其他情况下”译：“在其他情况下则显然稳定不变。”

4. . . . water is hardly nondescript. 句中“hardly”是“几乎不”“简直不”，“nondescript”是“难以归类的”“没有特征的”“难以描述的”。合起来是“并非没有特征的”。由于这是双重否定形式，也可译成肯定语气：“还是有其特征的”。

5. A frog's is . . . 句中 frog's 是所有格，后边省去了“body.”

6. A water molecule's one oxygen and two hudrogen atoms are so arranged as to give . . . . 句中 so arranged as to give . . . 是由 so . . . as to . . . 引出的结果状语。译：“…是这样排列的，使它…”

7. But by no means does water display its atomic eccentricity only . . . 这是一个因强调状语而把谓语提前的倒装句，助动词“does”放在主语 water 前。

8. So insistent is this expansion that . . . 也是倒装句，表语 insistent 提到句首了。so 则与后边 that 呼应，引出结果状语从句。

9. The *very* process of freezing and thawing . . . 句中 very 为形容词，修饰“process”，意为“就是这，就是那”译文中用“这一过程”表示。

10. That is may also baffle those who . . . . . is merely . . .

“That”引出的是名词从句做全句的主语。译：“水也许会难倒那些想揭开其奥秘的人，这一点只不过是说明它突出的复杂性的又一个例证罢了。”

译文：　　水的奇妙才能

尽管我们用水做饭，用水洗涤——而且我们人体很大部分是由水构成的——但几乎没有人真正了解它的性质。这是情有可原的。这种奇特的化合物是地球上最复杂的化合物之一。

真的，水似乎上是一种非常简单的物质。它是一种清澈的，稳定的液体，遇冷结冰，遇热沸腾，在其他情况下则显然是稳定不变的。但是尽管水无色、无臭、无味，但它并不是没有特征的。它是地球上最普遍、最基本的化合物。

水无所不在。在海洋里，在植物中，甚至在我们呼吸的空气中，我们的身体含水分65%，青蛙身体含水分78%，而波动不停的水母则含95%，几乎全是水。

由于水与众不同的电荷特性，不管是有机物还是惰性物质，它都能轻而易举地与之融合成一体。一个水分子中的一个氧原子和两个氢原子的排列使它既带一点儿正电荷，又带一点儿负电荷。由于正电荷吸引负电荷，反之亦然，一个水分子两者都具备，便易于与附近的任何分子相结合，而不管其电荷正负如何。正因为如此，许多种类的物质均能溶于水中。比如，当一匙盐放到一杯水里，水分子便侵入盐晶体，破坏原有的链，而产生出新的链。

但是水绝非只有在液体状态时才显示出它的原子的古怪习性。当温度下降时，绝大多数物质都收缩，因为寒冷抑制了分子的运动。而水则仅仅在结冰凝固以前才遵循这一规律。在结冰的时刻，水分子则排列成多孔状的松散结构，这就使整个体积膨胀。这种膨胀十分明显，在实验过程中，当四分之一英寸粗的密封细颈铁瓶中的水突然冻结时，这些铁瓶竟炸裂了。而当冰消融时，其分子结构崩溃，小得多的空

间能容纳多得多的分子。因此，一磅冷水比一磅热水体积小，密度大，而一磅冰则比一磅冷水或一磅热水都要体积大，密度小。水的结冰和消融这一变化过程惊人地活跃。水要结冰，就必须向其周围释放出大量的能量；相反，水在沸腾前，必须从其周围吸收大量的热能。因此，一辆汽车的冷却水箱通常能够使发动机冷却而它自己则不致于过热。

地球上温度的调节部分地有赖于水能够贪婪地吸收外部热量这一特性。海洋吸收了射到这颗行星上的大部分阳光，气候才免于受到明显的影响。而这也是一件幸事。要是没有这种起缓冲作用的液体，我们就可能要经受接近275华氏度的高温。这样的高温就经常烘烤着我们的干旱不毛的月球。

我们的地球与其近邻星球之间的这一明显的差异要归功于我们称之为水的这种氢氧化合物的变化多端的性质。这种本领高强的物质有助于平衡地球的气候，开动地球上的机器，以及维持地球上的各种生命形态。它也许还会难倒那些试图揭开其奥秘的人，这一点只不过是说明它突出的复杂性的另一个例证罢了。

2 What Causes the Tide?[1]

The Moon rotates around the Earth in the same direction that the Earth rotates around its own axis. In the course of twenty four hours the Earth completes one revolution of 360 degrees. During the same period of time the Moon moves 12 degrees around the Earth. A spot on the Earth directly beneath the Moon therefore has to travel 372 degrees before it is once again beneath the Moon. That extra 12 degrees takes abut 50 minutes, so that the time between Moon-rises is 24 hours and 50 minutes.

As the ocean tides follow the path of the Moon, the tidal 'day' is also 24 hours and 50 minutes long. Within this time there are, at most places on Earth, two high tides and two low tides. The reason for this is that the Moon's gravitational pull draws the ocean waters of the Earth towards it on the nearest side, creating a slight bulge. A corresponding bulge is generated on the opposite side of the Earth by the complex gravitational forces of the Earth-Moon orbital system. These bulges stay constantly orientated in line with the direction of the Moon. Meanwhile the Earth continues its rotation around its own axis, the continents and oceans performing their circuit together, while the two bulges stay put[2]. For this reason most coastal regions experience two high tides and two low tides within each lunar 'day'.

Pliny, a Roman scientist and naturalist, described

lunar tidal effects in the first century AD, but the complex mathematics of the physical laws at work were not formulated until the 17th century, when[3] Sir Isaac Newton developed his Law of Gravitation. According to this law, every particle in the Universe attracts every other particle. This attraction is proportional to the mass of the bodies involved. If mass alone was involved, then the Sun would exercise a greater pull on the Earth than the Moon does, for the Sun has a mass some 27 million times that of the Moon. But Newton's law also states that attraction is inversely proportional to the square of the distance between two bodies. If the distance between two bodies is doubled, then the attraction is quartered. The Sun is 390 times further from the Earth than the Moon. Tide-producing force is not straightforward attraction.[4] Tides are formed because the force exerted by the Moon on the nearest side of the Earth is greater than that exerted on the centre of the Earth, owing to the increased distance. The difference between the two forces makes the water move towards the pull of the Moon. This tide-producing force varies more than attraction with distance. The difference in pull between the nearest point of the Earth and the centre is inversely proportional to the cube of the distance. Therefore we can see that the Sun's superior mass is more than offset by its distance from the Earth. In fact, the Sun only produces about 46 per cent of the tidal attraction exerted by the Moon.

The effects of gravitation, as explained by Newton, also account for the bulge in the sea on the opposite side of

the Earth from the Moon. The water on the far side of the Earth is subject to less attraction than the Earth itself because it is further from the Moon. As a result the water on the far side of the Earth bulges outwards. Imagine swinging a jelly-like ball around on the end of a string. It will deform into an elongated blob — with a bulge facing the string and a bulge facing outwards. A similar mechanism generates our ocean tides.

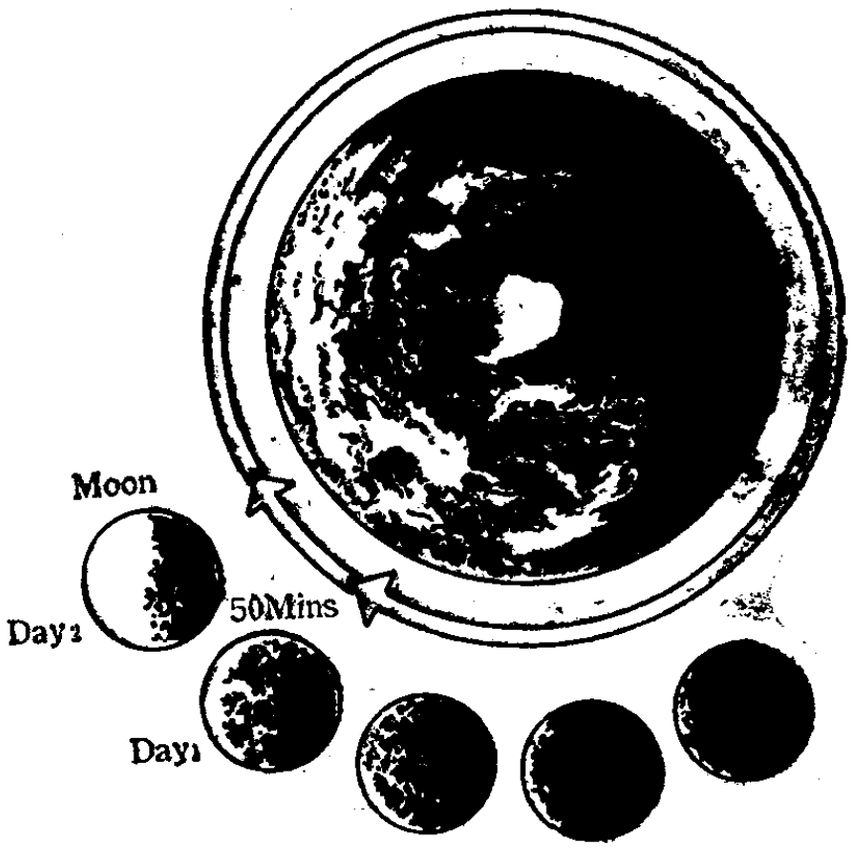
At full Moon and new Moon, the Sun and the Earth all lie along the same axis, with the Moon either between the Earth and the Sun, or else on the opposite side of the Earth from the Sun. With the gravitational forces of both Sun and Moon pulling in the same direction high tide is higher than usual. Also, because the 'bulge' is larger, the depressed ocean areas that form a band 90 degrees away, between the two swollen areas, are lower than usual.

Neap tides take place when the Moon is close to its first and third quarters. At these times the Sun, Earth and Moon form a right angle, with the Moon at one side or other of the Sun-Earth axis. The two ocean bulges are still orientated in line with the Moon, but the Moon's gravitational force is counteracted by that of the Sun, and the tidal range is correspondingly lower. Neaps are generally 20 per cent lower, and springs 20 per cent higher than average tides.

Other cyclic variations in the relationships between Sun, Moon and Earth also affect tidal range. The ellipse of the Moon's orbit around the Earth causes higher tides at perigee, the closest point to the Earth in the orbit, and

lower tides at apogee, the furthest point from the Earth. The difference between perigean and apogean tides may be as high as 40 per cent.

Yet another effect to be added in to the predictable variations occurs in a one year cycle as a result of variation in distance from the Sun of the Earth during its annual re-



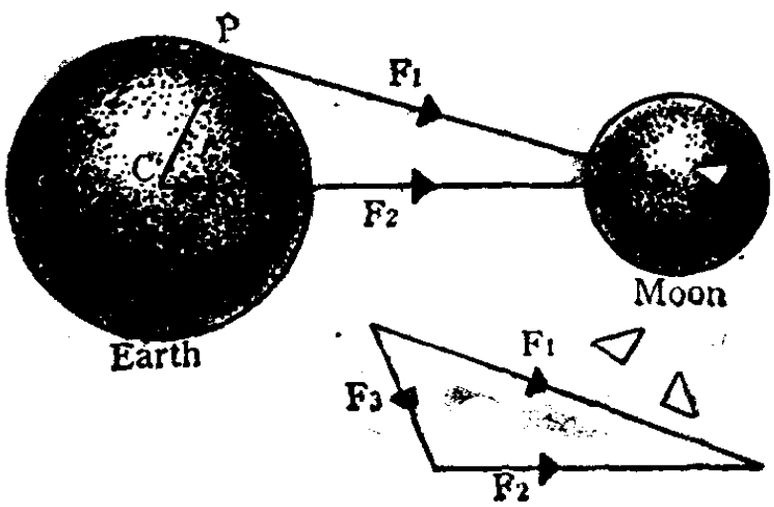
II — 1

Above Since the Moon orbits in the same direction as the Earth's rotation the Earth must make slightly more than one revolution for the Moon to reach the same place in the sky. The extra time required is 50 minutes and accounts for the slightly longer-than-half-day intervals between tides.

volution.[5] The Moon reaches its absolute perigee once a year. The perihelion, or closest approach of the Earth to the Sun, takes place every year on or about January 2nd. When perigee and perihelion coincide tidal range

is at its greatest. The opposite is true when apogee and *aphelion* (greatest distance between Sun and Earth) coincide.

Our own Moon, it has been discovered, is prone to measurable Moonquakes at its perigee, which are believed to result from the Earth's tidal effect. A further tidal effect on the Earth itself has been happening with almost immeasurable slowness for many millions of years. Because the Earth does not rotate absolutely smoothly beneath the swelling oceans, but is subject to a certain amount of friction, there is a gradual slowing down of the rotation. The rate is only an increase in the length of the day of about 0.002 second over the last 100 years. However, there is evidence from fossil corals that over the last 400 million years the year has decreased its number of days from 400 to the present 365.



II — 2

The forces which cause the tides are generated by the fact that different parts of the Earth experience a different combination of forces from the Moon and Sun. For instance, the total tidal force at P is the difference between forces F_1 and F_2, giving a resultant force F_3, which draws water towards the equator.

The progression of tidal effects is both elegant and stately. They are responsible for the breeding cycles of tiny animals and the destruction of moons. They can shape galaxies and, quite likely, affect the evolution of life forms. If we could begin to harness a tiny fraction of tidal energy from the oceans alone we would be plugging in to the Universe instead of merely scratching at its surface.[6]

Explanation of Words: 词解:

account [ə'kaunt] explain the cause, serve as an explanation of, answer 解释，回答

aphelion [æ'fi:liə] point in a planet's orbit at which it is farthest to the sun 远日点

apogee ['æpoudʒi:] position in the orbit of the moon or any planet when it is at its greatest distance from the earth 远地点

axis ['æksis] (pl. axes ['æksi:z])line round which a turning object spins 轴

band [bænd] flat, thin strip of material 带，箍

blob [blɔb] drop of liquid 一滴液体

bulge [bʌldʒ] place where a swelling or curve shows 鼓起处

coincide [kouin'said] happen at the same time 巧合

coral ['kɔrəl] hard, red, pink, or white substance built on the sea bed by small creatures 珊瑚

elongate ['i:lɔŋ'geit] make or become longer spatially 伸长，延长

fossil ['fɔsil] recognizable prehistoric animal or plant buried in earth, now hardened like rock 化石