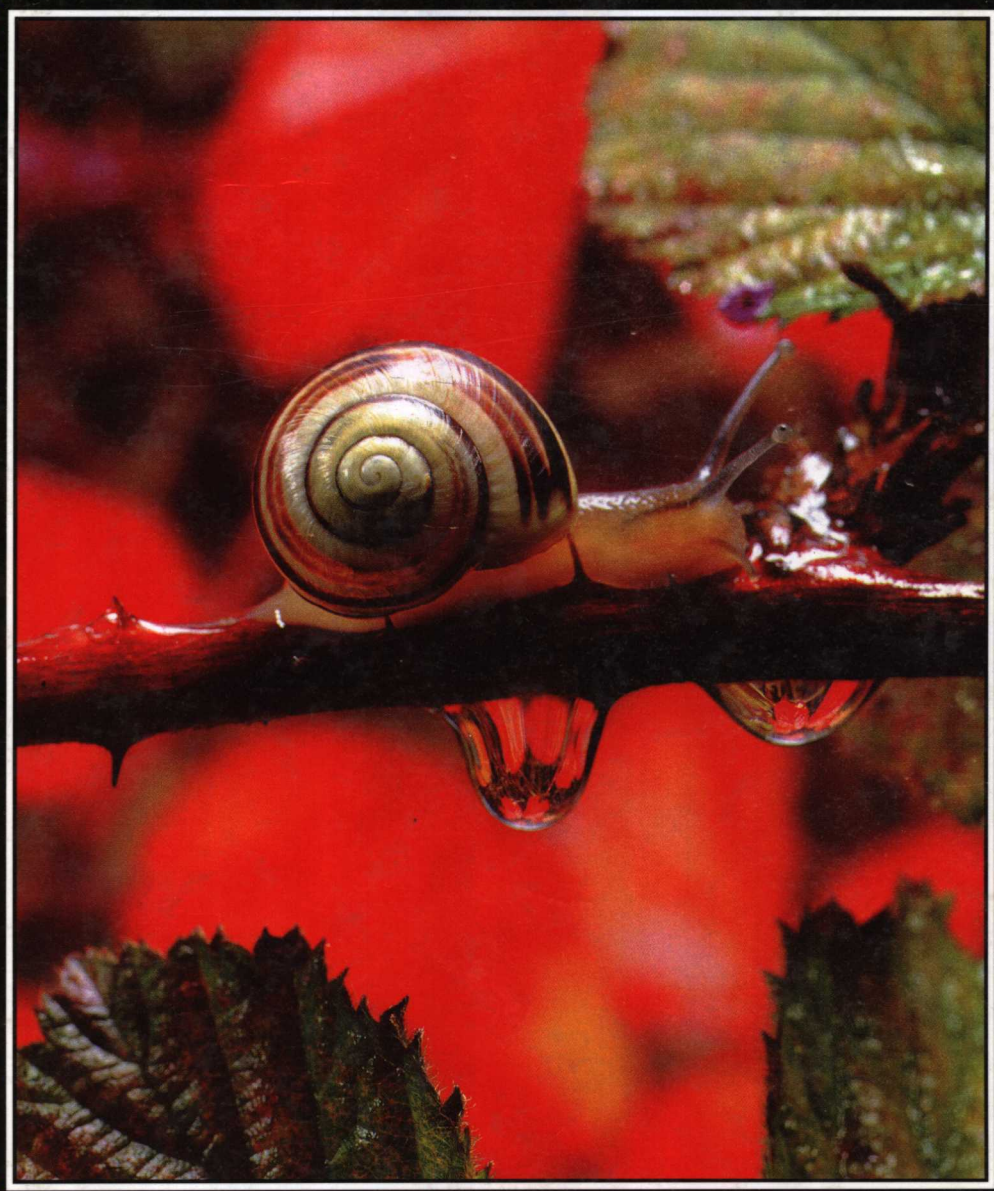


The Nature and Science of **RAIN**

雨的奥秘



Jane Burton and Kim Taylor 著 赵千川 译



外语教学与研究出版社

FOREIGN LANGUAGE TEACHING AND RESEARCH PRESS

The Nature and Science of

RAIN

雨的奥秘



Jane Burton and Kim Taylor 著

赵千川 译



外语教学与研究出版社

Foreign Language Teaching and Research Press



00155672

(京)新登字 155 号

京权图字: 01 - 1999 - 1553

图书在版编目(CIP)数据

雨的奥秘/(英)伯顿,(英)泰勒著;赵千川译.-北京:外语教学与研究出版社
ISBN 7-5600-1752-5

I. 雨… II. ①伯… ②泰… ③赵 III. 雨-普及读物 IV. P426.62-49

中国版本图书馆 CIP 数据核字(1999)第 54244 号

版权所有 翻印必究

Copyright © in this format 1997
by White Cottage Children's Books
Text and photographs copyright ©
1997 by Jane Burton and Kim Taylor

The photograph on page 18 (above) is by Mark Taylor

All rights reserved. No part of this
publication may be reproduced or transmitted,
in any form or by any means, without permission.
The rights of Jane Burton and Kim Taylor
to be identified as the authors of this
work have been asserted by them in accordance
with the Copyright, Design and Patents Act 1988.

雨的奥秘

Jane Burton and Kim Taylor 著

赵千川 译

* * *

责任编辑: 孙 蓓

执行编辑: 李 毅

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.cn>

印 刷: 北京新华彩印厂

开 本: 889 × 1194 1/16

印 张: 2

版 次: 2000 年 1 月第 1 版 2000 年 1 月第 1 次印刷

印 数: 1—10000 册

书 号: ISBN 7-5600-1752-5/H·1007

定 价: 12.90 元

* * *

如有印刷、装订质量问题出版社负责调换



Contents 目录

	Miraculous Rain 4 不可思议的雨
	Wet Air 6 潮湿的空气
	Fog and Clouds 8 云雾
	Falling Rain 12 下雨
	Drips and Drops 14 水滴
	Looking Through Raindrops 16 透过雨滴观察
	Waterproofing 18 防水
	Rain to Drink 20 饮用的雨水
	Water at Work 22 水在起作用
	Rainy Seasons 24 雨季
	The Water Cycle 26 水循环
	Things to Do: Measuring and Making Rain 28 动手做: 测量和制造雨
	Glossary 30 词汇表
	Plants and Animals 31 动植物索引
	Index 32 索引





Miraculous Rain

不可思议的雨

Heavy rain can be exciting and even dangerous. Raindrops come pelting down, the ground gets sodden and puddles form. Swirling brown water fills the rivers and may burst over their banks. But after rain, when the sun shines again, leaves are fresh and green, birds sing and flowers open.

Rain is absolutely **vital** to life on Earth, but it is possible only because air and water are able to mix. It may seem unlikely that a gas and a liquid can mix, but that is what happens when water **evaporates** into the air and that is where rain begins.

Water itself is made up of two gases, **hydrogen** and **oxygen**, joined together. Two **atoms** of hydrogen **combine** with one atom of oxygen to make one **molecule** of water. That is why the **chemical formula** for water is H_2O .

大雨有时是惊心动魄的，甚至是危险的。雨水倾盆而下，浸透土地，形成水洼。翻卷的泥水使河水猛涨，还可能冲出堤岸。不过，一俟雨过天晴，就是一派树叶清翠欲滴，鸟鸣花开的景象了。

雨对地球上的生命至关重要，但雨能够形成仅仅是因为空气和水可以混合。气体和液体相混合，听起来好像不大可能，但当水分蒸发到空气中并开始降雨时，情况确实如此。

水本身由氢气分子和氧气分子这两种气体结合而成。两个氢原子和一个氧原子组成一个水分子。这就是水的化学式是 H_2O 的原因。

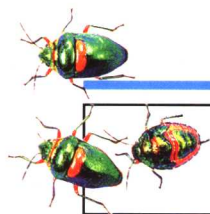
Black clouds have built up
along the coastline of west
Wales, blotting out the sun.
Rain is falling in grey curtains
over the sea.

沿西威尔士海岸的上空，乌云密布，形成一道灰幕，遮天蔽日，滂沱大雨倾泻在海面上。

A raindrop falls into a still pool causing a spike of water to shoot up and break into smaller drops.

一滴雨落到平静的池塘中，溅起水柱后又化成更小的水珠。 ▼





Wet Air 潮湿的空气

The brilliant colours of Harlequin Bugs gleam amongst the **moist green** leaves of **tropical forest**.

卷心菜斑色蝽明亮的色彩在热带雨林潮湿的绿叶中闪烁。

All around you there is water in the air. You cannot see the water because it is in the form of separate molecules floating about, mixed in with the molecules of air. It is water in a gas-like form and is known as **water vapour**.

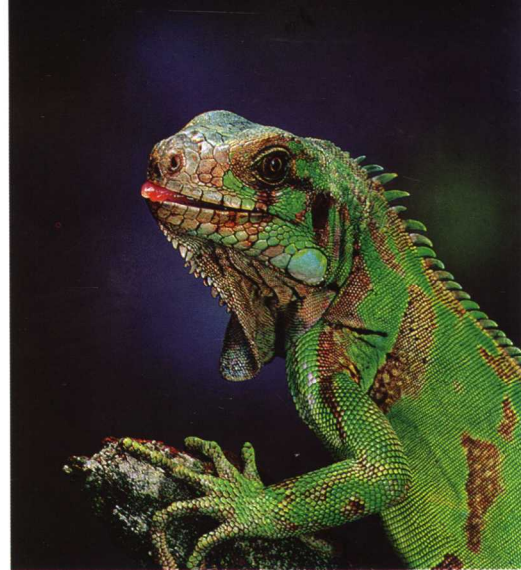
There is always some water vapour in the air. In desert areas there is just a little, but in **rainforests** there is a lot. The amount of water



vapour in the air is measured as a percentage called **relative humidity**. When the relative humidity is 100 per cent, it means that the air cannot carry any more water. It is **saturated**, and wet things will not dry at all.

我们身边空气中到处都有水。你看不到这种水是因为它以单个分子的形式存在，混在空气分子中以四处飘浮。这种以类似气体形式存在的水就是水蒸气。

空气中总有一些水蒸气。沙漠地区水蒸气很少，而雨林却有大量水蒸气。空气中水蒸气的量以叫做相对湿度的百分比表示。相对湿度达到百分之百，意味着空气不能接纳更多的水。这时空气处于饱和，潮湿的东西根本就晾不干。



A Green Iguana gets its water through eating leaves which contain water and through licking raindrops off the foliage.

绿鬣蜥通过吃含水的树叶和舔食叶子上的雨水来获得水分。

Plants take water out of the ground and give out water vapour into the air through their leaves. Where there are lots of leaves, as in this rainforest, the air is always moist.

植物从土地吸收水分并通过叶片释放水蒸气。在叶子繁茂的地区，如图中的这片热带雨林，空气总是潮湿的。





Fog and Clouds 云雾

Have you ever walked down by a river on a misty morning, or been in a city fog, or climbed a mountain until you reach the clouds? If you have, you will have seen the tiny specks of water that make up fog and cloud **drifting** in the air. These tiny water **droplets** are much easier to see in bright light, especially when the sun shines.

Warm air can carry more water vapour than cold air. This means that when air is cooled, its relative humidity rises and it may become saturated if it is cooled enough. Fog and clouds form when saturated air is cooled further. Then, the vapour **condenses** into water droplets. This happens when moist air near the ground rises high into the cooler regions of the **atmosphere** and forms clouds. It also happens at night when the ground becomes cold and cools the air next to it, forming fog.

你是否曾在晨雾中沿着河流漫步，或置身于笼罩在雾气中的城市，或登高到云雾缭绕的绝顶？如果有这种经历，你就会看到飘在空中形成云雾的小水点以及飘荡在空中的云。这些小水点在亮光中特别是阳光下更容易看到。

暖空气比冷空气可以携带更多水蒸气。这就是说当空气变冷时，相对湿度升高，如果足够冷时，空气就会饱和。饱和空气进一步降温就形成云雾。届时水蒸气会凝结成水点。当靠近地面的潮湿空气上升到更为寒冷的大气区域中形成云时，就属于这种情形。夜晚地面变冷使地面附近的空气降温形成雾时，也属于这种情况。



On a damp, misty autumn morning the air is saturated with water vapour and fine droplets hang in the air. Every surface is wet including the twigs and leaves of the trees, and the only sound is a steady drip, dripping.

在秋天潮湿、有雾的早晨，空气中充满水蒸气和悬浮在空中的小水点。包括树枝和树叶在内的所有物体表面都是湿的，惟一的聲音就是连续不断的滴水声。

Mist forms close to the ground when the air cannot carry any more water vapour. Some of it has to condense and every surface becomes laden with drops – even a piece of thistle down caught in the fine gossamer of a spider's web.

当空气不能再接纳水蒸气时，靠近地面处就形成雾。一部分水蒸气不得不凝结，所有物体表面都布满水珠，即使是缠在蜘蛛网细丝上的蓴种子冠毛也不例外。▼



Clouds form when wind carries moisture-laden air over mountains. The wet air is pushed up and cooled, causing the vapour to condense into tiny droplets.

风把潮湿空气吹过群山时，云就形成了。湿润的空气升高而冷却，使水蒸气凝结成极小的水点。▶

The shallow water where the Greater Flamingos are paddling has been warmed by the sun all day, but now it is evening and the incoming tide is so cold that it is cooling the air next to it, causing mist to form.

一整天的日照温暖了大火烈鸟行走的浅水，但时至傍晚，冰冷的潮水涌来，冷却了周围的空气，形成薄雾。▶

Most of the clouds that you see in the sky are made up of millions of minute water droplets **suspended** in the air. All this water is collected by the air in the form of vapour. A lot of it comes from the surface of the sea – particularly from warm **tropical** seas because warm water **vaporises** more readily than cold water. When salt water evaporates, only the water gets into the air. The salt is left behind.

Cold seas also supply water vapour to the air – especially when whipped up by stormy winds. A cold stormy sea like this one off the coast of Namibia (below) can put a lot of water vapour into the air.

天空中大部分可以看到的云由悬浮在空气里的无数小水点组成。所有的水以水蒸气的形式存在于空气中。许多水来源于海面——特别是温暖的热带海洋，因为热水比冷水更容易蒸发。海水蒸发时只有水分升到空气里。盐分会留下。

冰冷的海水也会向空气提供水蒸气——特别是当风暴席卷海面时。纳米比亚(如下)海岸附近的冰冷汹涌的海水就能够向空气输送大量水蒸气。







Falling Rain 下雨

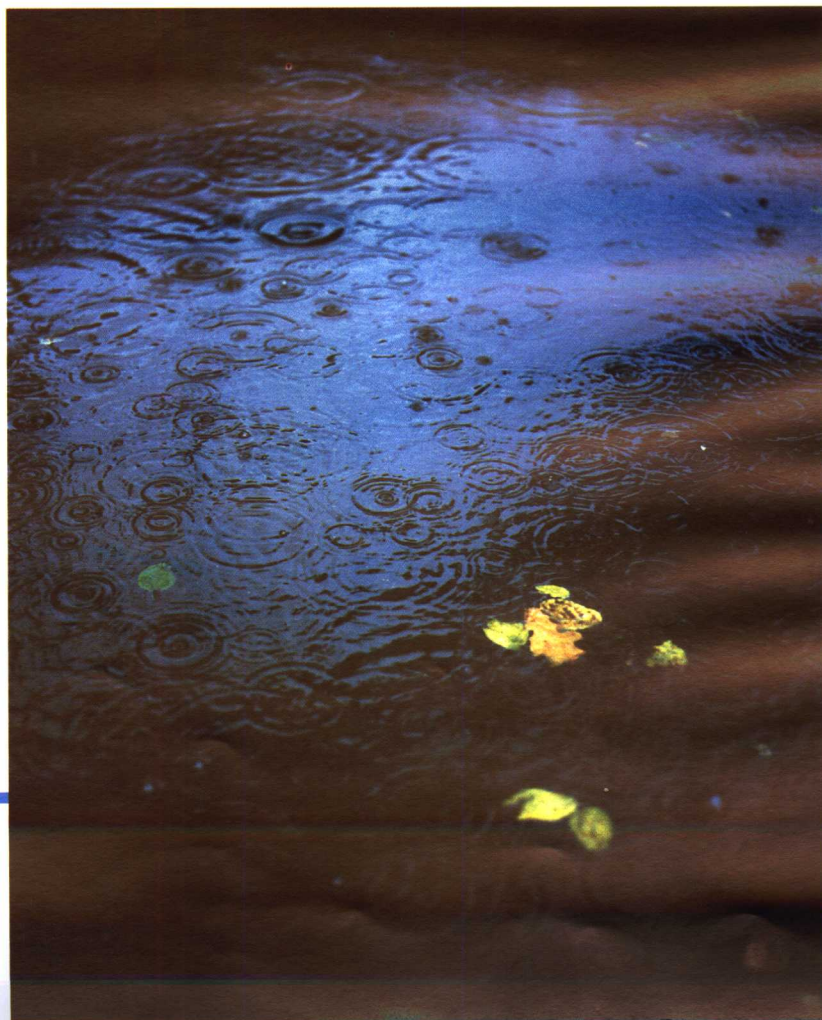
What causes a cloud to turn into rain? There is an easy answer: it is just a matter of **drop size**. When the droplets in a cloud grow beyond a certain size, instead of drifting, they start to fall.

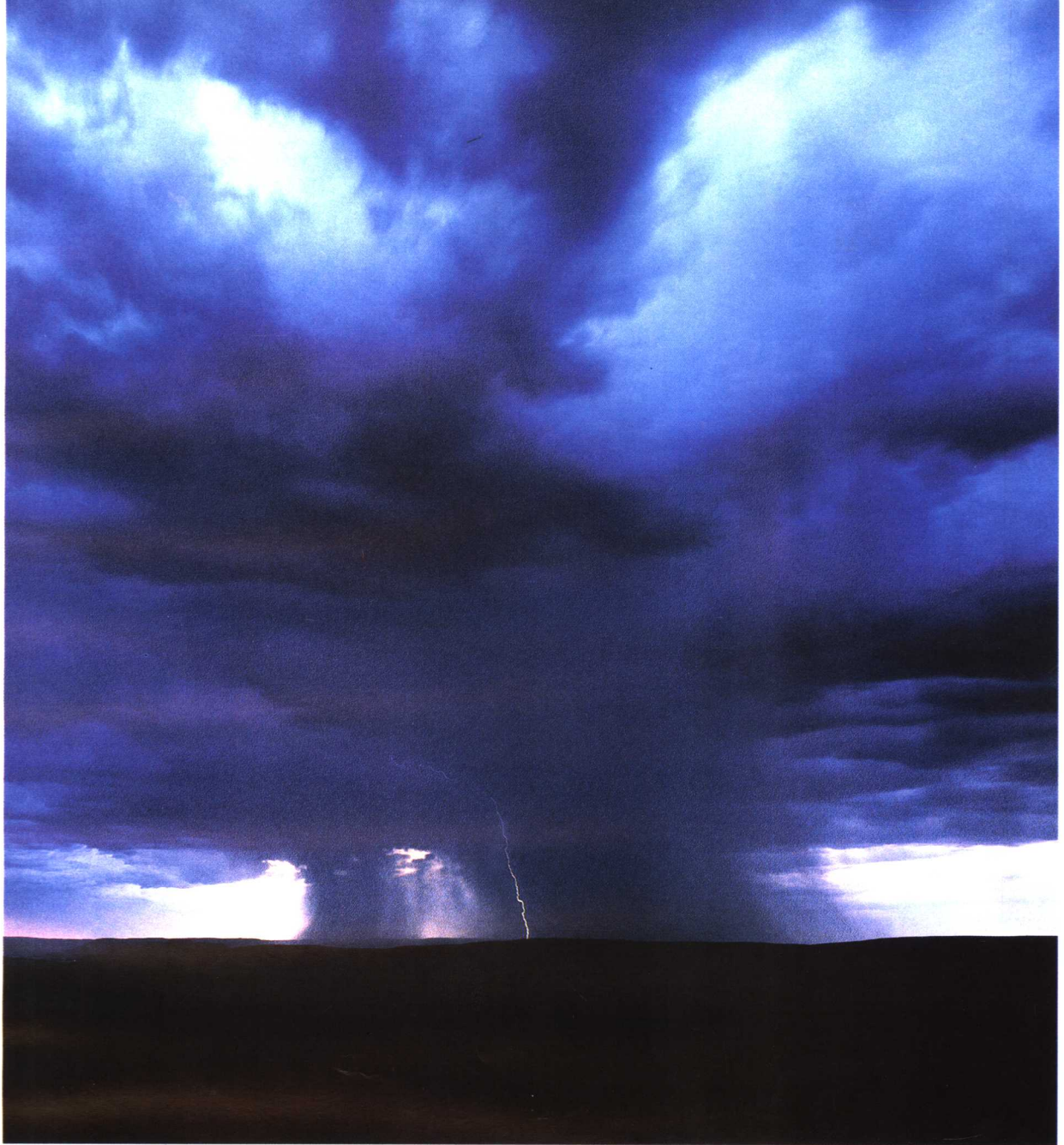
The reason why droplets in clouds sometimes grow is more complicated, but it is mostly a matter of temperature. When a cloud becomes colder, more water vapour condenses onto its droplets so that they get bigger and start to drift downwards. The falling droplets gather more water on their way, soon becoming raindrops which tumble towards the Earth.

Clouds become cooled if the air that carries them is pushed up higher into the atmosphere. This happens when wind blows them over mountains. That is why mountainous areas close to the sea are some of the wettest places on Earth. On high mountains, the air is so cold that the wetness falls as snow.

Raindrops falling from a thunder cloud collect moisture on their way down. The further they have to fall, the bigger they get and the faster they fall. They hit the ground really hard when they get there, and puddles quickly form. The black clouds are reflected on the surface of the puddles, and everywhere is dark.

雷雨云的雨点在下落过程中聚集着水分。雨点下降的距离越长，雨点越大，下降就越快。落到地面时雨点打得很猛，地面上很快就形成水洼。水洼倒映着乌云，到处笼罩着黑暗。





是什么把云变成了雨？答案很简单：是水珠大小的变化。当云中的水点增大超过一定液滴尺寸时，就不再飘浮，而是开始落下。

云中水点有时增大的原因比较复杂，但主要是温度的作用。云被冷却时，更多的水蒸气凝结到小水点上，使它变大并下降。降落的小水点聚集了更多的水分，很快就变成雨点坠向大地。

如果云随空气在大气中升高会变冷。云被风吹过群山时就会出现这种情况。这就是为什么靠海的山区属于地球上最湿润的地方。在高山上，空气非常寒冷时，水蒸气形成降雪。

Thunder storms ▲

often form when **currents** of warm moist air rise high in the sky above ground that has been heated by the sun.

雷暴常常是在暖湿气流升至远远高于被太阳加热的地表的高空中时形成的。



Drips and Drops 水滴

The water droplets in clouds and fine raindrops drifting gently downwards are perfect **spheres**. They are like tiny round beads. Each drop is held in shape by something called **surface tension**. This is like an elastic skin which keeps each drop round. All water surfaces – even the flat surfaces of lakes and puddles – have this invisible elastic **film** over them.

As falling raindrops get bigger, they hurtle through the air faster and their shape changes. The rush of air pushing against their lower sides makes them egg shaped. Eventually, surface tension, which is not very strong, can no longer hold each drop together and the big drops break up into smaller drops. This means that there is a **maximum** size for raindrops beyond which they cannot grow any bigger. The largest raindrops are only just over 4 millimetres across.

▲ A drop falls off a berry...

从浆果上落下的一个水滴……

▼ It hits the surface of a pond...

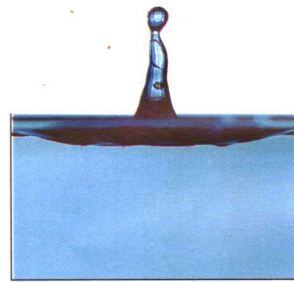
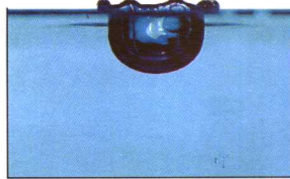
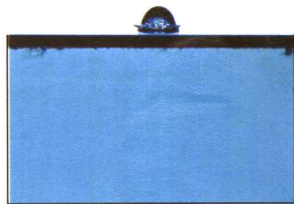
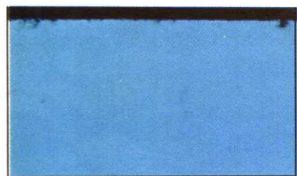
它打到池塘的水面……

▼ The drop smacks into the pond making a hollow in its surface...

水滴拍到池塘中在水面上打出一个坑……

▼ Water rushes from below to fill the hollow, but goes too far and makes a spike.

水从下面冲起来填补这个坑，却因冲得太高形成水柱。





Raindrops falling into a pond hit the surface so hard they make little spikes jump up out of the water. You can see a spike with a drop above it in between the ducks.

雨点砸到池塘水面,激起四处飞溅的小水柱。你可以看到鸭子之间的水柱及其上方的水滴。

云中的水点和徐缓下降的细雨滴是纯圆的。它们就像极小的圆珠子。每个水滴的形状都是由叫做表面张力的东西维持着。这就好像有一张弹性膜使它保持圆形。所有水面——即使是湖水和水洼的平整的表面——都有这么一张看不见的弹性膜覆盖在上面。

随着下落的雨点越来越大,它们在空气中坠落的速度也越来越快,形状也发生着变化。迅速流过的空气顶托它们的底部,使它们变成卵形水滴。最后,并不是很强的表面张力,再也无法使整滴雨珠维系在一起,大的雨滴散开成若干较小的雨滴。这就是说雨滴不可能超过某个最大尺寸。最大的雨滴直径刚好超过4毫米多一点。

▼ A little drop breaks off the top of the spike...
水柱顶上分出一个小小水滴……

▼ and keeps going up.
继续上升

▼ The spike falls back into the water...
水柱回落到水中……

▼ leaving the little drop to fall in later.
只剩小小水滴随后落入。

