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THE

# Telescope and Microscope

英语科普注释读物

## 望远镜与 显微镜

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上海译文出版社

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**The Telescope and Microscope**

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古民康 章汝荣 注释

上海译文出版社出版

上海延安中路 967 号

新华书店上海发行所发行

无锡外贸印刷厂印刷

开本 787×1092 1/32 印张 2.25 字数 44,000

1979 年 5 月第 1 版 1979 年 5 月第 1 次印刷

印数：1—120,000

书号：9188·39 定价 0.18 元

## 注释者的话

《望远镜与显微镜》选自 How It Works 丛书,由英国人罗伊·沃维尔 (Roy Worvill) 撰写,分别介绍望远镜与显微镜的产生、演变、种类及其操作方法;同时通过实际应用初步揭示了宏观和微观两个不同的世界。

本书可供大学一、二年级英语专业学生及具有中等英语程度的有关专业的读者阅读。书中出现的较难的习语、句子和语法现象都即页作了脚注,以便读者在阅读时参考。

由于初次进行科普英语原著的注释工作,且限于水平,难免存在缺点和错误,希读者批评指正。

一九七八年十二月

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# The Telescope

## Two worlds to explore<sup>1</sup>

How far can you see? The answer to this question really depends upon what you are looking at<sup>2</sup>. On a perfectly clear, dark night<sup>3</sup>, if your sight is keen and there is nothing in the way<sup>4</sup>, you can see the light of a small electric bulb, or even a candle-flame, at a distance of several miles<sup>5</sup>. The sun is an object of dazzling brilliance which can be seen at a distance of more than ninety million miles, though—for the sake of one's eyes<sup>6</sup>—it is not wise to look at the sun.<sup>7</sup>

Even the nearest star is far more distant than the sun<sup>8</sup> and, with the naked eye, we can see many whose light takes hundreds of years to reach us<sup>9</sup>. High overhead on winter

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1. 探索两个世界. to explore 是动词不定式, 作定语, 修饰 two worlds. 动词不定式作定语时常放在它所修饰的名词后面. 2. 取决于你瞧的东西了. to depend upon: 依……而定. 它后面跟一个由连接代词 what 引起的宾语从句, what 本身又是从句中的宾语. 3. 在晴朗无云的黑夜. 注意介词 on 的用法. 凡指具体的“某个晚上”, 须用 on 而不用 in 或 at, 如 on Saturday night; 如果指一般“晚上”, 则用 at night. 4. 挡在中间; 遮住视线. 5. 远在几英里路之外. 6. 为了(保护)眼睛起见. 这是一个插入语. for the sake of: 为……起见. 7. 盯着太阳看是不好的. it 是本句的形式主语, 动词不定式短语 to look at the sun 是真实主语. 这里的 look at 有“注意看”的意思. 8. 甚至(离我们)最近的恒星也要比太阳远得多. 这里的 far 修饰 more distant, 起加强语气的作用. >than 是连接词, 引起一个省略了句子成分的比较状语从句. 这里的 sun 后面省略了谓语动词 is. 9. 我们用肉眼能看见许多恒星, 它们发出的光照到我们需要数百年时间. the naked eye 作“肉眼”解. “动词 take + 时间 + 动词不定式”意思是“需要多少时间做某事”. 例如: He took two years to write the novel.



evenings in the northern hemisphere is a group of stars called Andromeda.<sup>10</sup> Among them is a faint wisp of light which comes from the combined rays of a hundred thousand million stars which make up the great Andromeda galaxy.<sup>11</sup> This light takes about<sup>12</sup> two million years to reach the earth. It is the most distant object which can be seen with the unaided eye<sup>13</sup>.

A telescope enables us to see things at vastly greater distances even than this.<sup>14</sup> A microscope enables us to look into a quite different, but equally exciting, world of things too small for the naked eye<sup>15</sup>. In this book we shall explore both worlds, the very big one shown to us by the telescope and the very small one revealed by the microscope<sup>16</sup>.

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10. 冬夜, 在北半球上空高挂着一群恒星, 称谓仙女座. 本句用的是倒装语序, 目的是强调表语 high overhead, 使被描写的景象更生动. 主语是 a group of stars, 过去分词短语 called Andromeda 作定语, 修饰 stars. 11. 在这群繁星间, 夹着一束暗淡的星光, 它来源于组成大仙女座星系的一千多亿颗恒星的聚合光线. 本句用的也是倒装语序, 目的是使本句和上文有更紧密的联系, 同时也由于句中主语较长, 自 a faint wisp of light 开始至句末 the great Andromeda galaxy. 这里的 make up 是“组成”的意思. 12. 大约; 左右. 这是副词, 修饰 two million. 13. 肉眼, 相当于 the naked eye. 14. 望远镜能使我们看到甚至比这束暗淡的星光更遥远的东西. 这里的 a telescope 并非指“一架望远镜”, 而是泛指“望远镜”. 指示代词 this 指上文的 a faint wisp of light. 15. 观察到大量迥然不同、小得连肉眼都看不见的东西, 但同样令人兴奋. a world of; 大量, 无数. too small for the naked eye 是形容词短语, 作定语, 修饰 things. too ... for (太……以致不能)的意思和 too ... to 相仿, 但前者接名词或动名词, 后者接动词. 16. 由望远镜显示的宏观世界和由显微镜揭示的微观世界. 句中用不定代词 one 代替名词 world, 以避免重复.

## The first telescopes

The earliest telescopes were made about the year 1608. *We cannot be sure who made the very first one.*<sup>17</sup> *Glass lenses were being used for spectacles before this time*<sup>18</sup> and two Englishmen, Roger Bacon (1210-1294) and Leonard Digges (1510-1555) who both lived at Oxford, made many experiments *with lenses and mirrors*<sup>19</sup>.

*It seems very probable, however, that the possibility of the telescope was realized by a Dutch spectaclemaker named Hans Lippershey, although a fellowcountryman of the same trade, Zacharias Jansen, also claimed the credit.*<sup>20</sup> The discovery was almost certainly the result of a simple experiment *using two lenses*<sup>21</sup>. *Distant objects suddenly appeared to be nearer.*<sup>22</sup> This would obviously be very useful in time of war, *enabling an enemy to be watched at*

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17. 我们不能确定谁制造了最早的那架望远镜. 连接代词 who 引起一个宾语从句, 同时又在从句中作主语. 这里的 very 是形容词, 和 the 连用, 用来加强名词的语气, 意思是“正是那个”. 18. 在这以前玻璃透镜已用来作眼镜. were being used 是过去进行时的被动语态. 介词 for 的意思是“当作、作为”. 19. 用透镜和平面镜. 介词 with 作“用(什么工具)”解. 20. 然而, 看来很可能是一个名叫汉斯·利珀希的荷兰眼镜商发明了望远镜, 尽管他的同行扎卡赖亚斯·詹森也要求享有这个荣誉. 句中 it 是形式主语, 代表连接词 that 所引起的主语从句. seem (看来是, 似乎是)是连系动词, 形容词 probable 作表语, 两者合成表性状的复合谓语. 连系动词 seem 用一般现在时, 表示客观事实. 21. 使用两个透镜. 这是现在分词短语, 作定语, 修饰 experiment. 22. 突然远处的物体看起来近了些. 本句相当于 it appeared that distant objects were suddenly nearer. appeared to be (似乎是, 看上去好象)后跟形容词构成表性状的复合谓语.

a distance<sup>23</sup>.

Perhaps you have used a simple convex lens<sup>24</sup> as a burning-glass<sup>25</sup>, collecting the sun's rays and concentrating their light and heat in a small bright spot<sup>26</sup>. This spot is a very small picture, or image, of the sun. The distance from the spot to the lens is called the focal length<sup>27</sup> of the lens.

An image formed in this way can be magnified by another lens, of shorter focal length, and this is most conveniently done by mounting both lenses in a tube<sup>28</sup>.

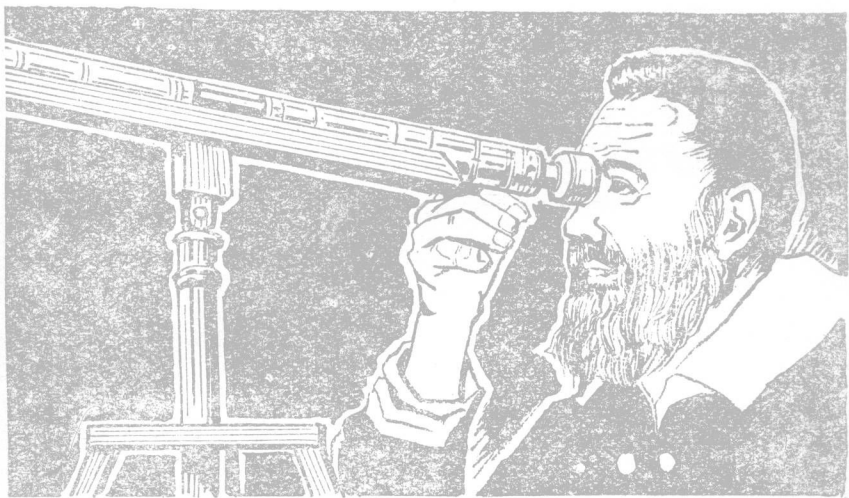
Some of the first telescopes were very long, as much as 150 feet<sup>29</sup>, in order to avoid the worst effects of rainbow-coloured edges<sup>30</sup>, produced because a simple lens cannot bring all the colours in sunlight to the same focal point<sup>31</sup>.

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23. 能从远处监视敌人. 这是现在分词短语, 作状语, 修饰谓语动词 would be, 含有说明原因的意味. 24. 凸透镜. 25. 作为取火镜. 这里的介词 as 作“作为”解. 26. 聚合太阳的光线并使其光和热集中在一个明亮的小点上. 这是两个并列的现在分词短语, 作状语, 含有说明目的的意味. 27. 焦距. 28. 做到这点非常方便, 只需将两片透镜装在一个镜筒里. this 是指上文提到的用另一块焦距较短的透镜放大由此而形成的(物)象这一情况. 这里的 by 表示方式, mounting both lenses in a tube 是动名词短语, 作介词 by 的宾语. 29. 长达 150 英尺; 有 150 英尺那么长. as ... as ... 意思是“如同……, 象……一样”. 这里第一个 as 是副词, 第二个 as 是连接词, 两者配合使用引起一个比较状语从句. 30. (图象的)五颜六色的边缘. 31. 焦点.



## Galileo explores the heavens



News<sup>32</sup> about the wonderful new invention quickly spread to countries outside Holland; to France, Germany and Italy. In Venice it reached the ears of an Italian professor of mathematics named *Galileo Galilei*<sup>33</sup>. He is usually known by his *first name*<sup>34</sup>, Galileo, and *it was he who first gave the new instrument the name 'telescope'*<sup>35</sup>, meaning

32. 消息. 这是不可数名词, 前面通常不能用不定冠词 *a*; 虽然形式上是复数, 但后面只能跟动词的单数形式. 33. 伽利莱奥·伽利略(1564—1642), 意大利物理学家、天文学家. 他通过比萨斜塔实验, 建立了落体定律. 他还发现了物体的惯性定律、摆振动的等时性、抛体运动规律, 并确定了伽利略相对性原理, 通常认为他是经典力学和实验物理学的前驱人物. 他也是利用望远镜观察天体取得大量成果的第一个人. 34. 名. 教名. 外国人的姓名一般名 (first name 即 Christian name) 在前, 姓 (family name 即 surname) 在后. 35. 正是他首先给这个新仪器起了“望远镜”的名字. 这是一个由 *it* 构成的强调结构, 强调是他(伽利略)而不是别人. 如果不用强调结构, 那末句子就成为: *He first gave the new instrument the name 'telescope'.*

an instrument to see things at a distance.

Galileo *set to work*<sup>36</sup> to make a telescope for his own use. It magnified only about three times, but it astonished the noblemen of Venice *as they surveyed their city's buildings and ships from church-tower balconies*<sup>37</sup>.

After more experiments, Galileo *succeeded in making a much better telescope which magnified about thirty times*<sup>38</sup>, and early in the year 1610 he began to look at the sky. He made some surprising and important discoveries.

*The landscape of the moon was seen to have mountain ranges and craters great and small.*<sup>39</sup> The planet Jupiter was found to have four smaller worlds, its satellites, revolving round it. The bright planet Venus showed a crescent phase like the moon, and *Saturn had something close to it which the telescope could not clearly show*<sup>40</sup>. Only later, *with the aid of better telescopes, was it possible to see*

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36. 开始工作. 37. 当他们从教堂塔楼的阳台上眺望城市的建筑物和船舶时. 这里的从属连词 as (= when) 作“当……时候”解, 引起一个时间状语从句. 38. 制成一架大约可放大三十倍的更好的望远镜. 动词 succeed in doing... 是“成功地做(某事)”的意思. 39. 看到月球(景色)上有许多大大小小的山脉和火山口. was seen to have ... 是表行为的复合谓语, 被动语态. 注意这里动词不定式 have 前面要用 to. 如果动词 see 用在主动语态里, 它后面可以接由“名词(或代词)+动词不定式”构成的复合宾语, 这时动词不定式前面不能加 to. 例如: He saw the landscape of the moon have ..., moon 是世界上独一无二的东西, 在它前面要用定冠词 the. great and small 这两个形容词放在被修饰的名词 mountain ranges and craters 后面, 表示强调. 40. 土星附近有什么东西, (这东西)望远镜里看不清楚. close to 意思是“靠近, 在……近处”.

*Saturn's spectacular system of rings.*<sup>41</sup> The pale band of light crossing the sky, *which we call the Milky Way*<sup>42</sup>, was seen to come from vast numbers of stars.

The telescope had become an instrument for the discoveries of science and not just a weapon of war.

### The lens makes the picture

Our own eyes are rather like a telescope, and also like a camera, *in the way they work*<sup>43</sup>. They have a lens at the front which collects light coming from the object *we are looking at*<sup>44</sup> and brings it to a focus on the retina at the back of the eye. *This acts as a kind of screen, where the image, or picture, is formed.*<sup>45</sup> *Like the image formed by the lens of a telescope or a camera*<sup>46</sup>, it is upside-down. We see the object the right way up because, *in a wonderful way, our*

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41. 只是借助了较好的望远镜, 才能看到壮观的土星光环系. 本句用的是倒装语序. 在英语中, 以 only 引起的状语提到句首表示强调时, 一般要掉换主语和谓语的位置. 如果 only 强调的不是副词或副词短语而是名词等, 那么就不须用倒装语序. 例如: Only the Party can lead us to victory, with the aid of: 在……的帮助下. 这里的 with 作“有了……、借……”解. 42. 我们称它为银河. 这是由关系代词 which 引起的非限制性定语从句, 表示插入意义. 43. 在它们(指“我们自己的眼睛”)的功能中. in the way: 用……方法(方式). they work 是定语从句, 修饰 the way, 前面省略了 in which. 44. 我们正看着的(物体). 它的前面省略了关系代词 that. 45. 这(视网膜)相当于一个屏幕, 图象或景色就在那上面形成. 这里的 act as (=serve as) 作“做、担任”解. 这里的关系副词 where 前面有逗号, 等于 and there, 作“那里”解, 它所引起的句子, 形式上是定语从句, 在意义上和前面的句子是并列的. 46. 象望远镜或照相机的透镜所形成的图象一样. 这是介词短语, 作状语, 修饰谓语动词 is. formed by the lens of a telescope or a camera 是过去分词短语, 作定语, 修饰 image.

*brain turns it round.*<sup>47</sup>

The large, front lens of a telescope is called the *object-glass*<sup>48</sup>, or the objective. It is very much larger than the pupil of our eye and so it collects much more light. A *lens of two inches diameter, for example*<sup>49</sup>, collects about one hundred times more light than our eye normally receives. *The light is bent*<sup>50</sup>, or refracted, as it passes through the lens and brought to a focus at a distance which is the focal length of the lens. Here, *as we have seen*<sup>51</sup>, the image is made. If we hold a sheet of paper at this point we can see the image of an object, *such as a distant light bulb*<sup>52</sup>, *projected on the screen of paper*<sup>53</sup>.

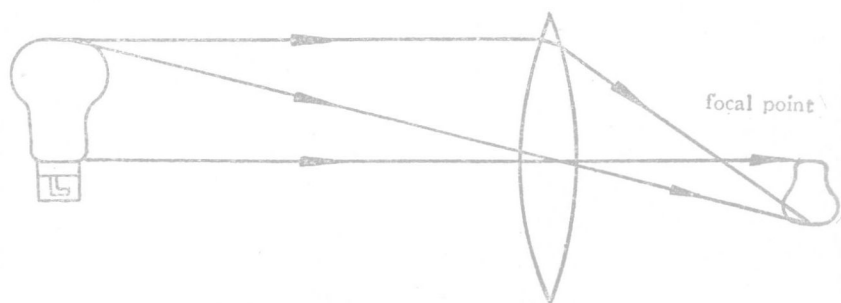
The telescope also has a smaller lens of much shorter focal length and placed just behind the focus of the objective lens. This is the eyepiece and it gives a magnified view of the object. It is sometimes thought that high magnification is the most important thing about a telescope, but this is not entirely true. Astronomers, especially, may need very large

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47. 我们看到物体是正立的, 因为我们的大脑把它奇妙地扭转过来. 句中的 *up* 和 *the object* 一起构成动词 *see* 的复合宾语, *the right way* 作状语, 修饰 *up*. 副词 *round* 在这里作“朝反方向”解. 48. 物镜. 49. 譬如直径二英寸的一块透镜. *two inches* 是名词性定语, 修饰 *diameter*. 在现代英语中, 名词作定语的趋向日益发展. *for example* 是固定词组, 不管举例多少, 是一个还是几个, *example* 总用单数形式. 50. 光经过了折射. 这里的 *bent* 是动词 *bend* 的过去分词, 在句中作表语. *bend* 的原意是“使弯曲”, 现转义为光学上的术语“折射”(即 *refract*). 51. 如同我们已经看到的. 这里的连接词 *as* 作“按照, 如同”解. 它引起一个方式状语从句. 52. 如远处的灯泡. 形容词 *such* 和关系代词 *as* 配合使用, 在语法上的作用和介词 *like* 相同, 意思是“例如……, 象……那样的”. 这个短语作定语, 修饰 *object*. 53. 映在纸屏上.



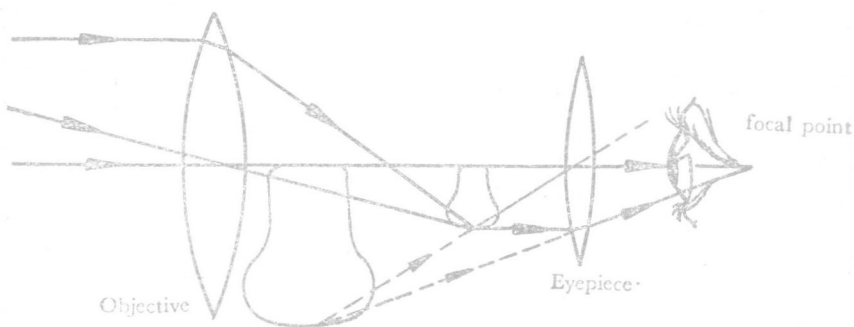
lenses in order to see objects which are *too faint or too distant to be seen with small ones*<sup>54</sup>, but they do not always use high powers of magnification.



#### HOW THE OBJECT LENS FORMS AN INVERTED IMAGE

In practice the focal length would be much greater than shown.

For simplicity, two rays of light are shown from the upper part of the bulb, but in fact all parts of the lens receive light to form the image.



#### HOW THE EYEPIECE MAGNIFIES THE IMAGE

54. 太暗淡或太遥远了，用小的透镜根本看不见，too ... to ... 表示“太……以致不能……”的意思，参见注 15。