科学就是力量 ▼ 知识就是财富

Astronomy

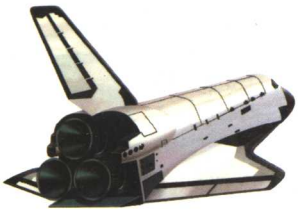
天文卷

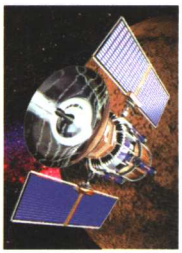
双语

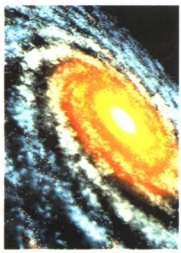
十万个为什么

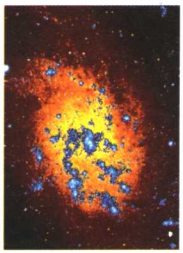
BILINGUAL SO MANY WHY

主编 / 谢志敏









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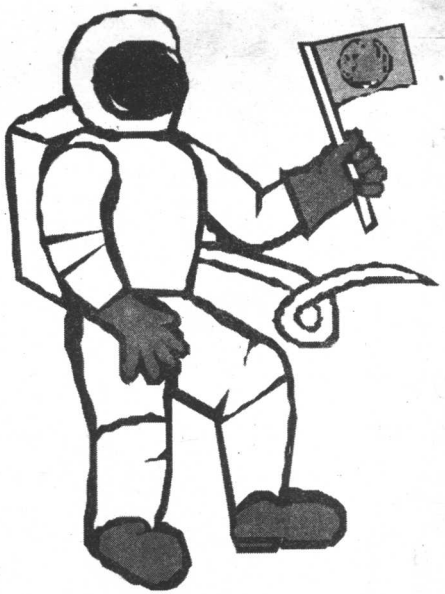

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责任编辑/陈颖杰　张远超
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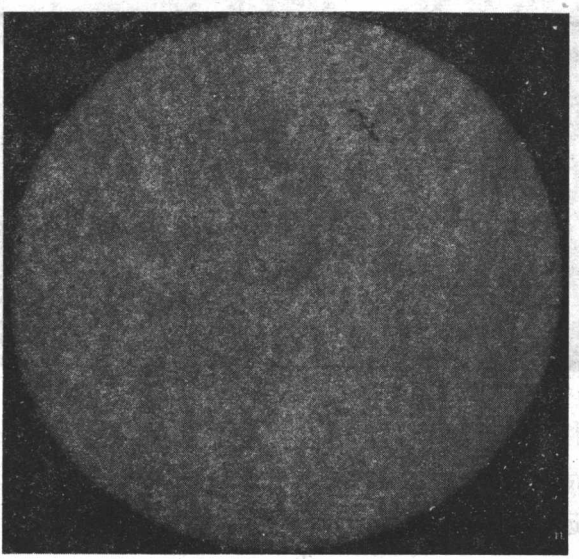
Why May Sunspots Activity Affect World Climates

为什么太阳黑子的活动会影响全球气候?

At a distance of about 150,000,000 kilometers, the sun is the earth's most proximate star. At over one hundred times the diameter of the earth, and at more than 360, 000 times its mass, the sun's enormity is hard to imagine. Providing the light and heat on earth, this huge star is

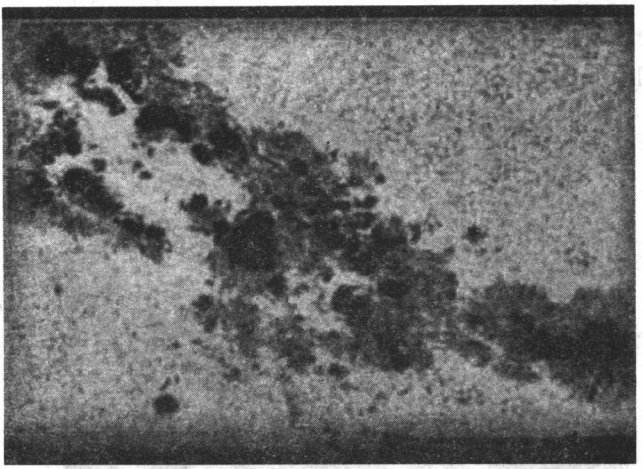


the generator and maintainer of all life and all life processes on this planet. Newly noted are indications that a solar activity known as sunspots may have given rise to certain historical occurrences.

太阳离地球约有1.5亿千米,

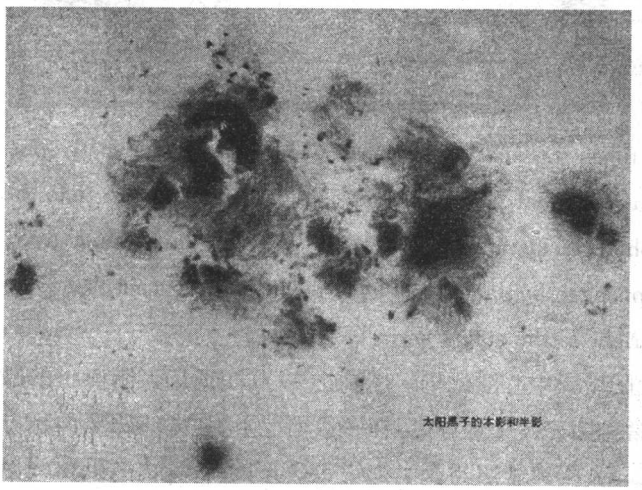
它是离地球最近的恒星。太阳直径是地球的100多倍，质量是地球的36万多倍，很难想象它究竟有多大。太阳发出的光和热使地球上所有生命和生命过程得以产生和维持。最近又有新的迹象表明，被称为太阳黑子的活动可能是导致某些历史事件的原因。

Appearing on the photosphere, the surface of the sun, and sometimes visible to the naked eyes, are sunspots, dark patches known to exist for at least 2, 000 years, although first scientifically studied in the seventeenth century by Galileo. It was, in fact, from studying the movement of sunspots that Galileo was able to conclude that the sun was a sphere rotating on its axis. With his telescope he perceived that the sunspots, which moved daily in a westerly direction, seemed to move at a slower rate near the limb than near the center of the sun.



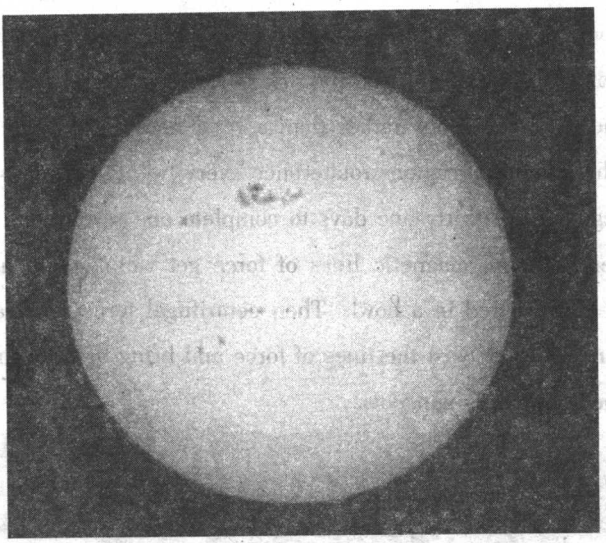
出现在光球，即太阳表面，有时肉眼也可见到的一块块黑色部分就是太阳黑子。早在2000多年前人类就已知道它们的存在，但最早对太阳黑子进行科学研究的是17世纪的伽利略。事实上，伽利略正是从研究太阳黑子的活动中才得出太阳是一个绕轴旋转的球体这一结论。伽利略通过他的望远镜观察到太阳黑子每天都在向西移动，但在太阳中心的移动速度似乎要比在其他地方更快一些。

Examined through a telescope, the sunspots are seen to have a dark center or shadow, the umbra, surrounded by a lighter area, the penumbra. All this appears superimposed on the granulation of the photosphere. The granules, which make up the photosphere, are the main convection mechanism of surface energy transport from the interior, hotter areas of the sun. Most recent theorists have suggested that sunspots arise from a complex physical process determined by the uneven nature of solar rotation. Unlike the earth, which rotates at a constant rate all over the globe, the sun, a gaseous rather than a rigid body, does not rotate uniformly. The equatorial regions rotate once every twenty-five days, while the polar regions take thirty-one days to complete one revolution. During this uneven rotation, magnetic lines of force get whipped up almost like cream being whipped in a bowl. Then centrifugal force, buoyancy, and turbulence further twist the lines of force and bring them to the surface, where they appear as sunspots.


太阳黑子的本影和半影

通过望远镜观察，太阳黑子中心是黑色的，或者是阴影，即暗影；四周颜色亮一些，即半影。所有这些看起来像是重叠在光球粒状组织上一样。这些组成光球的粒状组织，是太阳内部高温区的能量传

输到太阳表面的主要的传导机制。最近，研究者们认为，太阳黑子是一个由于太阳运转不均衡导致的复杂物理过程。地球各处旋转的速率都一样，而太阳却是一个气体而不是固体天球，它各处的旋转速率不同。太阳赤道地区旋转速率为每次 25 天，两极为 31 天。这样，磁力线就如同碗中的奶酪一样被搅乱了，再加上离心力、浮力以及湍流等作用，磁力线更加扭曲以至被抛至表面，从而形成黑子。



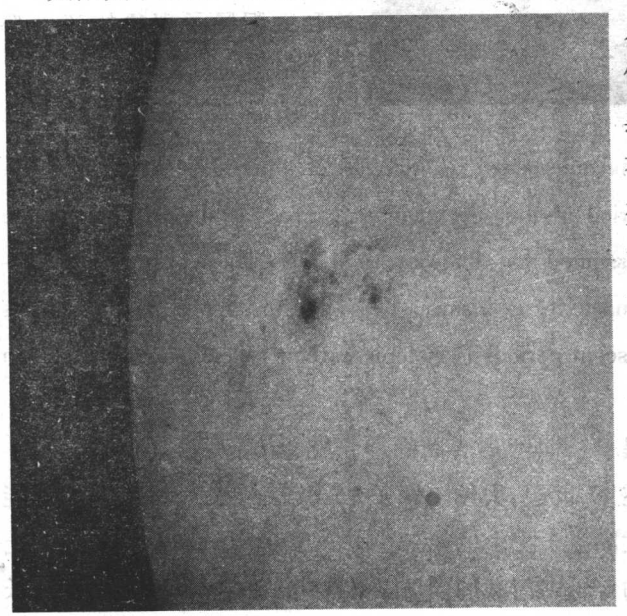
Magnetic field intensities of up to 4000 gauss have been recorded in the center of a sunspot. Often covering areas as large as the earth itself, these powerful magnetic fields are in many cases ten times the size of the earth. The sunspots typically produce temperatures of about 3500K, which is significantly cooler than the average photosphere temperature of 5000 K. Very bright on their own, sunspots only appear to be dark against the photosphere because they are 30 percent as bright as the sun' s surface.

据记载，太阳黑子中心的磁场强度高达 4000 高斯。太阳黑子的磁场覆盖面积通常相当于一个地球，但在多数情况下，强大的磁场面积可达地球的 10 倍。太阳黑子通常产生大约 3500K 的温度，大大低于光球平均温度 5000K。虽然太阳黑子本身已经够亮，但在光球的映衬下，太

阳黑子显得暗淡,因为黑子的亮度只相当于太阳表面亮度的30%。

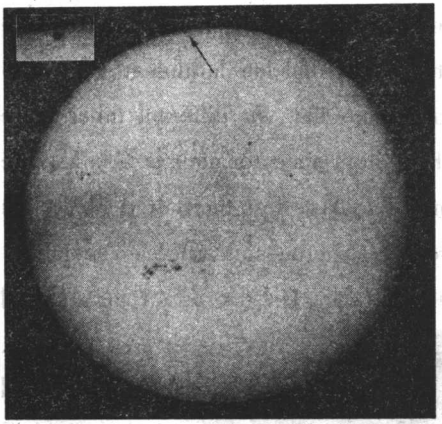
Occurring mostly near the middle of the photosphere, sunspots are predominantly a phenomenon of the middle and low latitudes. The number of sunspots intermittently varies somewhat. At different times there may be as many as a hundred of them all at once, or none at all. The life span of smaller sunspots for the most part lasts less than a day, although larger ones may last a week or two and sometimes as long as a month.

太阳黑子主要出现在光球中间,因此,在绝大多数情况下,它们只能出现在中、低纬度。太阳黑子的数量也有点呈周期性变化。有时会突然出现多达100个左右的太阳黑子,有时一个也没有。大部分较小的太阳黑子持续时间不超过1天,但较大型的太阳黑子可以持续一两周甚至有时长达1个月。



Most interesting is the phenomenon of the 11.2-year average sunspot cycle. It is not known what causes this periodicity, although recent theorists have proposed some convincing arguments implicating Jupiter, with its 11.8-year solar rotation. It is suggested that this planet may be instru-

mental in inducing tidal action and sunspots.



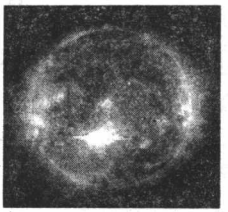
最有趣的现象是，太阳黑子活动周期平均为11.2年。目前尚不清楚为什么会出现这样一个周期，但最近有人提出的一些观点颇有说服力，他们认为这可能与公转周期为11.8年的木星有关。而且，潮汐和太阳黑子现象的产生都与木星活动有关。

Recorded also, however, are long periods of quiescence, the longest of which occurred over a seventy-five-year period in the seventeenth century. It should not, on the other hand, be assumed that this was the first or even necessarily the longest—period of inactivity in history. Available to support the hypothesis of very long quiescent periods is isotopic carbon 14 evidence recorded in tree rings.

关于太阳黑子长期停止活动的静止期也有记载，其中最长的一次静止期发生在17世纪，大约持续了75年多。另一方面，我们不能因此预测这是太阳黑子史上的第一次——或一定是最长的一次静止期。通过对树的年轮中记载的同位素碳14的鉴定，可以判断存在长期的静止期。

It has been noted that periods of sunspot quiescence have coincided with historically recorded periods of low temperature. However largely conjectural this hypothesis of direct correlation between solar activity and climate may be, it remains an attractive explanation for certain historical occurrences. One theory is that a long cold snap drove the Norse colony

out of Greenland in the seventeenth century, thus ending Norwegian colonization of North America.



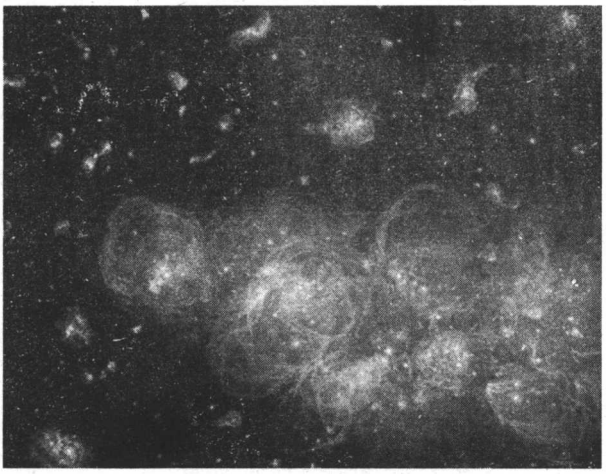
人们已经注意到,太阳黑子的静止期正好是历史上记载的低温期。不管将太阳活动和气候之间直接关联的这一假说多么缺乏根据,它仍可以用来解释某些历史上发生过的事情。一种理论认为,17 世纪挪威人被赶出格陵兰岛,从而结束挪威在北美大陆的殖民统治,完全是由于不堪忍受长期严寒的缘故。

Why Could the Universe Be Shaped Like a Soccer Ball

为什么宇宙的形状像足球?

The Universe could be shaped like a soccer ball, say mathematicians.

数学家说宇宙的形状可能像足球。



The idea is prompted by data from NASA's Wilkinson Microwave Anisotropy Probe (WMAP) satellite. This sees back to when the Universe was about 380, 000 years old, and reveals the all-pervading radiation left over from the Big Bang-the cosmic microwave background.

从美国国家航空和宇宙航行局发射的威尔金森微波各向异性探测器(WMAP)发回的数据为这一观点提供了证据支持。WMAP 探测器观测到了宇宙在年满 38 万岁时的情景,当时的宇宙充满了因"大爆炸"导致的辐射,即宇宙微波。

There are fluctuations in this background, like waves in the sea. They are the legacy of the small lumps in the early Universe that gave rise to stars and galaxies.

在当时宇宙微波环境中存在着起伏波动，犹如大海中的波浪。这些波浪是早期宇宙中小结块的残留物，正是它们使宇宙中出现了恒星和星系。

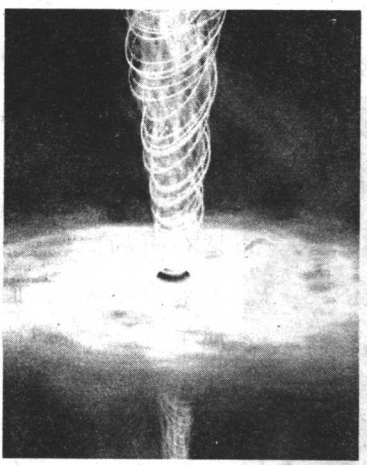
An infinite Universe would contain waves of all sizes. The WMAP did not see any very large waves. This point to space being finite-for the same reasons that you don' t see breakers in your bathtub.

如果宇宙是无限的，那么它应包含有大大小小的波，然而 WMAP 探测船并没有观测到任何巨大的波。这表明，宇宙太空是有限的，只是因为某些原因，我们现在还无法加以确认。

The best explanation for these observations is that the

cosmos is a Poincaré dodecahedral space, says a team led by Jeffrey Weeks, an independent mathematician based in Canton, New York. Mathematical models of a spherical, solid Universe edged by 12 curved pentagons produce the patterns seen in the background radiation without any special fine-tuning.

美国纽约数学家杰弗里·维克斯领导的独立研究小组对观测现象给予的最合理的解释是:宇宙是一个庞加莱 12 面体。这个球形的数学模型,从放射背景中看并没有什么特别的地方,有限宇宙的外表由 12 个五边形曲面构成。



Most physicists assume that the Universe is infinite. But Einstein's theories actually say nothing about whether the Universe stops or not.

绝大多数物理学家都假定宇宙是无限的。但是对于宇宙到底是否已经停止扩张,爱因斯坦原理中并没有对此进行阐述。

A journey of 60 billion light years across a dodecahedral Universe would bring you right back to Earth. Like a circumnavigation of the globe, it would be a seamless ride: there would be no obvious point at which one

"re-entered" the Universe.

如果你用600亿光年穿越12面体的宇宙进行一次旅行，最终你将重新回到地球。就像地球仪一样，它就像是一次没有缝隙的旅行：没有明显指向从哪个地方"重新"进入宇宙。

The most distant objects would be visible in opposite directions, although they would be seen at different ages. Trying to spot the same galaxy in two different places "would be like trying to recognize the same person viewed at age 50 face-on, and at the age of 7 from the top of their head," says Weeks.

在相反方向上，最遥远的物体是能够看得见的，虽然是在不同时代看到它们。在两个不同地方去观测同一个星系"将有可能会辨别出同一个人拥有50岁的脸，而从他们的头顶看却只有7岁大，"维克斯说。