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前　言

我们已步入一个新的世纪、新的千年。1999年11月，中美就中国加入WTO达成了双边协议，中国加入世贸组织指日可待。毫无疑问，不断地开放、与国际接轨、与世界融合将成为中国社会生活中的主旋律。

英语是我们顺应各种社会变革的最重要工具之一，但长期以来的英语教学与实践脱节、与时代脱节。一个生活在现代社会的人，一个想在未来社会有所发展的人，一个有志向在国际化潮流中大展宏图的人，必须学习纯正的、鲜活的、实用的英语。品味工作室推出的“英语书房”系列英汉对照读物，正是把学习英语和了解世界结合起来。《国际风云》、《经济聚焦》、《法庭内外》、《科技透视》等书中的文章均选自英语国家权威媒介并由各专业资深人士精心译校。其内容是近年来发生的具有重大影响的事件、思潮、动态，既具有较高的专业品味，其通俗性也适合不以英语为母语的人士阅读。这在已有的英语教材或读物中非常少见。读这样的英汉对照读物，我们不仅可以学习英语，而且学到的是带有强烈实践性和时代感的英语，特别有助于我们把

握和体会英语语言逻辑以及英语世界（国家）的社会思维。不论对初学者，还是对专业人士，都将大有裨益。

这套英汉对照读物采用了国际流行的口袋本形式，便于读者在紧张的工作和生活当中利用点滴时间随时翻阅。这套书在于倡导这样一种新的英语学习概念："了解世界、学习英语、开拓视野、把握未来"。我们相信这代表了未来英语读物和英语学习的趋势，也是我们对所有读者的最良好的祝愿。

目录

目录

The Digital Earth: Understanding Our Planet in the 21st Century

by Al Gore

Given at the California Science Center, Los Angeles, California, on January 31, 1998.

A new wave of technological innovation is allowing us to capture, store, process and display an unprecedented amount of information about our planet and a wide variety of environmental and cultural phenomena. Much of this information will be "georeferenced" – that is, it will refer to some specific place on the Earth's surface.

The hard part of taking advantage of this flood of geospatial information will be making sense of it – turning raw data into understandable information. Today, we often find that we have more information than we know what to do with. The Landsat program, designed to help us understand the global environment, is a good example. The Landsat satellite is capable of taking a complete photograph of the entire planet every two weeks, and it's been collecting data for more than 20 years. In spite of the great

数字地球：理解二十一世纪的地球

美国副总统戈尔1998年1月31日在加利福尼亚州洛杉矶加利福尼亚科学中心的讲话

由于一场技术创新的新浪潮，我们能够史无前例地捕捉、储存、处理并显示关于地球的大量数据以及有关环境及文化现象的广泛信息。这类数据大部分是“参照地理坐标的”，也就是说，这类数据将提到地球表面的某个特定位置。

要利用这些关于地球空间的浩如烟海的数据，困难之处在于弄清它们的意义——即把原始数据变成可理解的信息。今天，我们经常发现我们拥有太多的数据，多到了令人不知所措的地步，用来帮助人们了解地球环境的地球卫星计划可以很好地说明这一点。地球探测卫星每两个星期就能拍摄出整个地球的完整图像资料，并已经这样持续收集数据二十多年了。尽管人们有着对这些数据的巨大需求，但是这些图像的绝大部分并未激起任何人任何神经细胞的兴奋——它们被储藏在电

need for that information, the vast majority of those images have never fired a single neuron in a single human brain. Instead, they are stored in electronic silos of data. We used to have an agricultural policy where we stored grain in Midwestern silos and let it rot while millions of people starved to death. Now we have an insatiable hunger for knowledge. Yet a great deal of data remains unused.

Part of the problem has to do with the way information is displayed. Someone once said that if we tried to describe the human brain in computer terms, it looks as if we have a low bit rate, but very high resolution. For example, researchers have long known that we have trouble remembering more than seven pieces of data in our short-term memory. That's a low bit rate. On the other hand, we can absorb billions of bits of information instantly if they are arrayed in a recognizable pattern within which each bit gains meaning in relation to all the others , a human face, or a galaxy of stars.

The tools we have most commonly used to interact with data, such as the "desktop metaphor" employed by the Macintosh and Windows operating systems, are not really suited to this new challenge. I believe we need a "Digital Earth", a multi-

子数据库里。从前，我们的农业政策一方面把所生产的粮食贮存在中西部的仓库里任其腐烂，另一方面却任由有数百万人被饿死；现在，我们贪婪地渴求知识，可是大量的资料却从未被使用过。

这个问题部分在于信息显示的方式。有人曾经指出，如果我们用计算机术语来描述人脑，那么人脑似乎比特率较低而分辩能力很高。比如，研究人员很早就知道，在短时记忆中，人们难于记住七个以上的事项，这就是比特率低下。另一方面，如果将数据相互关联起来，增加每一比特信息的意义，排列成可辩认的图案——如人脸或是星系，我们就能在瞬间理解数十亿比特的信息。

目前人们最常用的数据处理工具——像在Macintosh 和 Windows 操作系统上所用的被称为“桌面隐喻”的图形工具等——都不能真正适应这一新的挑战。我相信我们需要一个“数字化地球”，也就是说，关于地球，我们需要一种能够嵌

-resolution, three-dimensional representation of the planet, into which we can embed vast quantities of geo-referenced data.

Imagine, for example, a young child going to a Digital Earth exhibit at a local museum. After donning a head-mounted display, she sees Earth as it appears from space. Using a data glove, she zooms in, using higher and higher levels of resolution, to see continents, then regions, countries, cities, and finally individual houses, trees, and other natural and man-made objects. Having found an area of the planet she is interested in exploring, she takes the equivalent of a "magic carpet ride" through a 3-D visualization of the terrain. Of course, terrain is only one of the many kinds of data with which she can interact. Using the systems, voice recognition capabilities, she is able to request information on land cover, distribution of plant and animal species, real-time weather, roads, political boundaries, and population. She can also visualize the environmental information that she and other students all over the world have collected as part of the GLOBE project. This information can be seamlessly fused with the digital map or terrain data. She can get more information on many of the objects she sees by using her

入大量地理数据的、多分辨率和三维的表现形式。

现在让我们做一个假设：一个小孩参观一家地方博物馆的数字化地球陈列室，戴上头盔显示器之后，她看到的是出现在太空中的地球。通过“数据手套”，她迅速进入，系统开始放大景物，伴随越来越高的分辨率，她会看到大陆，随之是地区、国家、城市，最后是一个个的房屋、树木以及其他各种自然和人造物体。在找到自己有兴趣探查的地区时，她可以搭乘像“魔毯”一样的东西，通过一种三维显像深入查看地形。当然，地形仅仅是她能够了解的多种信息中的一种。借助于这些系统，如声音识别装置，她还可以询问有关土地盖层、植物和动物种类的分布、实时的天气、道路、行政边界，以及人口等方面的信息。她也可以形象地看到自己以及世界各地的其他学生为“全球工程”收集的环境信息。这些信息可以天衣无缝地融入数字地图或地面数据。用数据手套点击超链接，她还能够获得所见物体更多的信息。比如，为了准备全家去黄石国家公园的度假，她策划一个完美的步行旅游，去参观她仅仅在书上读到过的喷泉、北美野牛和大角盘羊。事实上，在她家乡的博物馆里足不出户就可以把这些东西从头到尾地过上一遍。

data glove to click on a hyperlink. To prepare for her family's vacation to Yellowstone National Park, for example, she plans the perfect hike to the geysers, bison, and bighorn sheep that she has just read about. In fact, she can follow the trail visually from start to finish before she ever leaves the museum in her hometown.

She is not limited to moving through space, but can also travel through time. After taking a virtual field-trip to Paris to visit the Louvre, she moves backward in time to learn about French history, perusing digitized maps overlaid on the surface of the Digital Earth, newsreel footage, oral history, newspapers and other primary sources. She sends some of this information to her personal e-mail address to study later. The time-line, which stretches off in the distance, can be set for days, years, centuries, or even geological epochs, for those occasions when she wants to learn more about dinosaurs.

Obviously, no one organization in government, industry or academia could undertake such a project. Like the World Wide Web, it would require the grassroots efforts of hundreds of thousands of individuals, companies, university researchers, and government organizations. Although some of the data

她并非止于穿超空间，她还可以穿越时间。在到巴黎罗浮宫作了一番虚拟的实地旅游之后，她又通过细读覆盖在数字地球表面上的数字化地图、新闻影片、传说、报纸以及其他主要信息来源而回到过去去学习法国历史。她会把其中一些信息转送到自己的电子信箱里，以便日后研究。这条时间线可伸回很远，从数日、数年、数世纪，甚至当她想要了解恐龙的情况时，还可以延伸到地质纪元的年代里去。

显然，没有哪一个政府、产业或学术组织能够独自承担这样一个计划。像万维网一样，它需要有成百上千的个人、公司、大学研究人员以及政府机构参加的集体努力。虽然数字地球数据的某些部分是公益性的，但是它也可能成为一个数字市场。在这个市场上，公司可以提供大批商业

for the Digital Earth would be in the public domain, it might also become a digital marketplace for companies selling a vast array of commercial imagery and value-added information services. It could also become a "collaboratory" – a laboratory without walls, for research scientists seeking to understand the complex interaction between humanity and our environment.

Technologies needed for a Digital Earth

Although this scenario may seem like science fiction, most of the technologies and capabilities that would be required to build a Digital Earth are either here or under development. Of course, the capabilities of a Digital Earth will continue to evolve over time. What we will be able to do in 2005 will look primitive compared to the Digital Earth of the year 2020. Below are just a few of the technologies that are needed:

Computational Science: Untill the advent of computers, both experimental and theoretical ways of creating knowledge have been limited. Many of the phenomena that experimental scientists would like to study are too hard to observe – they may be too small or too large, too fast or too slow, occurring in a billionth of a second or over a billion years. Pure

图像和增值的信息服务。它也可能变成一个“合作实验室”——一个没有围墙的实验室，让科学家们通过在这里的研究来弄清人与环境间复杂的交互作用关系。

数字地球所需要的技术

虽然这些情节好像是科幻小说，然而建设数字地球的大部分技术和能力有的已经具备，有的正在研制。当然，数字地球本身的性能也将随着时间的推进而不断发展。2005 年的数字地球与 2020 年的相比较会显得原始得多。下面是几项所需要的技术：

计算科学：在计算机出现之前，靠做实验和用理论推论的方法来创造知识都一直受到限制。实验科学家想研究的许多现象观察起来太难了——它们不是太小就是太大，不是太快就是太慢，有的一秒钟之内就发生了十亿次，而有的十亿多年才发生一次。另一方面，纯理论又不能预报复杂自然现象的结果，如风暴或是飞机上空的

theory, on the other hand, cannot predict the outcomes of complex natural phenomena like thunderstorms or air flows over airplanes. But with high-speed computers as a new tool, we can simulate phenomena that are impossible to observe, and simultaneously better understand data from observations. In this way, computational science allows us to overcome the limitations of both experimental and theoretical science. Modeling and simulation will give us new insights into the data that we are collecting about our planet.

Mass Storage: The Digital Earth will require storing quadrillions of bytes of information. Later this year, NASA's Mission to Planet Earth program will generate a terrabyte of information each day. Fortunately, we are continuing to make dramatic improvements in this area.

Satellite Imagery: The Administration has licensed commercial satellites systems that will provide 1-meter resolution imagery beginning in early 1998. This provides a level of accuracy sufficient for detailed maps, and that was previously only available using aerial photography. This technology, originally developed in the U. S. intelligence community, is incredibly accurate. As one company