21世纪科技新视野丛书
New Horizons in The 21st Century's Science & Technology

（英汉对照读物）

◆丛书主编　吴文智　徐　新

THE FUTURE Environmental Science

未来环境科学

◆王萧　曲喆　编译

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序

人类社会进入21世纪的今天，科学技术日新月异的发展速度真正地到了匪夷所思的程度。那些在过去常常被人们认为不可能的梦想，今天大多成了事实。如果将来有一天你突然发现汽车可以像飞机一样在大街小巷穿梭飞行，或当你在某个餐厅就餐时竟然发现你对面就坐着一个与你百分之百相象的你，请不要吃惊，因为这正是现代科学技术创造的结果。

科学探索是一项伟大的冒险活动，充满了刺激与振奋。它使人类的求知欲和好奇心得到满足，并且益发地激起人们愈来愈大的想像力，去欣赏和理解科学技术所带来的种种美妙与神奇。e时代的到来更使人们对知识的力量不再有丝毫的怀凝，唯有对科学知识的需求更多地增添了紧迫感。“让科学知识为我们插上腾飞的双翅”成了我们绝大多数人潜意识的追求，正是在这样一种背景下，我们构想了这套《21世纪科技新视野》丛书。意欲从浩瀚的科学海洋中撷取那些对我们明天的开拓进取富有启迪意义的新知识，奉献给一切热爱学习，热爱科学的人们。

《21世纪科技新视野》是一套以英汉对照方式编排的“语言学习＋科技知识”的“链接”式丛书。在编写过程中，所有参编者遵照“应用价值、文化价值、精神价值”相结合的原则精心选择每篇文章，努力把最能体现人类创造力与想像力的科学成果介绍给广大读者，所有原文均摘自英语国家的现版期刊或网络杂志。英文地道，原汁原味。内容讲求知识性、趣味性、通俗性、新颖性，

使得广大英语爱好者在学习英语的同时可以接受新科学知识的熏陶，也使那些钟爱新科学知识的人们在掌握新知识的同时得以强化和提高自己的英语水准，特别是与这个时代特点相融合的那些“与时俱进”的科技英语水准。这在加入 WTO 后的今天犹为重要，因为 WTO 已不容置疑地把每一个中国人深深地卷入到了全球一体化发展的新浪潮中。作为链接未来科学技术的知识纽带——《21 世纪科技新视野》丛书，将把我们与新科学和新知识紧紧地联接在一起，从而为广大读者打造出一个再次提升自己的知识平台，以便可以从容应对 WTO 时代扑面而来的任何挑战。

如果本丛书的出版发行确能使读者对我们的上述编写意图认同十之一二，那就是对我们所有编写人员的莫大奖赏。此外，本书得以顺利出版，除了我们所有编写人员的努力外，还折射了煤炭工业出版社决策者的创新意识和与时俱进的奋发精神，渗透了本丛书责任编辑的辛勤汗水。在此一并表示感谢。

对于书中可能存在的不足之处，我们将在下次再版时改进，敬请广大读者批评指正。

《21 世纪科技新视野》丛书编委会

2002 年元旦于南京

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Humans are imperiling their own ecological niche with the threat of global warming. The vaporous by-products of civilization, in the form of greenhouse gases such as carbon dioxide, have trapped enough heat in the atmosphere to raise Earth's average surface air temperature a half degree Celsius during this century. If the trend continues, it could alter climate patterns worldwide — thawing glaciers, boosting sea level, scorching plains into deserts, and shifting vegetation zones.

随着地球正在变暖，人类目前正处在受到他们自己生态环境的威胁阶段。文明社会里烟雾袅袅的副产品，以诸如二氧化碳为代表的温室气体，截留了大气中大量的热量，在本世纪期间使得全球表面气温平均上升了0.5℃。如果这种趋势继续下去的话，它就会在世界范围内改变气候模式——冰雪融化，海平面上升，平原焦灼枯萎变成沙漠，植被带迁移转换。

The Polluted Groundwater Resource

More than half of the water used for drinking, washing and irrigating crops comes from under the ground. This *subterranean water[1] is known as groundwater.

It is generally *taken for granted[2] that the groundwater drawn from wells is omnipresent and will always be available and clean and safe to drink. But experts are reporting that groundwater sources can dry up through overuse, or become *contaminated[3] as a result of pollution, poor sanitation or salt water intrusion.

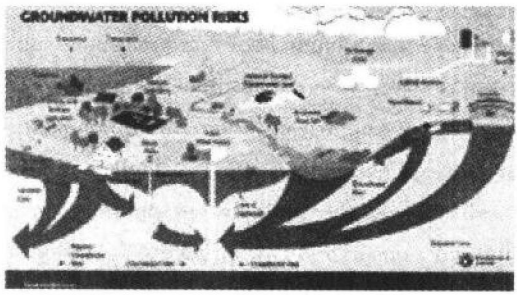
This "invisible resource" — as groundwater was described by the United Nations for its 1998 observance of World Day for Water — is slowly emerging in political, economic and personal affairs.

With demand growing and supply presenting greater difficulties, groundwater is on the way to becoming a boom business. The World Bank estimates that the developing countries will require investments totaling $600 billion to repair and improve water systems. Of the investments that are actually made, a substantial amount will *be devoted to[4] extracting and piping groundwater, primarily for agricultural use and secondarily for industry and household consumption. With a trend towards privatization of public services, it can be expected that a growing portion of investments in water will come from the private sector; requirements that governments privatize water utilities are already being written into the terms of multilateral loans. One consequence of growing

被污染的地下水

用于饮用、洗漱和灌溉农田的用水有一半多来自于地下水。这些隐藏在地下的水叫做地下水。

人们通常想当然地认为从井中抽出来的地下水是无所不在的，并且总是取之不尽，清洁卫生，适合饮用的。但是专家们却警告人们过度使用地下水可能会导致地下水资源枯竭，它也许会因为污染物、卫生状况恶劣或者咸水的浸入而被污染。



这个“看不见的资源”——1998 年“世界水日”上联合国将地下水定为主题——正在慢慢地走进人们的政治、经济和个人事物中。

随着用水需求量的增加和供水困难的增大，地下水行业正在突飞猛进地发展。世界银行估计，发展中国家将需要 6,000 亿美元的总投资来修理和改善供水系统。在实际进行的投资中，相当一部分资金将要用于抽取地下水和铺设管道。这首先要满足农业用水，其次是工业和生活用水。随着公共服务业朝着私有化方向的发展，人们预计水投资的大部分资金将来自于私人方面；要求政府部门将水事业私有化的条款已经写进了多边贷款项目中。进行水事业私有化

1. subterranean water: 地下水
2. taken for granted: 想当然地认为某事
3. contaminated: 被污染
4. be devoted to: 把……贡献给……；把……；专用于……

privatization may be that access to water will not be regarded as a right, but as a function of economic markets.

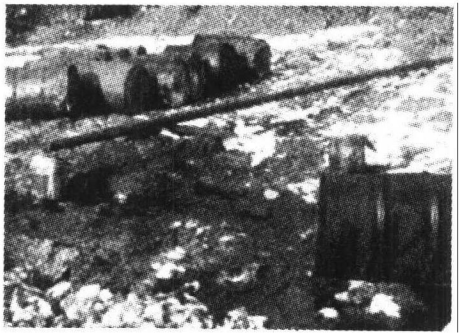
Groundwater, which in its natural state is more protected than surface water, is the preferred source of drinking water for cities. But pressure is being placed on groundwater resources lying close to urban areas by exploding populations, as the portion of the world's people residing in cities balloons from 31 per cent in 1955 to a projected 50 per cent in 2005. And there is also the pressure of pollution. Cities in the industrialized world are spending hundreds of millions of dollars to purchase land lying above groundwater sources and to keep it in a natural state, in order to protect *aquifers[5] from contamination. In the developing countries, where urban population growth is outstripping sewage systems, the biggest problem is untreated human waste.

Alongside the problems of public groundwater sources is the increased consumption of privately *bottled water[6], most of which is designated as spring water, i. e. groundwater. Consumption of bottled water in the United States, for instance, has risen from virtually nil in the 1950s to 843 million gallons in 1984 and 2. 95 billion gallons in 1997. But drinking bottled water is not just a health fad for the middle classes. In developing countries, water pipes rarely extend to the poorer neighborhoods, and residents *have no choice but[7] to pay high prices for bottled water.

Political leaders and analysts are talking more frequently about the possibility that increasing demand for precious groundwater will lead to crossborder conflicts, even wars. It is not easy to resolve disputes over sovereign groundwater rights, since many aquifers and underground

的结果可能是用水量的增加不再是一种权利，而是一种市场经济的职能。

由于地下水是以一种自然状态存在的，因此它要比地表水受到更多的保护，是城市饮用水的最佳水源。但是迅猛增加的人口给城市周围地区的地下水源造成了严重的压力，因为城市人口的比例从1955年的31%将猛增到2005年的50%。同时城市还要承受污染所带来的压力。工业化国家的城市正在花费数亿美元的价钱购买有地下水源的土地，使其保持在自然状态以防蓄水层遭到污染。在城市人口增长速度超过了污水系统处理能力的发展中国家，它们面临的最大问题就是未经处理的生活垃圾。



与公共地下水源并存的问题是私人瓶装水消费的增加，这些瓶装水大都被称为矿泉水，其实就是地下水。例如，在美国，瓶装水的消耗量在20世纪50年代几乎为零，到了1984年就上升到8.43亿加仑，到1997年上升到29.5加仑。但饮用瓶装水并不只是中产阶级的一种健康时尚。在发展中国家，由于自来水管道很少铺到比较贫穷的地区，因此居民们不得不花高价购买瓶装水。

政治家和分析家们时常谈论起因为宝贵的地下水需求的增加可能引起的边界冲突甚至战争的可能性。要想解决地下水所有权的纷争是不容易的，因为许多蓄水层和地下河流是跨越国境线的；在一国的边境内垂直打井可能会把在同一蓄水层打井的邻国的地下

5. aquifers: 蓄水层
6. bottled water: 瓶装水
7. have no choice but: 没有别的选择只能

streams cross national borders; and a well drilled vertically within the boundaries of one country may very well be * "siphoning" [8] water from the same aquifer, also *tapped[9] by a neighboring nation. Inclined and even horizontal drilling further complicates this issue.

Liquid gold

The Earth is sometimes called "the blue planet", because from outer space it appears mostly as blue ocean. But ocean water is salty, and not easily converted to freshwater. The amount of freshwater available for human use is only a small fraction of the amount of water found in oceans or locked away in polar *ice caps[10]. Of this available freshwater, 95 per cent is located underground.

Underground water is in motion most of the time, flowing slowly from *recharge areas[11] until it discharges into a spring, stream, lake, wetlands or ocean. Groundwater often follows the course of rivers or lies underneath marshes and swamps, keeping rivers from drying up and protecting vegetation when rain is scarce. The upward and downward movement of water through the ground has also a filtering effect, *accounting for[12]the generally good quality of groundwater. This means that groundwater is not only better suited for drinking than surface water; it also produces better crop yields.

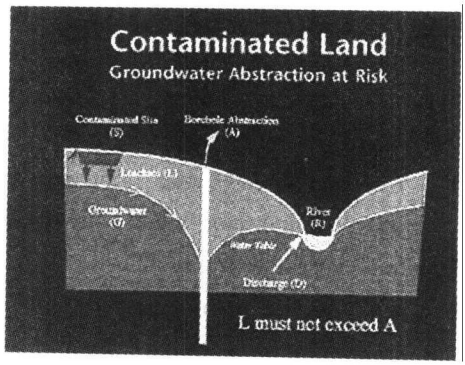
Triple threats

Surface water and groundwater form an *integrated system[13]. But this natural advantage becomes a disadvantage when man-made pollution enters the picture. When aquifers are contaminated by polluted surface water that is leaching downward, the damage is difficult, costly and even impossible to correct. *By comparison[14], it is relatively easy

水吸过来。倾斜甚至水平钻井都会使这个问题更加复杂化。

液体黄金

地球有的时候被称为“蓝色星球”，因为从太空观察，地球表面几乎大部分是海洋。但海水是咸的，很难把它转化成淡水。人类可以使用的淡水数量只是一小部分，大部分水存在于海洋中或遥远的极地冰盖里。在这些可使用的淡水中有95%位于地下。



地下水大部分时间处于运动状态，慢慢地从蓄水区流进泉水、溪流、湖泊、湿地或者海洋。地下水经常沿着河道流动或者隐藏在沼泽和湿地下，在雨量稀少时，地下水可以防止河流干涸，保护植被的正常生长。地下水在地层之间的上下流动也起到了一种过滤的作用，这就是地下水质量为什么通常很好的原因。这就意味着地下水不仅仅比地表水好喝，而且还会给农作物带来好的收成。

三面威胁

地表水和地下水形成了一个完整的体系。但是，当人们造成的污染侵害了这一体系时，天然的优势就会变成一件坏事。当蓄水层被向下渗透的已经遭到污染的地表水污染时，要消除危害很难而且花费也很大，甚至是不可能的。相比较而言，河流和湖泊在短时间内

8. siphoning: 用吸管去吸，这里指引来邻国的水
9. tapped: 分接；在……开一个孔（导出液体）
10. ice cap: 冰盖
11. recharge area: 蓄水区
12. accounting for: 是……的原因；是解释……的原因
13. integrated system: 统一的体系，这里指统一的水系
14. by comparison: 相比较而言

to allow rivers and lakes to cleanse themselves during a shore-term respite from pollution.

Discharges from industries and cities produce intensive, although localized, pollution. A more insidious threat is presented by the less intensive contamination spread over more extensive areas by modern agriculture. Worldwide, increase in food production over the last five decades have been driven by technologies dependent on the use of chemical fertilizers and pesticides. Return flows are gradually increasing the amount of *nitrates[15], *trace metals[16] and poisonous organic compounds in the ground, and in the groundwater as well.

A second threat comes from massive increase in groundwater extraction. Groundwater being only partly a renewable resource, few aquifers can withstand enormous extraction rates indefinitely. As shallow wells dry up, more expensive production wells must be drilled to progressively greater depths. People in poor areas who depend on *handpumps[17] for their for their water supplies are likely to be the first to be deprived. When missing their non-renewable reserves, aquifers will become irreversibly depleted.

Ironically, rising groundwater levels can be as damaging as those that are falling. This third threat is known as *waterlogging[18], and often occurs in farmlands where water has been brought in for irrigation, underneath cities that have imported large volumes of water or where there are leaking sewage systems, and in rural areas that have been deforested or stripped of vegetation. Waterlogging clog up the soil and generally lowers groundwater quality.

Policy and management

清除污染、恢复自然相对容易一些。

尽管城市里产生的污染是局部的，但它们还是相对密集的。危害更大的是现代农业生产所造成的不太密集但范围更广的污染。在过去的50多年里，为了增加粮食产量，人们在全世界范围内使用了大量的化肥和杀虫剂技术。地下水的回流就逐渐使得地表和地下水中的硝酸盐[15]、痕量金属[16]和有毒有机化合物的含量不断增加。

第二种威胁是来自于对地下水的大量开发使用。地下水只是一种部分可更新的资源，没有多少蓄水层可以被无限制地大量开采使用。当浅水井变干时，人们就得花费大量的资金去钻探更深的水井。那些靠人力汲水[17]的贫穷地区的人们就有可能会首先失去水源。当不可再生的蓄水层失去了它们的蓄水源时，它们就会永远枯竭了。

令人费解的是，升高了的地下水位和下降了的地下水位有着相同的危害。这第三种威胁就是水涝[18]。水涝经常发生在引水灌溉的农田、从外面大量进口水的城市，或者排水管道系统泄漏地区以及森林和植被遭到破坏的农村地区。水涝淹没了农田从而降低了地下水的质量。

政策及管理措施

15. nitrates: 硝酸盐
16. trace metals: 痕量金属
17. handpumps: 用人力取水
18. waterlogging: 水涝

The * out-of-sight, out-of-mind[19] nature of groundwater, * along with[20] the gradual nature of the processes that threaten groundwater resources, makes it easy to ignore emerging threats. At the other extreme is a temptation to *overdramatize[21] current problems and call for frantic and massive action to address all potential problems at once. The latter approach can lead to a spurt of activity usually followed by a return to long-term complacency. Overdramatization of problems everywhere may undercut the credibility of conservation measuresin places where emergencies are looming.

Experts from the United Nations system recommend careful monitoring of groundwater conditions, on a local and regional basis, and development of a capacity for long-term integrated water resources management in all countries.

Traditionally, * access to[22] groundwater has been limited only by ownership of the land directly above an aquifer and the landowner's financial capacity to drill or dig a well. But aquifers generally extend under large regions and are tapped by numerous users. No single property owner, therefore, is able to influence use or abuse by other users; furthermore, he or she has no incentive to invest in maintenance of the overall resource base. To the contrary, if there is an individual motivation, it is to use as much of the water as possible before others deplete the aquifer.

This problem, sometimes referred to as the *"common pool effect"[23], applies also to aquifers that overlap state or provincial *jurisdiction[24] or, posing even greater difficulty, the separate jurisdictions of different sovereign nations. There are also competing claims to groundwater