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

Energy Resources and New Materials

未来能源及新材料

◆张权　杨晋　编译

煤炭工业出版社

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丛书主编 吴文智 徐新

编译 张权 杨晋

策划 向云霞

责任编辑：田 园

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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

CONTENTS
目 录

New energy sources and new materials will shape the future just as surely as have genetic engineering and computer science.

就像遗传工程和计算机科学塑造了今日的世界，新材料和新能源将塑造出未来的世界。

The Age of Super Stuff

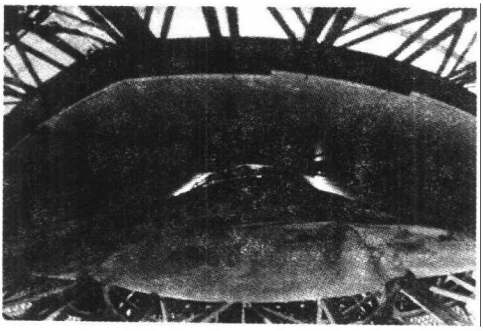
The Stone Age, The Iron Age, entire epochs have been named for materials. So what to call the decades ahead? The choice will be tough. Consider: high-fidelity loudspeakers made of transparent plastic film. Windshields that *tint[1] with the flip of a switch. Friction-free truck engines that require no radiator and get 100 miles to the gallon. Cars that never rust—running on highways without potholes. Replacement hip joints that meld with natural bone.

Welcome to the age of super stuff. Material science—once the least sexy technology—is bursting with new, practical discoveries, led by super conducting ceramics that may revolutionize electronics. But superconductors are just part of the picture: from houses and cars to cook pots and artificial teeth, the world will someday be made of different stuff. Exotic plastics, glass and ceramics will shape the future just as surely as have genetic engineering and computer science. The Japanese are *forging ahead[2] with new applications, and one important question is: can the United States compete in the race to move super stuff into daily life?

The key to the new materials is the researchers' increasing ability to manipulate substances at the molecular level. Ceramics, for example, have long been limited by the brittleness. But by minimizing the microscopic imperfections that cause it, scientists are making far stronger ceramics that still retain such qualities as hardness and heat

超级材料时代

石器时代，铁器时代，所有的时代都以材料来命名。那么如何称呼未来的几十年呢？名称的选择颇为棘手。考虑一下：由透明的塑料薄膜制成的高保真扬声器；按一下开关就改变颜色的挡风玻璃；不需要散热器、每加仑汽油行驶 100 英里的无摩擦卡车发动机；永不生锈、在公路上行驶不留车印的汽车；与骨骼结合的人工髋关节。



迎接超级材料时代吧。材料科学——过去最无吸引力的技术，正在涌现出崭新而实用的发展，居首位的是可使电子学彻底变革的超导陶瓷。但是超导体只是画面的一部分：从房屋和汽车到炒菜锅和假牙，世界有朝一日将由各种不同的超级材料构成。就像遗传工程和计算机科学塑造了今日的世界，奇异的塑料、玻璃和陶瓷在新材料应用方面处于领先地位。一个重要的问题是：在将超级材料引进日常生活的竞争中，美国能否与其抗衡？

新材料的关键在于研究者提高在分子水平操纵物质的能力。例如，陶瓷因其脆性长期受到了限制，而科学家通过尽量减少造成脆性的微观缺陷，正在制造出仍然保留硬度和热阻这类特性但坚固得

1. tint: 色彩；着色；in all tints of red 用种种浓淡不同的红色
2. forge ahead: 努力前进，领先

resistance. Ford Motor Co. now uses ceramic tools to cut steel. Several Japanese automakers produce ceramic engine parts. A firm called Kyocera has created a line of ceramic scissors and knives that stay sharp for years and never rust or corrode. And since ceramic diesel engines that run withstand higher temperatures than steel, U. S. and Japanese firms have made prototype ceramic diesel engines that run without a cooling system, allowing higher efficiency and lower weight.

A similar transformation has overtaken plastics. High-strength polymers now form bridges, ice-skating rinks and parts of experimental auto engines and helicopter rotors. Plastic bumpers and fuel tanks will soon be commonplace in new cars. And one new plastic that generate electricity when vibrated or pushed is used in electric guitars, touch sensors for robot hands and karate jackets that automatically record each punch and chop.

Even plastic litter, which once threatened to permanently blot the landscape, has proved * amenable to[3] molecular tinkering. Several manufacturers now make biodegradable forms: some plastic six-pack rings, for example, gradually decompose when *exposed to[4] sunlight. Researchers are developing ways to make plastics as recyclable as metal or glass. "From used packaging materials we could make sophisticated housing products," says Uwe Wascher, marketing vice president for GE Plastic General Electric.

Tennis racquets: Plastic can be both lighter and stronger than steel. Composites—plastic reinforced with fibers of graphite or other compounds—made the round-the-world flight of the Voyager possible. The latest jet fighters are about 25 percent composite, and the top se-

多的陶瓷。福特汽车公司现在使用陶瓷刀具切削钢材。几家日本汽车厂制造陶瓷发动机零件。一家叫京赛拉的公司已经制造出一系列的陶瓷剪刀和小刀。它们使用多年后仍然锋利，并且永不生锈和腐蚀。由于陶瓷比钢更耐高温，美国和日本的公司已经制造出了运转不需要冷却系统、效率高而重量轻的陶瓷柴油发动机。

塑料也发生了类似的变革。现在用高强度的聚合物制造桥梁、室内溜冰场、试验用汽车发动机零件和直升机的水平旋翼。塑料防冲撞板和燃料箱不久将在新式汽车上普遍采用。一种在振动或挤压时产生电流的新颖塑料，被用于电吉它、机器人手上的触觉传感器以及能自动记录每一次冲拳和劈击的空手道服装里。

即使曾威胁风景区的永久性污染塑料废弃物也可以用分子改组的办法予以处理。几家制造工厂现在制成了可生物分解的塑料。例如某些半打装集合包装塑料膜在阳光下会逐渐分解。研究人员正在研究使塑料像金属和玻璃一样可以回收利用的技术。通用电气公司塑料部的市场副仲裁尤·澳什说："我们能用旧包装材料制造复杂的房屋构件。"

网球拍：塑料能比钢更轻、更坚固。用石墨纤维或其他化合物纤维加强塑料的复合材料才使"旅行者号"环球飞行成为可能。最新式的喷气式飞机约有25%为复合材料，高度机密的"秘密行动轰炸

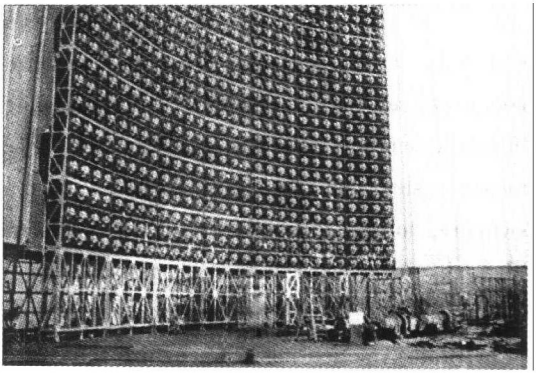
3. amenable to: 有服从义务的；经得起检验的
4. expose to: 暴露；揭露；遭受

cret Stealth bomber is believed to have an all composite skin to help avoid radar. At present, the materials cost more per pound than steel, so they have limited consumer applications. But graphite tennis racquets introduced composites to the public, and new high performance bicycles are made of them as well. Composites have even been proved in combat: a helmet saved an infantryman's life by deflecting two bullets in the Grenada invasion.

Some advanced materials are old standards with a new twist. The newest fiberoptic cables that carry telephone calls cross country are made of glass so transparent that a piece 100 miles thick is clearer than a standard window pane. PPG Industries will soon introduce glass that darkens when electricity passes through it. In airplanes of the future, pilots will simply flip a switch to reduce glare through the cockpit windshield. And even old fashioned concrete shows promise for improvement. Advanced cements are now so strong yet pliable that they can actually be formed into flexible springs. Such supercements could mean roads and bridges that would last decades without maintenance.

Piecemeal applications: But new materials have no impact until they are made into products. And that transition could prove difficult. "Where we have a problem is that the design and manufacturing stages in this country are separate operations," says Joel Clark, professor of material systems at MIT. Clark points out that automakers substitute new materials for old on a piecemeal basis—a composite fender here, a plastic gas tank there. "They are not redesigning the whole car to *take advantage of [5] the new materials."

Some of that reluctance is understandable. Automakers would



机”据认为具有全复合材料的外壳，以避开雷达。目前，这些材料的每磅售价超过钢材，所以限制了用户的应用。但是石墨网球拍向大众介绍了复合材料，并且现在高性能的自行车也用复合材料来制造。复合材料甚至已在战斗中得到验证：在入侵格林纳达时，头盔使两颗子弹偏转方向，从而救了一位步兵的命。

某些先进材料是另有一番新面貌的标准老材料。横穿全国传送电话的最新光纤电缆是由非常透明的玻璃制成的。一百英里厚的这种玻璃比普通的窗玻璃还要清晰。匹兹堡平板玻璃公司产业部即将试产一种通电后颜色会变黑的玻璃。在将来的飞机上，飞行员只要按一下开关就可减少透过座舱挡风玻璃的眩目强光。甚至老式的混凝土也有被改进的可能。现在先进的水泥非常坚固而且柔韧，用它们，实际上能做成有弹性的弹簧。这种超级水泥意味着道路和桥梁能使用几十年而不需要维修。

零星的应用：新材料只有制成产品后才会产生效果，这个过渡过程困难重重。麻省理工学院的材料系统学教授乔尔·克拉克说：“我们的问题在于：在这个国家里设计和制造是脱节的。”他指出，汽车制造商以零件为单位用新材料代替旧材料——这里换上复合材料挡泥板，那里换上塑料油箱，“他们没有重新设计整辆汽车来充分发挥新材料的优势。”

不愿采用新材料的某些原因是可以理解的。为了广泛地采用复

5. take advantage of: 趁；利用

need to rebuild entire assembly to use composites extensively. New materials could also cause rifts with labor. A single molded piece of composite can replace dozens of individual parts, reducing the need for human assembly. Liability problems can arise: manufacturers accustomed to steel may *be leery of [6] using plastics for critical parts. And switching to new substances requires lengthy research and investment. "It takes 10 to 15 years before new material is put into actual use," says Theodore Geballe of Stanford's Center for Material Research. "Corporate America has to recognize that long range research must be supported."

Congress will hear a similar warning this summer, when the Office of Technology Assessment presents a report on the commercial future of advanced materials. "The big threat," says OTA's Peter Blair, "is that even though we have a lead in the lab, other countries will lead in terms of industrial applications. The Japanese have a much firmer handle on how to move to commercialization." "Among the options OTA may recommend are research cooperatives in which industry works with universities. Such efforts could be crucial—because the next arena of global competition will almost certainly be built of super stuff."

(From Newsweek, May 25, 1987)

合材料，汽车制造商将需要重建整条装配线。新材料也会引起工人不和，因为一个压模的复合材料部件能代替几十个单独的零件，这样就减少了人工装配的需要。还会产生责任问题：制造商已习惯使用钢材，对关键零件使用塑料可能会小心翼翼，而且改用新材料需要长期的研究和投资。斯坦福材料研究中心的西奥多·格贝尔说："新材料要花 10～15 年的时间才能投入应用。美国上下不得不考虑必须支持长期的研究。"

今年夏天，当技术评价办公室提出关于先进材料的商业前途的报告时，国会将听到类似的警告。技术评价办公室的皮得说："巨大的威胁是：虽然我们在实验室里领先，其他国家将在工业应用方面领先。日本人对如何转向商业化抓得更紧。"技术评价办公室建议的选择方案中可能有：组成工业界与大学一起工作的联合研究组。这种努力有决定性的意义，因为下一个全球竞争的领域几乎肯定是在超级材料领域。

6. be leery of: 机警；对……怀有戒心