# 科技英语选读

## Manufacturing · Automobile Technology

## 制造业·汽车技术

主编：王丽娜

外文出版社

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# Readings in English for Science and Technology

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主　编　王丽娜
副主编　朱小燕
编　者　赵　纬
　　　　许卉艳
　　　　贾文学

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|---|---|---|---|
| **编　　者** | 王丽娜等 | | |
| **责任编辑** | 蔡　箐 | | |
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# 前　言

英语作为一门主流国际交流语言，其作用已日显重要。如何学好英语一直是人们关心的热点。近些年来，英语教学界基本认同了语言学习脱离不了文化这样一个道理。通过英语去更多地了解全球信息革命、科技突破、观念迭代、生活方式变更等已成为当今英语爱好者新的渴望和学习动力。

为适应英语学习这一新变化，许多新书已经面市，但是，总的来看，介绍社会生活方面的多，涉猎科技的少；而在科技读本中，内容综合的单本书多，按学科分类的丛书少。为了帮助大学四级以上英语水平的读者扩大知识面并能较系统地把握国外科技新进展，我们通过北京市高校研究生英语教学研究会组织了四所高等院校近二十位教师和专家编写了《科技英语选读》这套丛书。这套系列丛书共四卷，覆盖了十几门学科，如机电、化工、材料、信息、网络、生物技术、环境科学等。选材力求遵循新颖全面、理论与应用并重、旨趣性强三个原则。

**1. 新颖全面。**

人选文章既要突出学科最新成果和发展方向，又尽可能地反映该学科的全貌。《生物技术·环境科学》包括生物芯片、克隆和转基因动物、DNA 指纹分析等前沿性文章。同时，读者还能读到生物技术简史、人类基因组工程、农业生物技术等从不同侧面勾画生物技术的论述。《制造业·汽车技术》系统介绍机电一体化技术、虚拟制造、机器人等，汽车技术方面则选用了塑料汽车、电动汽车、模拟驾驶系统等文章。《化学与化工·材料·应用物理》让读者了解到纳米技术、航天材料、塑料电源等方面的知识，也较为全面地介绍了激光、超导、核动力等。《网络·通讯·计算机》选取网络安全、电子商务、虚拟现实、多媒体等方面的最新材料，同时还让读者了解到 Java 语言、浏览技

术、Intranet 等信息技术的发展动向。

**2. 理论与应用并重。**

丛书重点突出技术的实用性。理论性文章少而精，重点突出技术的应用。如 E-mail 的有效使用、网上商务、远程存取办公资料等，都直接面对信息社会的生活需要。在“生物技术”中，除五篇关键性理论介绍外，大部分都是应用方面的文章，如基因疗法、克隆技术、DNA 分析等。“环境科学”则着重介绍资源保护方面的现状和发展。

**3. 旨趣性强。**

为避免科技读物枯燥晦涩的弊病，丛书坚持了知识性与趣味性并重，所选文章读起来有益并且有趣。“制造业”中不仅选用了介绍机器人的文章，还包括了微观技术、军事侦察、三维动画等有趣的题目。“环境科学”涉及了太空开发动植物、生态旅游、野生动物保护等有趣的题材。《化学与化工·材料·应用物理》则收录了几篇具有探索性的小论文，如《利用 $CO_2$ 制造绿色塑料》、《植物回收重金属》。

由于读者已经具备一定的英语基础，本套丛书的练习便集中在专业词汇释义、难句、概念和背景的注释上。我们希望该套丛书能够帮助广大英语爱好者和科技爱好者更好、更快地阅读英语科技文章并能拓宽知识面，把握科技时代的脉搏，充满信心地迈向二十一世纪。

编　者

# Contents

# Part I

# Manufacturing

# 制造业

(1—25)

# 1. Introduction to Manufacturing
# 制造业简介

The wealth of a nation depends on its ability to **retrieve** natural resources and manufacture goods. Although the efficiency of the distribution system and service system is also important, the creation of goods is the most fundamental component of economic wealth. A simple and naive way of measuring the living standard of a culture is to divide the total goods produced (dollars sold) by the population. Of course, we know the matter is not so simple, because uneven distribution of wealth is indeed the norm everywhere. There are rich nations and poor nations, and rich people and poor people. However, the bottom line for creating national wealth is still to rely on the ability to manufacture. From history, we see that humanity has enjoyed an improvement in the standard of living over time. However, for thousands of years, the improvement has been relatively minor. Our first major improvement occurred during the stone age, when humans learned how to use hand tools. Actually, the ability to use hand tools distinguishes humans from other animals. Hand tools enable people to make simple things instead of waiting for nature to provide them. Hand tools are extensions of our hands. The next major improvement was not long ago: the Industrial Revolution brought another jump in the standard of living, and the development of machine tools. Machine tools are a principal product of the Industrial Revolution. They added power and precision to humans. With machine tools, humans can produce goods faster and more precisely. Human productivity has increased **drastically**, and industrial goods have replaced handmade products. They are both less expensive and of higher quality.

Europeans, with their newly invented machines, were able to expand their influence throughout the world. At the time of the Industrial Revolution, products were still custom made with manually operated machine tools. Parts interchangeability, developed by Eli Whitney, brought another major improvement to manufacturing. By combining jigs and gauges① developed for interchangeable manufacture, and the concept of the production/assembly line and mass production became a reality in the twentieth century. Never before in human history had humanity enjoyed such an improvement in the standard of living than in the twentieth century. Mass production② and scientific management of manufacturing helped to produce more, better, and less expensive goods. Automated (mechanically controlled) machines and systems (i.e., transfer lines) outproduced tens of hundreds of human workers. Mass-produced identical goods were plentiful and inexpensive. However, variety was limited due to the high cost of changeover in the manufacturing system. As Henry Ford so aptly put it, "You can have any color Model T that you'd like—as long as it's black."

Shortly after World War II, with the increasing demand for more complex parts, numerical-control (NC) machine③ tools were invented. NC replaced the need of the coordinated control of skilled machine operators, a skill that takes years to master. Since the 1950s, more scientific and technological developments have occurred than throughout human history. One of the most important developments is the invention of the digital computer. In discrete-product④ manufacturing, computers are essential to the development of NC, robotics, computer-aided design (CAD), computer-aided manufacturing (CAM), and flexible manufacturing systems (FMSs)[5]. These new computer-based technologies enable us to produce small-batch products[6] at low cost. Many human decision-making functions are replaced or assisted by computers. Thus, they further increase human productivity. The development of artificial intelligence (AI) and expert systems provides us with limited intelligence for our manufacturing systems. Computers can not only replace manual labor, but now they can also perform some mental processing.

From both the product demand and manufacturing batch size, we also see a trend. Before the Industrial Revolution, demand was low and products were all custom-made. Few products were available and their prices were uniformly high. Machine shops produced primarily small-batch products. From the turn of the century to the 1950s, the world was transformed from a society with few industrial products for few people to abundant products for everybody. Demand for industrial products grew fast, and to respond to the demand, mass-production techniques were developed. The lower product cost further stimulated demand. However, the desire to have more product variety has changed production from high volume to medium-and-small-batch quantities once again. Finally, in the 1980s, intense international competition has **mandated** that products be made quickly and inventory be kept to a minimum. Small-batch **dynamic** production environs[7] are needed. The production technology that has resulted produces better, inexpensive products in response to rapid demand changes. On the other hand, demand drives the development of a new production technology. In the modern manufacturing industry, survival is predicated on automation while maintaining its flexibility. Automation should provide good quality and low cost, and flexibility, all necessary to adapt to changes of the product and demand. It seems obvious that the solution is to apply computer-aided manufacturing (CAM) at the shop floor[8]. Computer-aided manufacturing can be defined as "the applications of computers in manufacturing." CAM thus includes a larger number of functions, ranging from FMS scheduling to machine control. Of course, for the total corporation, the solution is computer-integrated manufacturing (CIM), which includes not only manufacturing functions, but also business and other engineering functions. CAM is part of the CIM solution.

Today's new engineering **thrusts** include agile engineering[9], virtual manufacturing systems[10], rapid **prototyping**, and nanotechnologies[11]. The first three thrusts are changes that are being made in the way that we **engineer** products so that we can be more flexible to changes in designs and more responsive to customer needs/requests. Agile engineering concepts are a set of integration linkages that allow cross-functional activities to occur transparently for the designer, process engineer, and production engineer. As the term *agile* implies, agile engineering is focused at rapid response to customer and product changes. An agile manufacturing system is one that can quickly/instantly respond to product changes (demand and design). In a *virtual enterprise*[12], a variety of manufacturing resource **entities** (possibly even competitors) will be accessable to a designer, for example, ownership of manufacturing resources is available to *virtually* anyone that wants to use them. In a *virtual enterprise*, if a special plating or manufacturing process is required to bring a new product to **fruition**, the designer would have access to existing manufacturing facilities with these processes to address and use them as though they were in his own shop facility. Scheduling and refining the operation of these resources will be as if they were in a local shop facility.

Rapid prototyping refers to a broad set of engineering topics that are intended to be item 1 of a new design[13]. For many products, it is neecessary to produce a physical item so that ift, accessibility, and other interrelated product aspects can be determined. Historically, first item production has occurred in a "tool or model shop" with highly skilled machinists and technicians. Even with these highly skilled workers, the time required to fabricate the first item has been exceptionally high (especially if custom tooling or fixturing is required). Rapid prototyping is the process that allows the "first of" to be produced more quickly and inexpensively. Although rapid prototyping normally refers to the fabrication of a physical product, it also can refer to creation of software (especially control software). The processes that are normally used in physical rapid prototyping include layered deposition of material, for example, laser **sintering**. These "layered-methods" processes have been referred to a 3-D copying because layers of materials are deposited in 2-D form and then built up to make a 3-D object.

Nanotechnologies are a new set of processes that produce very small features and products. Nanotechnologies utilize processes that can be focused at atoms and molecules. "Drilling" with nanotechnology processes can create a hole molecule by molecule, thus producing an exceptionally accurate (and small) hole.

*Tien-Chien Chang*

## NEW WORDS

drastically /ˈdræstikəli/ adv. 大幅度地

dynamic /daiˈnæmik/ a. 动力的，动态的

engineer /ˌendʒiˈniə/ vt. 设计；制造

entity /ˈentiti/ n. 实体

fruition /fruːˈiʃən/ n. 实现，完成

mandate /ˈmændeit/ vt. 控制；要求

prototyping /ˈprəutəˌtaipiŋ/ n. 模型（样机）生产

retrieve /riˈtriːv/ vt. 使再生，使恢复

sinter /ˈsiŋtə/ vi. 熔结，热压结

thrust /θrʌst/ n. 推动力

## NOTES

1. jigs and gauges：夹具和量规
2. mass production：（大）批量生产
3. numerical-control（NC）machine：数控机床
4. discrete-product：不连续生产的产品
5. FMSs：柔性制造系统
6. small-batch products：小批量生产的产品
7. production environ：生产环境
8. Automation should ... shop floor：自动化应该满足高质、低耗、机动灵活性以及一切为适应产品和需求之变化所必需的要求。显然，把计算机辅助制造应用于实际制造工作中是条出路。
9. agile engineering：敏捷工程
10. virtual manufacturing system：虚拟制造系统
11. nano-technology：纳米技术（纳米是十亿万分之一米，或百万分之一毫米）
12. virtual enterprise：虚拟企业
13. Rapid prototyping ... design：快速成形包括一系列工程方面的课题，是进行一项新设计时，首先要考虑的。

## QUESTIONS

1. What are the major improvements in the standard of living enjoyed by humanity in human history?

2. What are the main forces that push today's new engineering forward?
3. How do you understand an agile engineering system and a virtual enterprise?
4. What have the "layered-methods" been referred to?