

科技英语突破

TOWARD

a Breakthrough in Scientific English

主 编：翟天利 副主编：祁春清 赖瑜

外文出版社

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前 言

编写本教材是为了使大学本科生从大学英语基础阶段顺利地过渡到专业英语学习阶段。国家教委一直强调各高等院校抓好专业英语教学工作，但是农、林、医、文、理、工各专业名目繁多，因此如何编写相应的教材就是一个大问题。是编写大对口的教材，还是编写小对口的教材，象这样的问题已经争论了几十年，也有过多次的编写及应用实践，但一直未有满意的结果。

其实，专业英语的核心还是通用英语。真正的专业词汇意思很单一，所以很好掌握，只要会查阅字典就可以了。专业英语（科技英语）与通用英语的不同之处主要体现在文章的表达方式和半科技词汇的运用这两个方面。基于这种考虑，我们着手编写了这本教材，试图解决从大学英语基础阶段到专业英语阶段的过渡问题，并帮助学生们提高实际应用英语的能力。

本教材也适用于任何有一定英语基础，又对科技英语感兴趣的读者自学。由于教材中包括了如何撰写论文的英文摘要，个人简历，科技英语的常用表达方式和使用说明书及合同书中所出现的常用词汇和句型，所以该教材也起到了手册的作用，以供学习者们在学习和工作中随时参考。

在本教材的编写过程中，得到了北京机械工业学院外事办公室的大力支持。美籍专家 Dr. Pamela Ramey 审阅了全书，并提出了很多宝贵意见，在此一并致谢。

编 者

一九九九年七月

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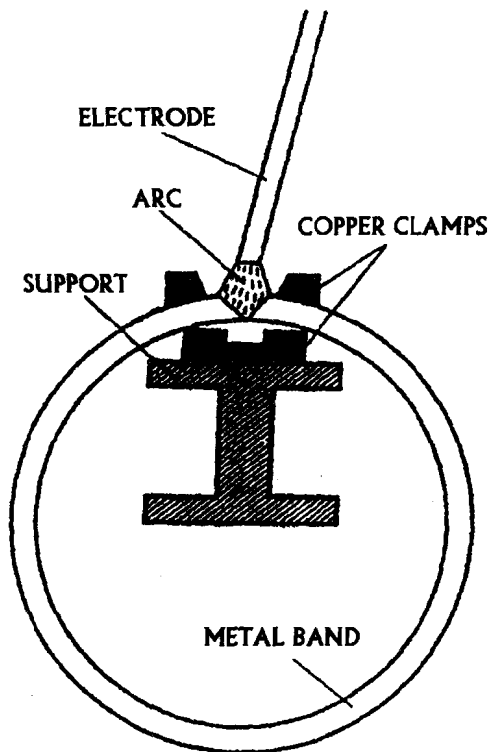
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Unit 1

I. Scientific Reading:

Welding

There are a number of methods of joining metal articles together; depending on the type of metal and the strength of the joint which is required. Soldering gives a satisfactory joint for light articles of steel, copper or brass, but the strength of a soldered joint is rather less than a joint which is *brazed*, *riveted* or *welded*. These methods of joining metal *are normally adopted* for strong permanent joints.



Electric arc welding

The simplest method of welding two pieces of metal together is known as pressure welding. The ends of metal *are heated* to a white heat—for iron, the welding temperature should be about 1300°C —in a flame. At this temperature the metal becomes plastic. The ends *are then pressed or hammered* together, and the joint is *smoothed off*. Care *must be taken* to ensure that the surfaces are thoroughly clean first, for dirt will weaken the weld. Moreover, the heating of iron or steel to a high temperature causes oxidation, and a film of oxide is *formed* on the heated surfaces. For this reason, a flux *is applied* to the heated metal. At welding heat, the flux melts, and the oxide particles *are dissolved* in it together with any other impurities which may be present. The metal surfaces *are pressed* together, and the flux *is squeezed* out from the center of the weld. A number of different types of weld

may be used, but for fairly thick bars of metal, a vee-shaped weld *should normally be employed*. It is rather stronger than the ordinary butt weld.

The heat for fusion welding *is generated* in several ways, depending on the sort of metal, which is being welded, and on its shape. An extremely hot flame *can be produced* from an oxy-acetylene torch. For certain welds an electric arc is used. In this method, an electric current is *passed* across two electrodes, and the metal surfaces *are placed* between them. The electrodes *are sometimes made* of carbon, but more frequently they are metallic. The work itself constitutes one of them and the other is

an insulated filler rod. An arc is struck between the two, and the heat, which is generated, melts the metal at the weld. A different method *is usually employed* for welding sheets or plates of metal together. This is *known* as spot welding. Two sheets or plates *are placed* together with a slight overlap, and a current is *passed* between the electrodes, at welding temperature, a strong pressure is *applied* to the metal sheets. The oxide film, and any impurities, which *are trapped* between the sheets, *are squeezed* out, and the weld is *made*.

II. Access to Scientific English:

科技英语的特点 (1)

什么是科技英语文体?

比较下面两个英语句子:

a. The factory turns out 100,000 cars every year.

b. The annual output of the factory is 100,000 cars.

这两句话的意思是一样的,但是用词和语法上有一些不一样。第一个句子用了日常口语中常用的动词短语(phrasal verb)作谓语,用的词汇是初中生都认识的。第二个句子用了系词,构成对事实的客观表达。句子里用的词汇有两个(annual 和 output)都是日常口语中少用的文语词。如果把这两个句子译成汉语,应该分别翻译成:

a. 这家工厂每年生产十万辆汽车。

b. 该工厂的汽车年产量为十万。

上述两个 a 句和 b 句之间的不同表明了 a 句和 b 句属于不同的文体。什么是文体呢?文体就是一部分具有共同职业或兴趣的人为了实现一定的交际目的而使用的语言变体。科技文体就是自然科学家和社会技术人员从事专业活动时使用的一种文体。大家所见到的科学著作、学术论文、实验报告、产品说明书等都属于科技文体。科技文体不以语言的艺术美为追求目标,而是讲求逻辑的条理清楚和叙述的准确严密。因此它有自己的语言、词汇和语法特点。当然,科技文体也不是“铁板一块”。粗略来说,可以分成正式科技文体和科普文体,两种都有书面和口语形式。以下将向大家介绍书面的正式英语科技文体(俗称科技英语)的词汇和语法特点。

第一讲 英语科技文体的词汇特点

一、大量使用专业术语。科技文章要求概念清楚,避免含糊不清和一词多义,因此使用较多的科技词汇。

科技词汇来源分三类:

A. 第一类科技词来自英语中的普通词,但赋予了它们新的词义。

例如: Work is the transfer of energy expressed as the product of a force and the distance through which its point of application moves in the direction of the force.

在这句话中, work、energy、product、force 都是从普通词汇中借来的物理学术语。work 的意思不是‘工作’,而是‘功’; energy 的意思不是‘活力’,而是‘能’; product 的意思不是‘产品’,而是‘乘积’; force 的意思不是‘力量’,而是‘力’。

B. 第二类科技词是从希腊或拉丁语中吸收的。

例如: therm 热 (希腊语) thesis 论文 (希腊语)
 parameter 参数 (拉丁语) radius 半径 (拉丁语)

这些希腊语和拉丁语来源的词的复数形式有些仍按原来的形式, 如 thesis 的复数是 theses, stratus 的复数是 strati。但是不少词由于在英语里用得久了, 除了保留原来的复数形式, 有的也有符合英语习惯的复数形式。例如 formula (公式, 拉丁语) 可以是 formulae, 也可以是 formulas; stratum (层, 拉丁语) 可以是 strata, 也可以是 stratum。特别有意思的是 datum (数据, 拉丁语), 它的复数形式是 data, 但是由于这个字常用复数, 所以有些外国人甚至误把它当成单数, 又造出了一个所谓的复数形式 datas。

C. 第三类是新造的词。每当出现新的科学技术现象时, 人们都要通过词汇把它表示出来。这就需要构造新的词汇。构成新词主要有以下几种方法:

- a. 转化: 通过词类转化构成新词。英语中名词、形容词、副词、介词可以转化成动词, 而动词、形容词、副词、介词可以转化成名词。但是最活跃的是名词转化成动词和动词转化成名词。

例如, 名词 island (岛屿) 转化成动词 island (隔离), 动词 coordinate (协调) 转化成名词 coordinate (坐标)。

- b. 合成: 由两个独立的词合成为一个词。

例如: air + craft —— aircraft 飞机
 metal + work —— metalwork 金属制品
 power + plant —— powerplant 发电站

有的合成词的两个成分之间要有连字符。

例如: cast-iron 铸铁
 conveyer-belt 传送带
 machine-made 机制的

英语中有很多专业术语有两个或更多的词组成, 叫做复合术语。它们的构成成分虽然看起来是独立的, 但实际上合起来构成一个完整的概念, 因此应该把它们看成是一个术语。

例如: liquid crystal 液晶
 water jacket 水套
 computer language 计算机语言
 machine building 机器制造
 linear measure 长度单位

- c. 派生: 这种方法也叫缀合。派生词是由词根加上前缀或后缀构成的。加前缀构成新词只改变词义, 不改变词类。

例如: decontrol (取消控制) v. —— de + control (control 是动词)
 ultrasonic (超声的) a. —— ultra + sonic (sonic 是形容词)
 subsystem (分系统) n. —— sub + system (system 是名词)

有些加前缀的派生词在前缀和词根之间有连字符。

例如: hydro-electric (水力的)

non-metal (非金属)

英语的前缀是有固定意义的, 记住其中一些常用前缀对于记忆生词和猜测词义很有帮助。这里只举些表示否定的前缀。

anti-	表示“反对”	antibody	抗体
counter-	表示“反对, 相反”	counterbalance	平衡
contra-	表示“反对, 相反”	contradiction	矛盾
de-	表示“减少, 降低, 否定”	decrease	减少
		devalue	贬值
		decompose	分解
dis-	表示“否定, 除去”	discharge	放电
		disassemble	拆卸
in-, il- (在字母 l 前), im- (在字母 m、b、p 前), 表示“不”			
		inaccurate	不准确的
		imbalance	不平衡的
		impure	不纯的
mis-	表示“错误”	mislead	误导
non-	表示“不, 非”	non-ferrous	有色金属的
un-	表示“不, 未, 丧失”	unaccountable	说明不了的
		unknown	未知的
		unbar	清除障碍

加后缀构成新词可能改变也可能不改变词义, 但一定改变词类。

例如: electricity n. — electric + ity (electric 是形容词)

liquidize (液化) v. — liquid + ize (liquid 是名词)

conductor n. — conduct + or (conduct 是动词)

invention n. — invent + ion (invent 是动词)

有些派生词加后缀后, 语音或拼写可能发生变化。

例如: simplicity (单纯) — simple + icity

maintenance (维修) — maintain + ance

propeller (推进器) — propel + l + er

英语后缀的作用和前缀有所不同, 它们主要用来——词类。从一个词的后缀可以判别它的词类, 这是它的语法意义。它们的词汇意义往往并不明显。下面举一些常见的形容词后缀。

-able, -ible, -uble	表示“可…”	avoidable	可以避免的
		audible	听得见的
		soluble	可溶的
-al	表示“…(性质)的”	fundamental	基本的
-ant, -ent	表示“…(性质)的”	abundant	富饶的

		apparent	显然的
-ed	表示“有…的”	cultured	有文化的
-ful	表示“充满…的，有…倾向的”	useful	有用的
-ic, -ical	表示“…的”	basic	基本的
		economical	经济的
-less	表示“没有”	useless	无用的
-ous	表示“有…的，多…的”	numerous	众多的

d. 缩略：把词省略或简化，然后组合成新词。现在的趋势是缩略词的数目不断增大，使用面不断扩大。

例如：laboratory 缩略成 lab (实验室)

unidentified flying object 缩合成 UFO (不明飞行物)

radio detection and ranging 缩减并拼读成 radar (雷达)

transistor 和 receiver 各取一部分，组合成 transceiver (收发机)

二、英语科技文体中有很多词汇并不是专业术语，但在日常口语中很少用，它们多只见于书面语中，叫做文语词。俗话称它们为“大词”。掌握这类词对阅读科技文章或写科技论文十分重要。这类词用得很广，不仅出现在科技文体的各个专业中，也出现在政治、经济、法律、语言等社会科学的文体中。本书的半科技词汇学习部分就列举了部分常用的文语词。

III. Semi-Scientific Word Study:

1. Negligible, Considerable, Substantial

A negligible amount of something 表明很小的数量概念，小到甚至于可以忽略不计。而 a considerable, an appreciable, a substantial, a material amount of something 则表明数量相当大。

An appreciable amount is large enough to be worth appreciable or noticing.

A considerable amount is large enough to be worth considering or noticing.

A substantial amount is large enough to be noticed, like a substance.

A material amount is large enough to be noticed, like a material.

2. Melt, Molten, Smelt

At a certain temperature, metals melt. They become molten.

The molten iron passes out of the furnace into moulds.

We smelt iron ore by heat, and change the ore into its metal state.

When the ore is smelted, it becomes pig iron.

3. Property

Here are some of the properties which metals may have:

The metal is fluid. It has fluidity.

plastic plasticity

elastic elasticity

ductile ductility

malleable

malleability

4. Bring about, Produce, Cause, Give rise to

The high temperature	may	bring about	cracks in the furnace walls.
These experiments	will	produce	new methods of construction.
A drop in pressure	can	give rise to	cylinder condensation.
		cause	a lot of unemployment.

5. Critical ← decisive and therefore important or serious.

The critical temperature of steel: above or below this temperature the molecular structure changes.

The critical pressure: the pressure at which a gas can be liquefied.

6. Conducive

Regular maintenance is		better performance of the machine.
Good labor relations are	conducive to	improved production.
Turbulence in the cylinder is	(helpful to)	more efficient burning of the gases.

IV. Practical Usage of Some Patterns:

1. Maximum and Minimum

(1) The maximum temperature

The upper temperature limit 35°C

(2) The minimum temperature in this country 0°C

The lower temperature limit is about 171/2°C

(3) The average temperature

The mean temperature

(4) The temperature in this country ranges from 35°C to 0°C.
varies

(5) The maximum pressure in the boiler is 500 lb/m².

(6) The maximum fuel consumption of the engine is 30 m. p. g. (miles per gallon).

2. Contents

(1) The gas contains about 5 1/2 % of carbon monoxide.

(2) The alloy 5 % nickel and 5 % iron.

(3) The carbon monoxide content was about 5 %.

(4) The moisture content of the cylinder increased.

(5) The class consists of 24 students.

(6) The atmosphere comprises a number of gases.

(7) The machine is composed of several different parts.

(8) The gas in the atmosphere includes oxygen and nitrogen.

V. Supplementary Readings and Exercises:

Reading 1

AIR BEARINGS

Plastic air bearings that run virtually silent at speeds up to 120,000 rpm have been demonstrated by the National Center of Tribology (= the study of friction) at Riseley. The widespread introduction of these bearings into textile machinery is expected to increase output and considerably improve the environment of the textile worker.

Shaft speeds in textile machinery are vitally important because output is directly proportional to them. In the present generation of textile machines, shaft speeds are around 40,000 rpm using conventional rolling-element bearings. The current maximum at which an adequate life can be obtained is about 60,000 rpm, but the noise they generate is unacceptable to the labor force.

In principle, the air bearing is no different to an oil-lubricated plain bearing. It simply uses a film of air as the lubricant instead of oil. An air bearing, however, has to be made with considerable precision and is relatively expensive when machined from metal. To overcome this, the Riseley engineers have developed a new moulding technique which allows a journal air bearing to be precision-moulded in plastic in a single operation that requires no further finishing. The bearings are circular to within the 0.0001 inch tolerance necessary for satisfactory performance—which is one order of magnitude more precise than has previously been possible with plastic moulding.

Compared with a ball or roller bearing, the plastic air bearing has no small parts in it to chatter or vibrate, and will run at any speed between 3,000 and 120,000 rpm with virtually no noise. All air bearings suffer from a dynamic instability known as “half speed whirl”, but this is no problem for the plastic air bearing because its intrinsic resilience allows it to be driven through the region of instability.

However, a bearing system that will run at 100,000 rpm is the solution to only half the problem. A means still has to be found for driving the textile shaft at these speeds. The traditional answer is the use of long belts which run over a number of small pulleys. This is simple and cheap but inadequate at very high speeds. A much better system is to use an individual high speed electric motor mounted on each shaft. Each shaft can stop and start independently and its speed is then accurately determined by the frequency of the alternating current used to drive the motor.

Exercise 1. Word Recognition by Context

Here are some phrases from the text. Each short line stands for one missing letter. The words in brackets will help you.

Timed activity

- a. the widesp _____ introduction of these bearings (on a large scale)
- b. is expected to increase out _____ and (the amount of goods made)
- c. in the present gen _____ of machines (class of the same age)

- d. it is rel _____ expensive (comparatively)
- e. the bearings are cir _____ to within 0.0001 inch tolerance (round)
- f. all air bearings suf _____ from a dynamic instability (have the disadvantage of)
- g. this is the sol _____ to only half the problem (answer)
- h. sh _____ speeds in textile machinery are vitally important (part joining one part of a machine to another)

Now use your dictionary to check the words you have written.

Exercise 2. Search Reading

Look at these questions then read through the following passage quickly to try to find the answer.
Group work. Discuss your answers.

- a. Have plastic bearings yet been introduced on a wide scale?
- b. How much faster than normal bearings can they operate?
- c. What other advantages do they have?

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Exercise 3. Text Completion

As you read, choose the word from each group of words in italics which completes the passage best.

Timed activity

In principle, the air bearing is no different to (1) *an/a/most* oil-lubricated plain bearing. It simply uses a film (2) *with/of/in* air as the lubricant instead of oil. An air (3) *film/bearing/lubrican*, however, has to be made with considerable precision and (4) *costs/develops/is* relatively expensive when machined from metal. To overcome this, (5) *most/both/the* Riseley engineers have developed a new moulding technique which (6) *forces/allows/makes* a journal air bearing to be precision-moulded in (7) *plastic/time/metal* in a single operation which requires no further finishing (8) *those/the/a* bearings are circular to within the 0.0001 inch (9) *tolerance/size/diameter* necessary for satisfactory performance-which is one order of (10) *size/magnitude/magnification* more precise than has previously been possible with plastic (11) *moulding/building/works*.