普通高等教育"十一五"国家级规划教材

EST Integrated Course

科技英语综合教程

主编 刘爱军 王斌

拓展 高等学校英语拓展系列教程

语言技能类 语言应用类 语言文化类 专业英语类

外语教学与研究出版社
FOREIGN LANGUAGE TEACHING AND RESEARCH PRESS

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高等学校英语拓展系列教程

编写委员会

总序

随着我国对外科技交流的发展，科技英语作为交流的工具越来越受到人们的重视。为了帮助大学生提高科技英语阅读、写作和翻译能力，为他们在科技领域运用英语进行学习、研究和交流架起一座桥梁，我们编写了这套“科技英语系列教材”。

“科技英语系列教材”归属于“高等学校英语拓展系列教程”中的“专业英语类”，专为高等学校科技英语专业或理工科专业本科高年级学生及研究生专业英语课而设计，也可作为科研院所培养工程硕士、博士的培训教材，同时还可供广大科技工作者自学与参考之用。

本系列教材共有5本：《科技英语语法》（配教师用书）、《科技英语写作》（配教师用书）、《科技英语翻译》（配教师手册）、《科技英语阅读》及《科技英语综合教程》（配教师用书）。其内容涵盖通信、电子、计算机、环境、能源、生物技术与农业、遗传工程与医学、宇宙、纳米技术等多个热门科技专题，充分体现了当今科学技术的最新发展，反映了科学研究的探索与创新精神。本系列教材旨在提高学生阅读、翻译、写作相关专业论文或学术作品的能力。

本系列的5本教材是有机关联的一个整体：

《科技英语语法》是核心，总结了科技英语的特殊语法现象，剖析了科技英语学习中的重点、难点及容易忽视的语言点。为科技英语阅读、翻译和写作打下语言基础。

《科技英语翻译》融专业知识学习与翻译技能训练于一体。讲练结合，注重实践，帮助学生在掌握翻译技巧的基础上通过练习融会贯通。

《科技英语写作》分为单句写作、论文写作、应用文写作三大部分：单句写作部分深入剖析了科技英语的词法、句法特征，并归纳总结出科技英语写作中

的常用句型及表达方式，精辟实用。论文写作部分论述了科技论文的语篇及结构特征。应用文写作部分结合各类实用范文，介绍了英文书信、个人简历等的写法。

《科技英语阅读》以阅读为载体，旨在帮助学生提高科技英语阅读、翻译和写作的综合运用能力。课文精选最新英美期刊、专著及科普读物，语言地道、内容实用。

《科技英语综合教程》综合体现科技英语的特点，是连接大学英语基础阶段学习和科技类专业英语学习的桥梁。

希望本系列教材成为您全面提升科技英语水平的良师益友，不当之处诚请指正。

秦荻辉

2006 年 2 月

于西安电子科技大学科技英语研究中心

前言

为适应我国高等教育发展的新形势，深化教学改革，尤其是教学模式的改革，提高教学质量，满足新时期国家和社会对人才培养的需要，2004 年 6 月教育部制定颁布了《大学英语课程教学要求（试行）》，以此作为高等学校进行大学英语教学的主要依据。

《大学英语课程教学要求（试行）》将大学阶段的英语教学分为三个层次：一般要求、较高要求和更高要求。一般要求是高等学校非英语专业本科毕业生应达到的基本要求；较高要求和更高要求是对那些学有余力、英语基础好的大学生设置的。这就提出了要保持大学英语四年学习不断线的问题。因此，我们编写了这本《科技英语综合教程》，为那些基础好的学生进一步提高英语水平提供学习素材及学习方法。

本书在编写时考虑到以下两个方面：

一、语言学习的特点就是要日积月累，每天读一点、背一点，积少成多，而阅读是继续保持和提高语言水平最直接最有效的手段；

二、当今社会科技发展突飞猛进，信息交流日益增多，学生们迫切需要掌握一点基础科学的新知识、新潮流，将知识性与趣味性融于一体。

教材特点

一、选材新颖。本书选取了最前沿最时尚的十个领域作为本书的学习素材，涵盖了科技领域的方方面面，包括数学中的博弈论、生物制药、基因工程、十大电信技术、计算机、网络、无线通信、软硬材料、微机械及航天技术与宇宙学。选取的材料为 2004 年至今在 *Science*、*Discover*、*Science News*、*Newsweek*、*Scientific American* 等知名杂志上发表的文献，还有的就是近期在网上出现的文章。

二、安排合理。本书共十个单元。每单元分为 Text A 和 Text B。Text A 为精读，教师对课文中的背景知识及语言点做主要讲解；Text B 为学生课下自学内容。每单元除单词表外，还列出了相关短语、语言点讲解及课文注释。

三、讲练结合。这是本书的一大特色。除了每单元的大量练习之外，我们还编写了科技英语阅读方法、科技英语翻译技巧及编译技巧，并附有相关练习以供学生操练。各单元练习按照不同板块编排，更具针对性。

四、练习多样。本书的练习以 Text A 为主，包括回答问题、填写大意、多项选择、选词填空、完型填空、单词词组及句子翻译及写作。Text B 的练习形式包括回答问题、词汇填空、判断对错及编译。练习的设计均以各单元内容为主题，使课文和练习融为一体，成为一个系列。

此外，全书最后列出了总词汇表以供查阅。

教材使用建议

本教材涵盖的科普内容非常广泛，教师可以根据所在学校的课程设置和学生的实际情况，选择全部或部分章节的内容。教材供一学期使用。建议授课班级的规模控制在 120 人以内。每周两学时，以 Text A 为主，可采取教师讲解、学生讨论、学生讲解等教学模式；Text B 为课下自学内容。

使用对象

编写本书的目的主要是为了提高学生科技英语阅读理解、翻译及写作能力。本书主要供高等学校非英语专业三年级学生使用，可作为大学英语选修课教材使用。

本教材在编写过程中，美国朋友 Joel Lintner 教授、北京邮电大学语言学院卢志鸿教授对教材进行了深入细致的审校工作；蔡红霞老师提供了相关篇章素材；同时，本教材还得到了相关领域专业人士江其生、陈广新、金长善、周鸣虎等的帮助。在此我们对所有关心、支持和参与本教材编写工作的人士表示衷心的感谢。

由于本教材涉猎的学科面较广，在编写过程中专业知识方面的疏漏之处在所难免，敬请各学科的专家和读者及时告知，给予指正。

编者

2007 年 7 月

于北京邮电大学

Acknowledgment

We are extremely grateful to the authors of all the articles and the magazines and newspapers from which we have chosen the texts for this textbook. And we apologize for the insufficient information in some cases due to our lack of resources. We intend to show every respect for intellectual property rights, including some websites, but we hope our pleading for the permissions to use the related articles for teaching purposes will receive kind and generous consideration.

Unit 1 Mathematics

Text A Game Theory by Avinash Dixit and Barry Nalebuff from *http://www.econlib.org*.

Text B Digital Signature in Applied Cryptography author unknown, a modified section of the crash course from *http://www.iusmentis.com*

Unit 2 Medicine

Text A Making a Little Progress by Aimee Cunningham from *SCIENCE NEWS*, October 29, 2005, Vol. 168.

Text B Are Antibiotics Killing Us? by Jessica Snyder Sachs from *DISCOVER*, Vol. 26, No. 10, October 2005, Biology & Medicine.

Unit 3 Genetic Engineering

Text A Ready or Not? Human ES Cells Head Toward the Clinic by Gretchen Vogel from *SCIENCE*, June 10, 2005, Vol. 308.

Text B Gene Doping by Christen Brownlee from *SCIENCE NEWS*, October 30, 2004, Vol. 166.

Unit 4 Telecommunications

Text A 10 Hottest Telecom Technologies of the Year (I) by Telecommunications Staff (Sean Buckley et al) from *Telecommunications*, April 1, 2004, Vol. 38.

Text B 10 Hottest Telecom Technologies of the Year (II) by Telecommunications Staff (Sean Buckley et al) from *Telecommunications*, April 1, 2004, Vol. 38.

Unit 5 Wireless Communications

Text A Your Next Computer by Brad Stone from *Newsweek*, May 30, 2004.

Text B Share the Internet Wealth by Steven Johnson from *DISCOVER*, Vol. 26, No. 01, January 2005, Technology.

Unit 6 Computer Science

Text A Get Mean, Go Green by David Greenfield from *Network Magazine*, January 2004.

Text B Conversational Computers by Andy Aaron, Ellen Eide, and John F. Pitrelli from *Scientific American*, June 2005.

Unit 7 Internet

Text A We Know Where You Are by David Greenfield from *Network Magazine*, March 2005.

Text B Why Spareware Poses Multiple Threats to Security by Roger Thompson from *Communication of the ACM*, August 2005.

Unit 8 Materials

Text A Designing Superhard Materials by Richard B.Kaner, John J. Gilman, Sarah H.Tolbert from *SCIENCE*, May 27, 2005.

Text B Toxic Potential of Materials at the Nanolevel by Andre Nel, Tian Xia, Lutz Mädler, Ning Li from an article published in *SCIENCE*, February 2006, Vol. 311.

Unit 9 Mechanics

Text A 5 Future Applications of MEMS in Healthcare Applications from an experiment report of a group of university students from *http://www.ic.chalmers.se*.

Text B Introduction to Micromechanics from an experiment report of a group of university students from *http://www.ic.chalmers.se*.

Unit 10 Space Technology and Cosmology

Text A Can a Small Start-up Build America's Next Spaceship? by Michael Belfiore from *Popular Science*, October 2005, Vol. 267.

Text B Misconceptions about the Big Bang by Charles H. Lineweaver and Tamara M. Davis from *Scientific American*, March 2005, Vol. 292.

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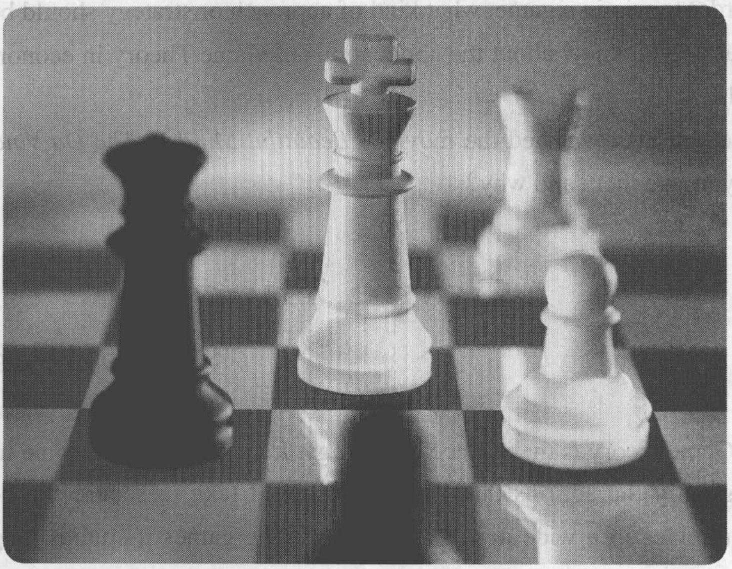
Unit 1
Mathematics



Lead In

In this unit, the latest application of modern mathematics is introduced into two fields. One is Game Theory which received special attention with the awarding of the Nobel Prize in economics to John Nash. Now it has been broadened theoretically and applied to many social problems. It has driven a revolution in economic theory. It has also found applications in sociology and psychology, and established links with evolution and biology. The other field is Digital Signature, which is the focus of cryptography studies. In text B, current applications of the Digital Signature technique are illustrated. From the article, readers can understand the basic concepts and principles of Digital Signature and may have an interest in continued study of cryptography.

Text A

Warm-up Questions:

1. What are the basic elements of games and what is the goal of the participants in the game?
2. In order to win in a game, what kind of approach or strategy should be applied?
3. What do you know about the applications of Game Theory in economics and other fields?
4. Have you ever watched the movie *A Beautiful Mind* or *The Da Vinci Code*? How did you like them and why?

Game Theory

by Avinash Dixit and Barry Nalebuff

1 Game theory is the science of strategy. It attempts to determine mathematically and logically the actions that "players" should take to secure the best **outcomes** for themselves in a wide **array** of "games". The games it studies range from chess to child rearing and from tennis to takeovers. But the games all share the common feature of **interdependence**. That is, the outcome for each participant depends upon the choices (strategies) of all. In so-called zero-sum games the interests of the players conflict totally, so that one person's gain always is another's loss. More typical are games with the potential for either mutual gain (positive sum) or mutual harm (negative sum), as well as some conflict.

2 Game theory was pioneered by Princeton mathematician John von Neumann. In the early years the emphasis was on games of pure conflict (zero-sum games). Other games were considered in a cooperative form. That is, the participants were supposed to choose and **implement** their actions **jointly**. Recent research has focused on games that are neither zero-sum nor purely cooperative. In these games the players choose their actions separately, but their links to others involve elements of both competition and cooperation.

3 Games are fundamentally different from decisions made in a **neutral** environment.

To illustrate the point, think of the difference between the decisions of a **lumberjack** and those of a general. When the lumberjack decides how to chop wood, he does not expect the wood to **fight back**; his environment is neutral. But when the general tries to **cut down** the enemy's army, he must anticipate and overcome resistance to his plans. Like the general, a game player must recognize his interaction with other intelligent and purposive people. His own choice must allow for both conflict and for possibilities for cooperation.

4 The essence of a game is the interdependence of player strategies. There are two distinct types of strategic interdependence: **sequential** and **simultaneous**. In the former the players move in sequence, each aware of the others' previous actions. In the latter the players act at the same time, each ignorant of the others' actions.

5 A general principle for a player in a sequential-move game is to look ahead and reason back. Each player should figure out how the other players will respond to his current move, how he will respond in turn, and so on. The player anticipates where his initial decisions will ultimately lead, and uses this information to calculate his current best choice. When thinking about how others will respond, one must **put oneself in their shoes** and think as they would; one should not impose one's own reasoning on them.

6 In principle, any sequential game that ends after a finite sequence of moves can be "solved" completely. We determine each player's best strategy by looking ahead to every possible outcome. Simple games, such as tic-tac-toe, can be solved in this way and are therefore not challenging. For many other games, such as chess, the calculations are too complex to perform in practice—even with computers. Therefore, the players look a few moves ahead and try to evaluate the resulting positions on the basis of experience.

7 **In contrast to** the **linear** chain of reasoning for sequential games, a game with simultaneous moves involves a logical circle. Although the players act at the same time, in ignorance of the others' current actions, each must be aware that there are other players who, in turn, are similarly aware, and so on. The thinking goes: "I think that he thinks that I think...." Therefore, each must **figuratively** put himself in the shoes of all and try to calculate the outcome. His own best action is an **integral** part of this overall calculation.

8 This logical circle is **squared** (the circular reasoning is brought to a conclusion)

using a concept of **equilibrium** developed by the Princeton mathematician John Nash. We look for a set of choices, one for each player, such that each person's strategy is best for him when all others are playing their **stipulated** best strategies. In other words, each picks his best response to what the others do.

9 Sometimes one person's best choice is the same no matter what the others do. This is called a dominant strategy for that player. At other times, one player has a uniformly bad choice—a dominated strategy—in the sense that some other choice is better for him no matter what the others do. The search for an equilibrium should begin by looking for dominant strategies and eliminating dominated ones.

10 When we say that an outcome is an equilibrium, there is no presumption that each person's privately best choice will lead to a **collectively optimal** result. Indeed, there are **notorious** examples, such as the prisoners' **dilemma** (see below), where the players are drawn into a bad outcome by each following his best private interests.

11 Nash's notion of equilibrium remains an incomplete solution to the problem of circular reasoning in simultaneous-move games. Some games have many such equilibria while others have none. And the dynamic process that can lead to an equilibrium is left unspecified. But in spite of these flaws, the concept has proved extremely useful in analyzing many strategic interactions.

12 The following examples of strategic interaction illustrate some of the fundamentals of game theory:

13 **The Prisoners' Dilemma.** Two suspects are questioned separately, and each can **confess** or keep silent. If suspect A keeps silent, then suspect B can get a better deal by confessing. If A confesses, B had better confess to avoid especially harsh treatment. Confession is B's dominant strategy. The same is true for A. Therefore, in equilibrium both confess. Both would fare better if they both stayed silent. Such cooperative behavior can be achieved in repeated plays of the game because the temporary gain from cheating (confession) can be outweighed by the long-run loss due to the breakdown of cooperation. Strategies such as **tit-for-tat** are suggested in this context.

14 **Mixing Moves.** In some situations of conflict, any systematic action will be discovered and exploited by the rival. Therefore, it is important to keep the rival guessing by mixing one's moves. Typical examples arise in sports—whether to run or

to pass in a particular situation in football, or whether to hit a passing shot cross-court or down the line in tennis. Game theory quantifies this insight and details the right proportions of such mixtures.

15 **Strategic Moves.** A player can use threats and promises to alter other players' expectations of his future actions, and thereby induce them to take actions favorable to him or **deter** them from making moves that harm him. To succeed, the threats and promises must be credible. This is problematic because when the time comes, it is generally costly to carry out a threat or make good on a promise. Game theory studies several ways to enhance credibility. The general principle is that it can be in a player's interest to reduce his own freedom of future action. By so doing, he removes his own temptation to **renege** on a promise or to forgive others' **transgressions**.

16 For example, Cortés burned his own ships upon his arrival in Mexico. He purposefully eliminated retreat as an option. Without ships to sail home, Cortés would either succeed in his conquest or **perish**. Although his soldiers were vastly outnumbered, this threat to fight to the death demoralized the opposition; it chose to retreat rather than fight such a determined opponent. Polaroid Corporation used a similar strategy when it purposefully refused to diversify out of the instant photography market. It was committed to a **life-or-death** battle against any intruder in the market. When Kodak entered the instant photography market, Polaroid put all its resources into the fight; fourteen years later, Polaroid won a nearly billion-dollar lawsuit against Kodak and regained its **monopoly** market.

17 Another way to make threats credible is to employ the adventuresome strategy of **brinkmanship**—deliberately creating a risk that if other players fail to act as one would like them to, the outcome will be bad for everyone. Introduced by Thomas Schelling in *The Strategy of Conflict*, brinkmanship "is the tactic of deliberately letting the situation get somewhat **out of hand**, just because its being out of hand may be intolerable to the other party and force his accommodation."

18 **Bargaining.** Two players decide how to split a pie. Each wants a larger share, and both prefer to achieve agreement sooner rather than later. When the two take turns making offers, the principle of looking ahead and reasoning back determines the equilibrium shares. Agreement is reached at once, but the cost of delay governs the shares. The player more impatient to reach agreement gets a smaller share.