科技英语丛书

English for General Biology

普通生物学专业英语

主编　周延清　陈晓春

中国科学技术大学出版社

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内 容 简 介

本书是作者根据生物学双语教学实践与科研中查阅、撰写生物学专业英语文章的经验体会写成的一部简明生物学专业英语教材，包括生物学专业知识与技术、科技英语翻译技巧和科技论文写作技巧三章内容。第一章分为13个单元，涵盖生物学介绍、生物化学、细胞生物学、分子生物学、细胞工程、动物学、植物学、微生物学、遗传学、生态学、基因工程、水产养殖学、生物信息学和基因组学方面的内容。各单元后都附有英汉对照词汇表和练习题，每隔两个单元有一次口语表达活动。第二章包括科技英语行文规范、习惯表达法、翻译原则和实例方面的内容。第三章包括科技论文的定义、类型、特点、基本格式和写作步骤与技巧方面的内容。书后附有习题答案、各单元选段的英译汉范例及主要参考文献。本书体现了生物学基础知识和新技术的统一性、可读性、实用性和指导性，突出科技英语写作特点，注重中英文翻译技巧与应用，图文并茂。

本书可作为高等院校本科生的生物学专业英语教材和非生物学专业学生的生物选修课教材，也可供生物学相关专业教师、研究生以及科研与管理人员参考使用。

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Preface

前 言

随着生命科学日新月异的发展以及不同民族、文化和语言之间交流的日益加深，我国高等教育呈现出国际化的发展趋势，促使高等院校开设专业双语教学课程，培养复合型科技和教育人才。2001 年，教育部在《关于加强高等学校本科教学工作提高教学质量的若干意见》中明确提出，高等学校要大力提倡编写、引进和使用先进教材，积极推动使用英语等外语进行教学。我国引进国外优秀生命科学教材进行生物学专业英语的双语教学工作的确能够让学生了解和借鉴国际先进的研究成果和技术，提高学生生物学专业英语阅读、会话、视听和写作等综合语言能力。但是，国外优秀生命科学教材内容很丰富且价格昂贵，有些内容不太符合我国高校教学和学生学习的实际需求，这就需要我们编写能满足我国不同层次大学教学的实际需求且适应师生英语水平的优秀双语教材。因此，我们撰写了《普通生物学专业英语》一书。

本书分为三章：第一章是生物学专业知识与技术，包括生物学介绍、生物大分子、细胞结构和功能、细胞分离、细胞培养与动物克隆、遗传信息传递及其调控、遗传规律与遗传病、动植物微生物及其应用、转基因食品及其生物安全性、生物多样性及其保护、水产养殖技术和应用、生物信息学和基因组学 13 个单元；第二章是科技英语翻译技巧，包括科技英语行文规范、习惯表达法、翻译原则和实例 3 个单元；第三章是专业科技论文写作技巧，包括科技论文的定义、类型、特点、基本格式和写作步骤与技巧 4 个单元。此外，该书附有习题答案、各单元选段的英译汉范例以及主要参考文献等内容。

本书由从事生物学双语教学的周延清教授和从事大学英语教学的陈晓春副教授负责撰写和统稿，中州大学王芳老师负责对附录、部分图片和文字等进行处理（约 3 万字）。

为了方便读者领会各单元的核心内容，每个单元前都添加了中文导语，且单元后都附有英汉对照词语；为了帮助读者深入理解、复习、掌握所学内容，每章或单元后面都设置了练习题；为了提高读者生物学专业英语阅读、会话、视听和写作等综

合语言能力，每隔两单元设计了一个语言表达实践活动。

本书的撰写与出版得到了教育部“‘普通生物学’国家级双语教学示范课程建设”项目和河南师范大学“生物学英汉双语课程建设与实践”教改项目的资助，得到了中国科学技术大学出版社的支持以及河南师范大学生命科学学院师生员工的关心、支持与帮助。本书参考和使用了国外 *Essential Biology*、*Concepts in Biology*、*Gene Cloning and DNA Analysis* 和 *Ecology: Concepts & Applications* 等生命科学教材和国内一些文献资料以及网站上的文章和图表，在此一并表示衷心的感谢！

由于编者水平有限，书中若有不妥之处，敬请同行与读者批评指正。

编　者

2012 年 6 月

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Chapter 1 Reading Materials of Life Sciences

Unit 1 Introduction to Biology

导语 生物是自然界有生命的物质，具有非生命物质所不具有的代谢过程、生殖过程、对环境刺激反应的过程、生长发育、遗传和变异等特征，可分为动物、植物和微生物三大类群。生物学是研究生物的科学，可分为动物学、植物学和微生物学及其多种分支学科。学习和掌握生物学知识、原理和技术有利于我们认识生命现象和规律，分析和解决生物学相关问题，造福于人类。

本单元主要介绍生物学在人类生活中的意义，生命特征，生物学的发展史、学科趋势、领军人物、基本概念等。

1.1 The Significance of Biology in Human Life

Maybe you have heard of the following questions: How does a single cell become a new plant? Can agriculture be revolutionized? How do computer monitors, cell phones, and microwave ovens affect us? Is DNA testing reliable enough to be admitted as evidence in court cases? What pills can be developed by people to control a person's weight? Can scientists manipulate our genes to control certain genetic disease such as red-green blindness? Are human activities really causing the world to get warmer and result in increased incidence of skin cancer? Will people develop a vaccine for AIDS in the near future? Will new, inexpensive, socially acceptable methods of birth control be developed that can slow world population growth? These questions and many others have biological basis. Biology has an enormous impact on our everyday life, and people can not understand many important issues without a basic understanding of life science. It is no wonder that biology is daily news. Whatever your reasons for taking this course is, even if only to meet your colleges' requirement, you will soon discover that this is the best time ever to study biology.

1.2 The History of Biology

Biology is the science of life. Specifically, biology is a science that deals with living things and how they interact with their surroundings. Biology is both an old and a vast science that gets bigger every year because of the great discovery explosion.

The history of biology traces back to the study of the living world from ancient to modern times. Our earliest recorded biology comes from the ancient Greeks, but even prehistoric man left beautiful drawings of animals behind in his caves, which seemingly indicate that man has a sensitive awareness of proportion, anatomy and motion. When man existed principally as a hunter, he practiced biology of a sort as he sought out his food, for he had to know the ways of the hunted animal, the ways of those animals that would prey upon him, and the sources of edible plants. When he turned from nomad life to a more stable, agricultural existence, he had to have a greater knowledge of plants and animals before he could domesticate them sufficiently well to provide himself with a ready sources of food. And as he domesticated them, they domesticate him, for he had to adapt himself to their ways of life, and to adapt them to his own. It is from these early beginnings that biology had its start.

Although the concept of biology as a single coherent field arose in the 19th century, the biological sciences emerged from traditions of medicine and natural history in the ancient Greco-Roman world. This ancient work was further developed in the Middle Ages by Muslim physicians and scholars. During the European Renaissance and early modern period, biological thought was revolutionized in Europe by a renewed interest in empiricism and the discovery of many novel organisms. Prominent in this movement were Vesalius and Harvey, who used experimentation and careful observation in physiology, and naturalists such as Linnaeus and Buffon who began to classify the diversity of life and the fossil record, as well as the development and behavior of organisms. Microscopy revealed the previously unknown world of microorganisms, laying the groundwork for cell theory. The growing importance of natural theology, partly a response to the rise of mechanical philosophy, encouraged the growth of natural history. Over the 18th and 19th centuries, biological sciences such as botany and zoology became increasingly professional scientific disciplines. Naturalists such as Alexander von Humboldt investigated the interaction between organisms and their environments, and the ways this relationship depends on geography—laying the foundations for biogeography, ecology and ethology. Naturalists began to reject essentialism and consider the importance of extinction and the mutability of species. Cell theory provided a new perspective on the fundamental basis of life. These developments, as well as the results from embryology and paleontology, were synthesized in Charles Darwin's theory of evolution by natural selection. The end of the 19th century saw the fall of spontaneous generation and the rise of the germ theory of disease, though the mechanism of inheritance remained a mystery.

In the early 20th century, the rediscovery of Mendel's work led to the rapid development of genetics by Thomas Hunt Morgan and his students, and by the 1930s the combination of population genetics and natural selection in the "neo-Darwinian synthesis". New disciplines developed rapidly, especially after Watson and Crick proposed the structure of DNA. Following the establishment of the Central Dogma and the cracking of the genetic code, biology was largely split between organismal biology—the fields that deal with whole organisms and groups of organisms—and the fields related to cellular and molecular biology. By the late 20th century, new fields like genomics and proteomics were reversing this trend, with organismal biologists using molecular techniques, and molecular and cell biologists investigating the interplay between genes and the environment, as well as the genetics of natural populations of organisms.

1.3 The Characteristics of Living Things

In nature, there are many different types of living things. Some can fly in the sky, some can swim in water, others can run or walk on land, still others can go through soil. However, they are all called living things. Why? For living things have special common abilities and structures or characteristics not typically found in non-living things: ① metabolism, ② reproduction, ③ responsive processes, ④ control processes, ⑤ a unique structural organization, ⑥ heredity and variation, and ⑦ growth and development. It is important to recognize that while these characteristics are typical of all living things, they may not necessarily all be present in each organism at every point in time. For example, some individuals may reproduce or grow only at certain times.

1.3.1 Metabolism

Metabolism is the set of chemical reactions that happen in the cells of living organisms to sustain life. These processes allow organisms to grow and reproduce, maintain their structures, and respond to their environments, and many other activities, and are controlled and sequenced. Metabolism is usually divided into two types: catabolism and anabolism. The former breaks down organic matter to provide energy and smaller molecules in cellular respiration, while the latter uses energy and smaller molecules to construct certain biomacromolecules including proteins and nucleic acids in cells. There are three essential aspects of metabolism: ① nutrient uptake, ② nutrient processing, and ③ waste elimination. All organisms expend energy to take in nutrients into their cells from their environment to maintain their lives, for example, many animals take them in by eating other organisms. Once inside, nutrients enter a network of chemical reactions. These reactions manipulate nutrients in order to manufacture new parts, make repairs, reproduce. and provide energy for essential activities. However, not all materials entering a living thing are valuable to it. There may be portions of nutrients that are useless or even harmful. Organisms eliminate these portions as waste. These metabolic processes also produce unusable heat energy, which may be considered a waste product.

1.3.2 Reproduction

Reproduction, a fundamental feature of all known life, is the biological process by which new "offspring" individual organisms are produced from their "parents". All over of the world, every individual organism exists as the result of reproduction. Growth and reproduction are directly related to metabolism because neither can occur without gaining and processing nutrients. Since all organisms eventually die, life would cease to exist without reproduction. In general, there are two different ways that various kinds of organisms reproduce and guarantee their continued existence. Some kinds of living things reproduce by sexual reproduction in which two individuals contribute to the creation of a unique, new organism. A sexual reproduction occurs when an individual organism makes identical copies of itself.

1.3.3 Responsive Processes

Organisms also respond to changes within their bodies and in their surroundings in a meaningful way. These responsive processes have been organized into three categories: irritability, individual adaptation, and adaptation of populations, which is also known as evolution.

Irritability is an individual's ability to recognize a stimulus and rapidly respond to it, such as your response to a loud noise, beautiful sunset, or noxious odor. The response occurs only in the individual receiving the stimulus and the reaction is rapid because the structures and processes that cause the response to occur (i.e., muscles, bones, and nerves) are already in place.

Individual adaptation also results from an individual's reaction to a stimulus but is slower because it requires growth or some other fundamental change in an organism. For example, when the days are getting shorter, a weasel responds such that its fur color will change from its brown summer coat to its white winter coat—genes responsible for the production of brown pigment are "turned off" and new white hair grows. Similarly, the response of our body to disease organisms requires a change in the way cells work to attack and eventually destroy the disease-causing organisms. Or the body responds to lower oxygen levels by producing more red blood cells, which carry oxygen. This is why athletes like to train at high elevations. Their ability to transport oxygen to muscles is improved by the increased number of red blood cells.

Evolution involves changes in the kinds of characteristics displayed by individuals within the population. It is a slow change in the genetic makeup of a population of organisms over generations. This process occurs over long periods of time and enables a species to adapt and better survive long-term changes in its environment over many generations. For example, the development of structures that enable birds to fly long distances, allow them to respond to a world in which the winter season presents severe conditions that would threaten survival. Similarly, the development of the human brain and the ability to reason allowed our ancestors to craft and use tools. The use of tools allowed them to survive and be successful in a great variety of environmental conditions.

1. 3. 4 Control Processes

Control processes are mechanisms that ensure an organism will carry out all metabolic activities in the proper sequence (coordination) and at the proper rate (regulation). All the chemical reactions of an organism are coordinated and linked together in specific pathways. The orchestration of all the reactions ensures that there will be specific stepwise handling of the nutrients needed to maintain life. The molecules responsible for coordinating these reactions are known as enzymes that are able to increase and control the rate at which life's chemical reactions occur, and that regulate the amount of nutrients processed into other forms. The physical activities of organisms are coordinated. When an insect walks. the activities of the muscles of its six legs are coordinated so that an orderly movement results.

Many of the internal activities of organisms are interrelated and coordinated so that a constant internal environment is maintained. This constant internal environment is called homeostasis. For example, when we begin to exercise, we use up oxygen more rapidly. So the amount of oxygen in the blood falls. In order to maintain a "constant internal environment", the body must obtain more oxygen. This involves more rapid contractions of the muscles that cause breathing and a more rapid and forceful pumping of the heart to get blood to the lungs. These activities must occur together at the right time and at the correct rate, and when they do, the level of oxygen in the blood will remain normal while supporting the additional muscular activity.

1. 3. 5 Unique Structural Organization

Living things also share basic structural similarities. All living things are made up of structural units called cells. Cells have an outer limiting membrane and several kinds of internal structures. Each structure has specific functions. Some living things, like you, consist of trillions of cells while others such as bacteria or yeasts, consist of only one cell. Any unit that is capable of functioning independently is called an organism, whether it consists of a single cell or complex groups of interacting cells. Nonliving materials, such as rocks, water, or gases, do not share a structurally complex common subunit.

1.3.6 Heredity and Variation

The genetic information of each organism is segregated within it and passed from it to its offsprings. This is why offsprings are similar to their parents. However, genetic information does vary somewhat because of crossover and recombination, so there are some dissimilarities between parents and their offsprings.

1.4 The Importance of Biology

We owe our current high standard of living to biological advances in several areas:

(1) Food production. Plant and animal breeders have developed organisms that provide better sources of food than the original varieties. Improvements in yield have been brought about in plants and animals. The improvements in the plants, along with changed farming practices, have led to greatly increased production of food. Animal breeders also have had great successes. The pig, chicken, and cow of today are much different animals from those available even 100 years ago. Chickens lay more eggs, dairy cows give more milk, and beef cattle grow faster. All of these improvements raise our standard of living. One interesting example is the change in the kinds of pigs that are raised. At one time, farmers wanted pigs that were fatty. The fat could be made into lard, soap, and a variety of other useful products. As the demand for the fat products of pigs declined, animal breeders developed pigs that gave a high yield of meat and relatively little fat.

(2) Disease control. There has been fantastic progress in the area of health and disease control. Many diseases, such as polio, whooping cough, measles, and mumps, can be easily controlled by vaccinations. The understanding of how the human body works has led to treatments that can control such diseases as diabetes, high blood pressure, and even some kinds of cancer. Paradoxically, these advances contribute to a major biological problem: the increasing size of the human population.

(3) One of the newest applications of biology is the development of techniques for artificially transferring genes from one organism to another, used for producing

certain medicinal drugs, increasing crop productivity and curing certain human diseases.

(4) Perhaps, the most important application of biology is to help us understand and respond to the environmental problems, for example, global changes in weather and climate, and find the solution to them.

1.5 Future Direcitons in Biology

Although biology has made major advances, many problems remain to be solved. For example, scientists are seeking major advances in the control of the human population and there is a continued interest in the development of more efficient methods of producing food. Some areas that will receive much attention in the future are as follows:

(1) The relationship between genetic information and such diseases as Alzheimer's disease, stroke, arthritis, and cancer. These and many other diseases are caused by abnormal body chemistry, which is the result of hereditary characteristics. Curing certain hereditary diseases is a big job. It requires a thorough understanding of genetics and the manipulation of hereditary information in all of the trillions of cells of the organism.

(2) Ecology. Climate change, destruction of natural ecosystems to feed a rapidly increasing human population, and pollution are all still severe problems. Most people need to learn that some environmental changes may be acceptable and that other changes will ultimately lead to our destruction. We have two tasks. The first is to improve technology and increase our understanding about how things work in our biological world. The second, and probably the more difficult, is to educate, pressure, and remind people that their actions determine the kind of world in which the next generation will live.

(3) Unity of analysis and summary. Comprehensively investigate gene, molecules and cells and how they interact to form complex life system.

(4) Multi-disciplines cross and fusion.

(5) Further elucidation of essence of life.

(6) Unity of basic research and applied research.

In addition, biologists should also make suggestions to politicians and other policy makers about which courses of action are the most logical from a scientific