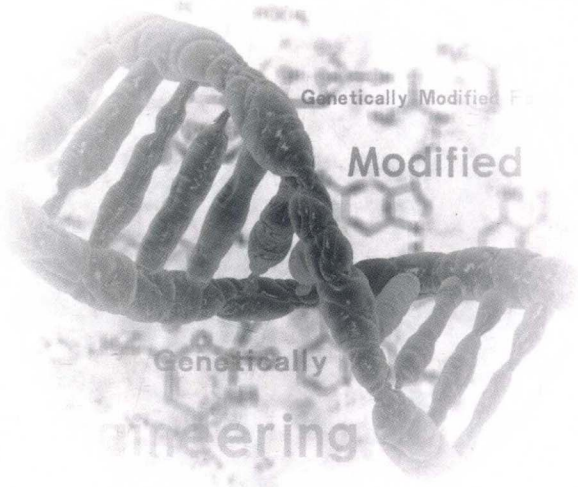
国家双语教学示范课程配套教材

生命科学核心课程系列教材

# 生物学专业英语

## Biology-Related English

周延清　陈晓春　主　编

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周延清　陈晓春　主　编
段艳红　王　芳　副主编

科学出版社
北　京

## 内 容 简 介

本书根据作者在普通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编写而成，包括生物学专业知识与技术、科技英语翻译技巧和专业科技论文写作技巧三篇。第一篇涵盖生物学概论、植物学、动物学、微生物学、遗传学、细胞生物学、细胞工程与克隆、发酵工程、生物化学、酶工程、分子生物学、基因工程和转基因食品、基因组学、生物信息学、系统生物学和生态学方面的内容，分为 16 个单元。每个单元后附英汉对照词语和练习题，每隔两个单元有一次口语表达活动。第二篇包括科技英语行文常规、习惯表达法、翻译原则和实例。第三篇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。附录有习题答案、每个单元选段的英译汉范例等内容。本书基于最新生物学研究成果、文献资料和教学实践编写而成，其具有科学性、可操作性、示范性、实用性、综合性、广泛性、生物学基础知识和新技术的统一性及可读性等特点。本书突出了科技英语的写作特点，注重中英文翻译技巧与应用，加强了口语表达技巧训练。

本书可供高等院校生物学专业英语课学习使用和非生物学专业的生物选修课学习使用，也可供生物学相关专业教师、研究生及研究与管理人员参考使用。

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# 前言（PREFACE）

世界上，有勤劳、勇敢、智慧和发明创造的人类；有很多人类肉眼难以看到的微生物；有给我们提供营养、能量和氧气的绿色植物；有能在地上跑、会在空中飞、善在水中游的各种动物。这些构成了五彩斑斓、神奇奥秘和充满勃勃生机的生物世界。研究诸多生物的生命科学及其产业深刻影响着人类社会的政治、经济、科技、文化、生态环境、能源和发展，以及人类自身的健康等，已经成为当今充满希望和发展前途的科技领域。生命科学及其产业的迅猛发展要求我国高等教育培养越来越多的优秀复合型人才。为此，我国教育部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。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。而且国外优秀生命科学教材内容很丰富，但价格昂贵，有些内容不太符合我国高校教学和学生学习的实际，需要我们编写符合我国不同层次大学教学实际和师生英语水平实际的优秀双语书。因此，我们撰写并且出版了《生物学专业英语》一书。

本书包括三篇内容。第一篇生物学专业知识与技术，包括生物学概论、植物学、动物学、微生物学、遗传学、细胞生物学、细胞工程与克隆、发酵工程、生物化学、酶工程、分子生物学、基因工程和转基因食品、基因组学、生物信息学、系统生物学和生态学 16 个单元。每个单元的内容为 Brief introduction、English passages selected from original English articles、New Words and Explanations、Analyses of complex and long sentences、Exercises 和 References 等部分，其中最新原版英语文献节选内容的比例相当大；主要参考文献直接放在单元后。第二篇科技英语翻译技巧包括科技英语行文常规、习惯表达法、翻译原则和实例。第三篇专业科技论文写作技巧涉及科技论文的定义、类型、特点、基本格式和写作步骤与技巧。为了帮助读者深入理解、复习、掌握所学内容，每篇或单元后有练习题，在附录中有习题参考答案；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，每隔两单元设计一个语言表达实践活动。

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，新乡学院段艳红和中州大学王芳老师参加部分内容的编写、附录制作、部分图片和文字处理等工作。后 3 人编写字数依次为 10 万字、10 万字和 5 万字。

本书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，得到了科学出版社的支持，得到了河南师范大学生命科学学院师生的关心、支持与帮助，参考和使用了国外 *Essential Biology*、

*Concepts in Biology*、*Gene Cloning and DNA Analysis* 和 *Ecology:Concepts & Applications* 等生命科学类图书和国内一些文献资料，以及百度、谷歌、http://isiknowledge.com、http://www.engineeringvillage.com/ 和 http://en.wikipedia.org 等网站上的文字、文章和图表及一些作者的英文文献，在此一并表示衷心的感谢！

由于编者水平有限，书中不妥之处在所难免，敬请同行与读者批评指正。

编　者

2015 年 10 月于河南师范大学

# 目录 CONTENTS

# Chapter 1

# SPECIAL KNOWLEDGE AND TECHNOLOGIES OF LIFE SCIENCES

# 生物学专业知识与技术

## Unit 1 Biology Overview 生物学概论

### 1. Brief Introduction

In nature, there are billions of things including living things and non-living things. In addition, there are two words, synonymous with living thing, such as organism and creature. An organism or creature is any living thing such as any animal, plant, fungus, or microorganism.In terms of living things, there are many different groups. Some can not be seen with naked eyes of human beings, for example, bacteria and viruses, while others can be seen with them, for instance, many plants and animals; Some are motile, for example, many animals, while others are non-or-limitedly motile, for instance, plants. As for animals, some can fly in the sky, some can swim in water, others can run or walk on land, still others can live in soil. However, they are all called living things. Why? For living things have some common abilities and characteristics not typically found in non-living things.

### 1.1 The characteristics of living things

The characteristics of living things are as follows metabolism, responses, growth, development, reproduction, heredity and variation and so on. It is important to recognize that while these characteristics are typical of all living things, they may not necessarily all be present in each living thing at every point in time. For example, some individuals may reproduce or grow only at certain times.

#### 1.1.1 Metabolism

Living things often take in energy by metabolism. Metabolism is the set of chemical reactions

that happen between living things and their environments,and in the cells of living things to sustain life. These processes allow organisms to grow and reproduce, maintain their structures, and respond to their environments, and do 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 carbohydrates, etc. in cells (Figure 1-1). There are three essential aspects of metabolism: ①nutrient uptake, ②nutrient processing, ③waste elimination. All organisms expend energy to take in nutrients into their cells from their environments 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.

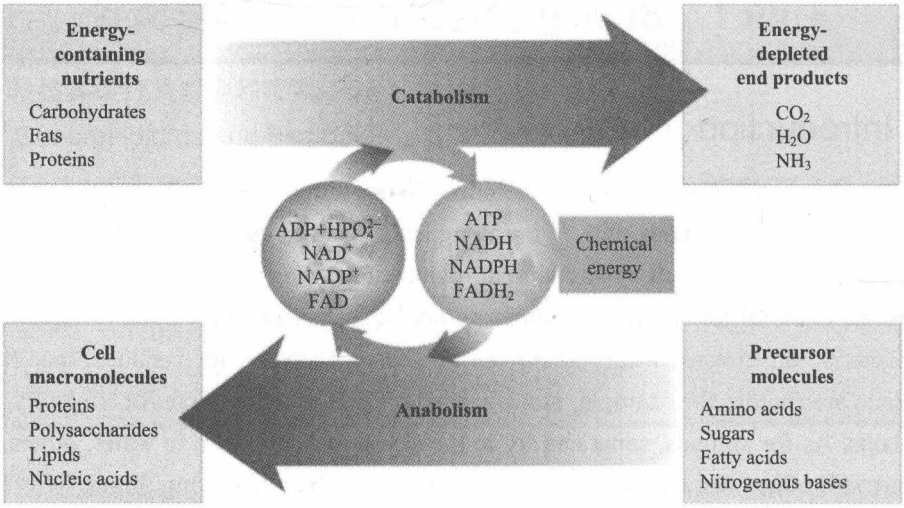


Figure 1-1 Metabolism summary (from http://www. doc88. com/p-184434125407. html)

### 1.1.2 Reproduction

Reproduction 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. Generally, 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 (Figure 1-2). Asexual reproduction occurs when an individual organism makes identical copies of itself (Figure 1-3).

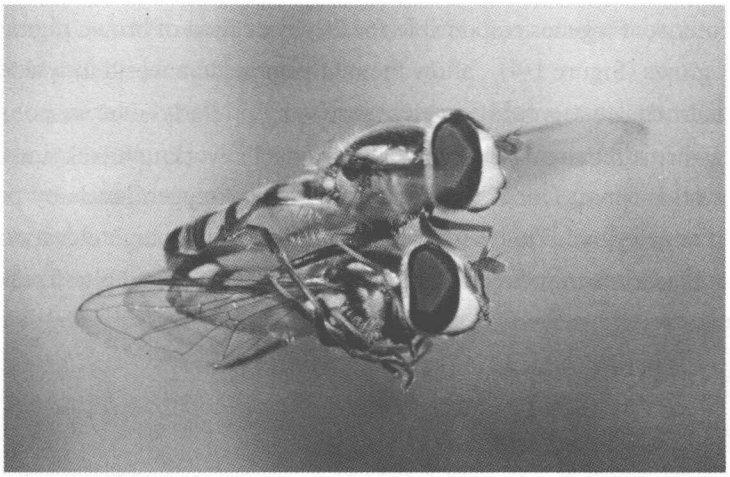

Figure 1-2 Hoverflies mating in midair flight (from http://en.wikipedia.org/wiki/Hoverfly)

Figure 1-3 Production of new individuals along a leaf margin of the air plant (*Kalanchoe pinnata*) (from http://en.wikipedia.org/wiki/File:Kalanchoe_veg.jpg)

### 1.1.3 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 (Figure 1-4), allow them to respond to a world in which the winter season presents severe conditions that would threaten survival. Similarly, the response of our body to disease-causing organisms requires a change in the way cells work to attack and eventually destroy the disease-causing organisms. Our bodies respond 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.

Figure 1-4 Weasel adaptation by which its fur color will change from its brown summer coat (Left) to its white winter coat (Right)

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 period 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. 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.

### 1.1.4 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. For example,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 do exercises, 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.

### 1.1.5 Unique structural organization

Living things also share basic structural similarities. Most 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. However,a few types of living things such as viruses and viroids do not consist of any cell but molecules. Nonliving materials, such as rocks, water, or gases, do not share a structurally complex common subunit.

### 1.1.6 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 (heredity). However, genetic information does vary somewhat because of its crossover and recombination, so there are some dissimilarities between parents and their offsprings (variations)(Figure 1-5).

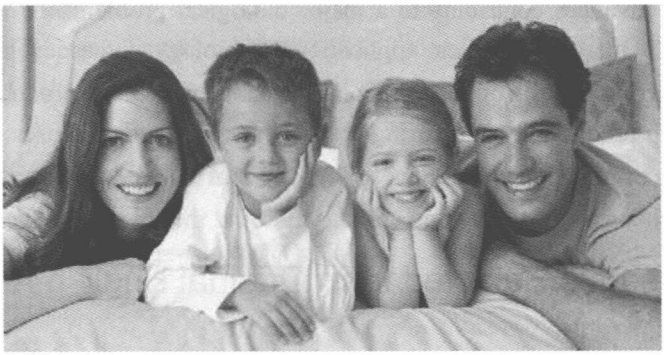

Figure 1-5 Heredity and variation between parents and children (from http://image.baidu.com/search/index? tn=saiduimage &ipn=r&ct=201326592&cl=2&fm= searchdetail&lm= -1&st=-1&sf=2&fmq=1438163631078_R&pv=&ic=0&nc=1&z=&se=&showtab=0&fb=0&width=&height=&face=0&istype=2&ie=utf-8&word=%E9%81%97%E4%BC%A0)

### 1.2 What is biology?

Broadly speaking, 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 an old, a vast and ever-developing science that gets bigger every year because of the great discovery explosion. Biology is so vast that it is subdivided into many different subjects such as taxonomy, botany, zoology, microbiology, virology, physiology, ecology, cell biology, biochemistry, biotechnology, evolution, genetics, molecular biology, genomics, transcriptomics, proteomics, metabolomics, systems biology and so on.

### 1.3 The significance of biology

Biology is very important for our lives and health. We owe our current high standard of living to biological advances in several areas: ①Food 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. ②Disease 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. ③One 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 Fenetic diseases. ④Perhaps, 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.

## 2. English Passages Selected from Original English Articles

### 2.1 Responses of bacteria to high pressure processing treatment

High pressure processing (HPP) treatment is an emerging food preservation method able to meet not only the increasing consumer demand for microbiologically safe foods, but also to produce foods with fresh-like appearance and with minimal modification of nutritional and organoleptic

properties. HPP treatments of food are carried out with intense pressure (commercially ranging from 100 to 600 MPa) with or without heat, inactivating efficiently microorganisms and, consequently, extending food products shelf-life. The susceptibility of microorganisms to high hydrostatic pressure varies considerably depending on the pressure range applied, temperature and duration of the treatment, but also depends on each microorganism characteristics, growth phase and suspending medium. It is generally assumed that Gram-positive bacteria and cells in the stationary growth phase are more resistant than Gram-negative and cells in the exponential growth phase (Baptista et al.,2015).

### 2.2 Genes regulation of plant response to iron-deficiency

Iron (Fe) is an essential element for plant growth and development. Iron deficiency results in abnormal metabolisms from respiration to photosynthesis such as imbalanced redox reaction, abnormal respiration and photosynthesis, and altered root architecture. When plants encounter iron limitation, they may trigger various strategies to improve iron mobilization in soil and uptake into plants. Iron abundance in plant tissues is regulated through uptake, translocation and recycling. Exploration of Fe-deficient responsive genes and their networks is critically important to understand molecular mechanisms leading to the plant adaptation to soil Fe-limitation. Co-expression genes are a cluster of genes that have a similar expression pattern to execute relatively biological functions at a stage of development or under a certain environmental condition.They may share a common regulatory mechanism. Further characterization of these Fe-deficient responsive genes will provide insights into the biological functions and interaction of genes under iron-deficiency and help in the understanding of the mechanism for plant adaptation to iron limitation(Li et al.,2015) .

## 3. New Words and Explanations

(1) taxonomy [tæk'sɒnəmi] n.生物分类，分类系统
(2) hydrostatic [ˌhaidrə'stætik] adj.流体净水力学的
(3) photosynthesis [fəutəu'sinθəsis] n.光合作用
(4) organoleptic [ˌɔ:gənəu'leptik] adj.器官感觉的
(5) metabolism [mə'tæbəlizəm] n.新陈代谢
(6) polio ['pəuliəu] n.骨髓灰质炎，小儿麻痹症
(7) stationary growth phase ['steiʃənri ɡrəuθ feiz] pl.静止生长期
(8) homeostasis [həumiə'steisis] n.内环境稳定
(9) exponential [ˌekspə'nenʃl] adj.指数的
(10) yeast [ji:st] n.酵母，发酵物
(11) Gram-positive adj.革兰氏阳性的
(12) mumps [mʌmps] n.腮腺炎
(13) vaccination [væksi'neiʃn] n.接种疫苗，种痘，牛痘疤
(14) redox ['redɔks] reaction pl.氧化还原反应
(15) pigment ['pigmənt] n.色素，颜料

(16) hereditary [hə'reditri] adj.遗传的；世袭的，承袭的
(17) arthritis [a:'θraitis] n.关节炎
(18) membrane ['membrein] n.膜，隔膜
(19) measles ['mi:zlz] n.麻疹
(20) shelf-life n.保质期，货架寿命

## 4. Analyses of Complex and Long Sentences

(1) 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.

**解析**：本句旨在说明酶分子在调节生物体内代谢过程中发生的化学反应。形容词性短语 responsible for coordinating these reactions 修饰主语 The molecules，动名词短语 coordinating these reactions 作介词 for 的宾语；两个 that 从句修饰介词宾语 enzymes，which 从句修饰 the rate；过去分词短语 processed into other forms 后置，作定语，修饰 nutrients。

**译文**：调节(生物体内代谢) 反应的分子称作酶，酶能够提高和调控化学反应的速率，能够调控营养物转化成其他形式物质的数量。

(2) High pressure processing (HPP) treatment is an emerging food preservation method able to meet not only the increasing consumer demand for microbiologically safe foods, but also to produce foods with fresh-like appearance and with minimal modification of nutritional and organoleptic properties.

**解析**：本句旨在说明新兴保鲜方法——高压加工处理的优点。形容词短语 able to meet…修饰表语 method，not only…but also…词组连接两个动词不定式；两个动名词 emerging 和 increasing 作定语；形容词 like 意为像……一样，作副词，与 fresh 形成一个复合形容词，意为像新鲜的一样；两个 with 短语修饰宾语 foods；microbiologically safe foods 短语作介词 for 的宾语，其中副词 microbiologically 修饰形容词 safe；两个形容词 nutritional 和 organoleptic 修饰名词 properties。

**译文**：高压加工处理方法是一种新兴的方法。该方法既能够满足消费者对微生物安全食品越来越高的要求，又能够生产外观新鲜、营养(成分)变化最小、感官特性改变最小的食品。

## 5. Exercises

### 5.1 Translate the following English into Chinese

(1) Broadly, biology is the study of living things. Specifically, it is a science that deals with living things and how they interact with their surroundings.

(2) Living things show several characteristics that nonliving things do not display: metabolism, reproduction, response, control, unique structural organization and so on.

(3) The response of our body to disease-causing organisms requires a change in the way by which cells work to attack and eventually destroy them.