

# ENGLISH FOR BIOLOGY STUDENTS

SECOND EDITION

## 生物专业英语 第2版

□ 蒋 悟 生



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**ENGLISH**  
**FOR**  
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# 前言

21 世纪是生命科学飞速发展的世纪,新知识、新方法、新概念不断涌现。为了更好地学习和运用专业科学知识,借鉴国际间的研究成果,从事具有创新性的科学研究,同时开展国际间的科技交流与合作,编者根据高等教育大力培养创业和创新人才的需要,编写了这本教材,奉献给广大读者。

本教材共 15 课,1~10 课由课文、课后练习、补充资料、阅读理解和阅读材料 5 部分组成,11~15 课由课文、补充资料和阅读材料组成。书后附有练习答案和主要词汇。教材内容涉及细胞生物学、遗传学、动物学、植物学、微生物学、生态学、分子生物学、物种起源与进化、生物信息学等,依专业词汇的难易程度和词汇重复率编排顺序。

本教材的特点在于:① 注重专业词汇的积累。目前大学生、研究生都具有大学英语四、六级的水平,并已掌握了基本的英语语法,但他们在阅读生物专业英文书刊时仍感到异常费力。其主要原因为学生除了自身专业知识面较窄外,更重要的是他们对专业词汇了解甚少。书刊中专业词汇重复率的高低直接影响到阅读理解的速度及阅读兴趣。因此,编者在编写时注意文章中专业词汇的重复性。首先把课文中最初出现的重要的生物学词汇以黑体标注,依次在注释中对词汇或短语加注国际音标,并用中英文加以注释,最后在书后附有词汇表,便于学生自学。每课阅读材料中提供了与课文相应的内容和课后练习,帮助学生巩固、加深对课文的理解和专业词汇的记忆。② 注重专业阅读、检索、写作能力的提高。阅读专业英文书刊的能力、科技文献检索能力及撰写技术报告、学位论文、研究论文等写作能力是保证学生未来在各自研究领域成功地进行高水平科学研究的关键。本书在这些方面为读者提供了学习和实践环境。在补充材料内容的选择上,编者有意挑选科技写作和情报学方面(如《生物学文摘》(Biological Abstracts《BA》)、《化学文摘》(Chemical Abstracts《CA》)、《科学引文索引》(Science Citation Index《SCI》)的检索与利用)的资料,试图通过这些内容扩大学生的科技写作和文献检索知识。③ 选材具有实用性、可读性和趣味性。本书所选材料力图提高学生学习的兴趣,帮助他们尽快掌握专业英语书刊的阅读技巧、了解文献检索及写作知识。④ 内容涉及面广,难易适度。本教材力求反映现代生物学的发展趋势,取材新颖。内容取材于国外原版教材、专业学术期刊、Internet 网上资源等。

本书可作为高等学校生物专业英语教材,也可作为相关专业研究生和从事生物学、农学、林学等研究领域的科学工作者的参考书及参加 TOEFL 或 GRE 考试学生的考前阅读材料。

本书第 2 版在第 1 版的基础上更新了部分较为陈旧的阅读材料,增加了文献数据库检索、网上资源检索等资料,以满足读者的需要。

本书取材于下列文献: Tissue Culture in Forestry (Eds. Bonga, J. M. and Durzan, D. J., 1982); Concepts Biology (Eds. Enger, E. D., *et al.*, 1991); Study Guide to Accompany Essentials of Biology (Ed. Hopson, J. L., 1990); Molecular Biology and Biotechnology: Comprehensive Desk Reference (Eds. McFadden, J. and Stoker, N., 1995); Molecular Cell Biology (Eds. Lodish H., *et al.*, 1995); A Dictionary of the Environment (Ed. Allaby, M., 1977); Dictionary of Life Sciences (Ed. Martin, E. A., 1983); Biology: Bringing Science to Life (Eds. Postlethwait, J. H., Hopson, J. L. and Veres, R. C., 1991); Life: The Science of Biology (Eds. Purves, W. K. and Gordon, H., 1983); Understanding Biology (Eds. Raven, P. H. and Johnson, G. B., 1988); Biology: A Human Emphasis (Ed. Starr, C., 1994); Writing up Research: Experimental Research Report Writing for Students of English (Eds. Weissberg, R. and Buker, S., 1990); Short-cut to High Marks (Eds. Wang Jing and Men Shengdong, 1999); Plant Cytogenetics (Ed. Singh, R. J., 1993); The ISI Web of Knowledge<sup>sm</sup> Platform: Current and Future Directions (Szigeti, H., 2001); Microbiology (Eds. Prescott, L. M., Harley, J., Klein, D. A., 2002); <http://www.nature.com>; <http://www.isinet.com>。编者向他们表示最诚挚的谢意。

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本书虽经作者努力, 但错误、缺点在所难免, 衷心希望广大读者批评指正。

蒋悟生

2004 年 12 月于天津

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# Lesson One

## Inside the Living Cell: Structure and Function of Internal Cell Parts

### 1. Cytoplasm: The Dynamic, Mobile Factory

Most of the properties we associate with life are properties of the **cytoplasm**. Much of the mass of a cell consists of this semifluid substance, which is bounded on the outside by the plasma membrane. Organelles are suspended within it, supported by the filamentous network of the **cytoskeleton**. Dissolved in the cytoplasmic fluid are nutrients, ions, soluble proteins, and other materials needed for cell functioning.

### 2. The Nucleus: Information Central

The eukaryotic cell **nucleus** is the largest organelle and houses the genetic material (DNA) on **chromosomes**. (In prokaryotes the hereditary material is found in the **nucleoid**.) The nucleus also contains one or two organelles—the **nucleoli**—that play a role in cell division. A pore-perforated sac called the **nuclear envelope** separates the nucleus and its contents from the cytoplasm. Small molecules can pass through the nuclear envelope, but larger molecules such as mRNA and ribosomes must enter and exit via the pores.

### 3. Organelles: Specialized Work Units

All eukaryotic cells contain most of the various kinds of organelles, and each organelle performs a specialized function in the cell. Organelles described in this section include ribosomes, the endoplasmic reticulum, the Golgi complex, vacuoles, lysosomes, mitochondria, and the plastids of plant cells.

The number of ribosomes within a cell may range from a few hundred to many thousands. This quantity reflects the fact that ribosomes are the sites at which amino acids are assembled into proteins for export or for use in cell processes. A complete ribosome is composed of one larger and one smaller subunit. During protein synthesis the two subunits move along a strand of mRNA, "reading" the genetic sequence coded in it and translating that sequence into protein. Several ribosomes may become attached to a single mRNA strand; such a combination is called a **polysome**. Most cellular proteins are manufactured on ribosomes in the cytoplasm. Exportable proteins and membrane proteins are usually made in association with the endoplasmic reticulum.

The **endoplasmic reticulum**, a lacy array of membranous sacs, tubules, and vesicles, may be either rough (RER) or smooth (SER). Both types play roles in the synthesis and transport of proteins. The RER, which is studded with polysomes, also seems to be the source of the nuclear envelope after a cell divides.

SER lacks polysomes; it is active in the synthesis of fats and steroids and in the oxidation of toxic substances in the cell. Both types of endoplasmic reticulum serve as compartments within the cell where specific products can be isolated and subsequently shunted to particular areas in or outside the cell.

Transport vesicles may carry exportable molecules from the endoplasmic reticulum to another membranous organelle, the **Golgi complex**. Within the Golgi complex molecules are modified and packaged for export out of the cell or for delivery elsewhere in the cytoplasm.

**Vacuoles** in cells appear to be hollow sacs but are actually filled with fluid and soluble molecules. The most prominent vacuoles appear in plant cells and serve as water reservoirs and storage sites for sugars and other molecules. Vacuoles in animal cells carry out **phagocytosis** (the intake of particulate matter) and **pinocytosis** (vacuolar drinking).

A subset of vacuoles is the organelles known as **lysosomes**, which contain digestive enzymes (packaged in lysosomes in the Golgi complex) that can break down most biological macromolecules. They act to digest food particles and to degrade damaged cell parts.

**Mitochondria** are the sites of energy-yielding chemical reactions in all cells. In addition, plant cells contain **plastids** that utilize light energy to manufacture carbohydrates in the process of photosynthesis. It is on the large surface area provided by the inner cristae of mitochondria that ATP-generating enzymes are located. Mitochondria are self-replicating, and probably they are the evolutionary descendants of what were once free-living prokaryotes.

There are two types of plastids: **leucoplasts**, which lack pigments and serve as storage sites for starch, proteins, and oils; and **chromoplasts**, which contain pigments. The most important chromoplasts are **chloroplasts**—organelles that contain the chlorophyll used in photosynthesis. The internal structure of chloroplasts includes stacks of membranes called **grana**, which are embedded, in a matrix called the **stroma**.

#### 4. The Cytoskeleton

All eukaryotic cells have a cytoskeleton, which is a convoluted latticework of filaments and tubules that appears to fill all available space in the cell and provides support for various other organelles. A large portion of the cytoskeleton consists of threadlike **microfilaments** composed mainly of the contractile protein **actin**. They are involved in many types of intracellular movements in plant and animal cells. A second protein, **myosin**, is involved in the contraction of muscle cells. Another main structural component of the cytoskeleton consists of **microtubules**, which are composed of the globular protein **tubulin** and together act as scaffolding that provides a stable cell shape. Cytoskeletal intermediate filaments appear to impart tensile strength to the cell cytoplasm. Mechanoenzymes such as myosin, **dynein**, and kinesin interact with the cytoskeletal filaments and tubules to generate forces that cause movements.

#### 5. Cellular Movements

Although the cytoskeleton provides some stability to cells, its microtubules and filaments and their associated proteins enable cells to move by creeping or gliding. Such movements require a solid substrate to which the cell can adhere and can be guided by the geometry of the surface. Some cells also exhibit

**chemotaxis**, the ability to move toward or away from the source of a diffusing chemical.

Certain eukaryotic cells can swim freely in liquid environments, propelled by whiplike **cilia** or **flagella**. Both cilia and flagella have the same internal structure: nine doublets (pairs of microtubules) are arranged in a ring and extend the length of the cilium or flagellum, and two more microtubules run down the center of the ring. Every cilium or flagellum grows only from the cell surface where a **basal body** is located. Movement is based on the activities of tiny dynein side arms that extend from one of the microtubules of each doublet.

Nutrients, proteins, and other materials within most plant cells are moved about via cytoplasmic streaming. The process occurs as myosin proteins attached to organelles push against microfilaments arrayed throughout the cell. Microfilaments and microtubules are responsible for almost all major cytoplasmic movements. During cell division, microtubules of the spindle— assembled from tubulin subunits near organelles called **centrioles**—move the chromosomes.

## Glossary

### **actin** ['æktin] 肌动蛋白

A globular contractile protein. In muscle cells, actin interacts with another protein, myosin, to bring about contraction.

### **basal body** ['beisl 'bɒdi] 基体

A body identical in structure to a centriole, found always at the base of a cilium or eukaryote flagellum.

### **centriole** ['sentriəul] 中心粒

An organelle located close to the nucleus in most animal and lower plant cells but absent from prokaryotes and higher plants.

### **chemotaxis** [,keiməu'tæksis] 趋化性

A locomotory movement of an organism or cell in response to, and directed by, an external directional stimulus.

### **chloroplast** ['klɔ(:)rəplæst] 叶绿体

A plastid in which photosynthesis is carried out. Chloroplasts occur in all photosynthetic organisms except photosynthetic bacteria and blue-green algae.

### **chromosome** ['krəʊməseəm] 染色体

A DNA-histone thread residing in the nucleus of a cell. Each chromosome possesses two te-

lomeres and a centromere, and some contain a nucleolus organizer. RNA proteins are invariably associated with the chromosome.

### **cilia** ['silie] 纤毛

Numerous short, hairlike structures projecting from the cell surface that enable locomotion.

### **cytoplasm** ['saitəplæzm] [细] 胞质

The living contents of a cell bounded externally by the plasmalemma, including an aqueous ground substance (hyaloplasm, cell sap, or cell matrix) containing organelles and various inclusions but excluding the nucleus and visible vacuoles.

### **cytoskeleton** [,saitəu'skelitən] 细胞骨架

Of eukaryotic cells, an internal "skeleton". Its microtubules and other components structurally support the cell, organize and move its internal components. The cytoskeleton also helps free-living cells move through their environment.

### **dynein** ['daine:n] 动力蛋白

A group of at least four distinct proteins found in the flagella and microtubules of eukaryotic cells and possessing ATPase activity.

## endoplasmic reticulum

[,endou'plæzmik ri'tikjuləm] 内质网

Folded membranes and tubes throughout the eukaryotic cell that provide a large surface upon which chemical activities take place.

**flagella** [flə'dʒelə] (单 **flagellum** [flə'dʒeləm])

鞭毛

Long, hairlike structures projecting from the cell surface that enable locomotion.

**Golgi complex** ['gɒldʒi 'kɒmpleks]

高尔基复合体

A stack of flattened, smooth, membranous sacs; the site of synthesis and packaging of certain molecules in eukaryotic cells.

**lysosome** ['laisəsəm] 溶酶体

A specialized organelle that holds a mixture of hydrolytic enzymes.

**microfilament** [,maikrə'filəmənt] 微丝, 纤丝

Long, fiberlike structures made of protein and found in cells, often in close association with the microtubules; provide structural support and enable movement.

**microtubule** [,maikrə'tju:bjul] 微管

Small, hollow tubes of protein that function throughout the cytoplasm to provide structural support and enable movement.

**mitochondrion** [,maɪtə'kɒndrɪən]

(复 **mitochondria** [,maɪtə'kɒndrɪə]) 线粒体

A membranous organelle resembling a small bag with a larger bag inside that is folded back on itself; serves as the site of aerobic cellular respiration.

**myosin** ['maɪəsɪn] 肌球蛋白

A protein that, with actin, constitutes the principal element of the contractile apparatus of muscle.

**nuclear envelope** ['nju:kliə 'envələup]

核膜, 核被膜

A double membrane (two lipid bilayers and associated proteins) that is the outermost portion

of a cell nucleus.

**nucleoid** ['nju:kliɔɪd] 拟核, 类核, 核质体

The DNA-containing area of a prokaryote cell, analogous to the eukaryote nucleus but not membrane bounded.

**nucleoli** [nju:'kli:əlai] (单 **nucleolus** [nju:'kli:ələs])

核仁

Nuclear structures composed of completed or partially completed ribosomes and the specific parts of chromosomes that contain the information for their construction.

**nucleus** ['nju:kliəs] (复 **nuclei** ['nju:kli,ai])

[细] 胞核, 神经核, 核

The organelle of the eukaryote cell that contains the chromosomes and hence ultimately controls cellular activity and inheritance through the activity of the genetic material, DNA.

**phagocytosis** [,fægəsai'təʊsɪs] 吞噬[作用]

The process by which the cell wraps around a particle and engulfs it.

**pinocytosis** [,paɪnɔsai'təʊsɪs]

胞饮[作用], 饮液作用

The process by which a cell engulfs some molecules dissolved in water.

**plastid** ['plæstɪd] 质体, 成形粒

An organelle present in all plants except bacteria, blue-green algae, and fungi; it is enclosed by two membranes (the envelope) and has various functions.

**polysome** ['pɒlɪsəm]

多核糖体, 多聚核糖体

Of protein synthesis, several ribosomes all translating the same messenger RNA molecule, one after the other.

**ribosome** ['raɪbəsəm] 核糖体, 核蛋白体

Small structures composed of two protein and ribonucleic acid subunits involved in the assembly of proteins from amino acids.

**stroma** ['strəʊmə] (复 **stromata** ['strəʊmətə])

子座, 基质

Region within a chloroplast that has no chlorophyll.

crotubules.

**tubulin** ['tju:bju:lɪn] 微管蛋白

**vacuole** ['vækjuəul] 液泡, 泡

A protein that is the major constituent of mi-

Storage container within the cytoplasm of a cell having a surrounding membrane.

## Exercises

### I. Key Terms: Matching

Match each term on the left with the most appropriate description on the right.

- |                   |  |
|-------------------|--|
| 1. polysome       | a. protein synthesis                       |
| 2. pinocytosis    | b. baglike structure                       |
| 3. exocytosis     | c. power generator                         |
| 4. plastid        | d. where flagella grow                     |
| 5. Golgi complex  | e. toward or away from a chemical stimulus |
| 6. flagella       | f. engulfment                              |
| 7. phagocytosis   | g. RNA and ribosomes                       |
| 8. lysosome       | h. weblike                                 |
| 9. basal body     | i. in plants only                          |
| 10. chemotactic   | j. control room                            |
| 11. nucleus       | k. expel                                   |
| 12. vacuole       | l. vacant                                  |
| 13. ribosome      | m. whiplike                                |
| 14. cytoskeleton  | n. cell drinking                           |
| 15. mitochondrion | o. packaging                               |

### II. True or False

1. — The DNA of prokaryotic cells is concentrated in the nucleus.
2. — Ribosomes are derived from the nucleoli.
3. — Unlike other cell membranes, the nuclear envelope has no pores.
4. — The smooth endoplasmic reticulum is held in place by the cytoskeleton.
5. — Structural proteins are exportable.
6. — The nuclear envelope is produced by the rough endoplasmic reticulum.
7. — Most cellular proteins are manufactured on ribosomes.
8. — White blood cells work by phagocytosis.
9. — Prokaryotic cells have microbodies.
10. — Mitochondria are self-replicating.
11. — Pinocytosis describes the intake of fluid into a cell by a vacuole.
12. — Both prokaryotic and eukaryotic cells have a supporting cytoskeleton.



13. — Carotenoids are colorless molecules.
14. — Grana are surrounded by stomata.

### III. Completion

1. Phagocytosis is a method of cell feeding that first requires that the food be \_\_\_\_\_.
2. The \_\_\_\_\_ packages some fifty hydrolytic enzymes in \_\_\_\_\_.
3. \_\_\_\_\_ are lysosome-like vesicles containing waste products. They are thought to be involved with cell \_\_\_\_\_.
4. Both \_\_\_\_\_ and \_\_\_\_\_ are thought to have arisen from endosymbiosis.
5. The cytoskeleton is composed of very fine \_\_\_\_\_, medium \_\_\_\_\_ and larger \_\_\_\_\_.
6. Creeping and gliding cell movements are usually \_\_\_\_\_-dependent.
7. \_\_\_\_\_ behavior is shown when a cell moves toward or away from a chemical substance.
8. Flagella grow from the cell surface only at the \_\_\_\_\_.

### IV. Multiple Choice

Finish each of the following sentences by circling the letter of the correct response.

1. Most of the properties associated with processes of life are properties of \_\_\_\_\_.
  - a. the nucleus
  - b. DNA
  - c. the cytoplasm
  - d. endosymbionts
  - e. none of the above
2. Ribosomes \_\_\_\_\_.
  - a. are organelles involved in protein synthesis
  - b. are the cell's main energy source
  - c. are storage sites for starch
  - d. are involved in the breakdown of proteins
  - e. store genetic information in the form of DNA
3. Smooth endoplasmic reticulum (SER) \_\_\_\_\_.
  - a. lacks ribosomes
  - b. is active in fat and steroid synthesis
  - c. is involved in the oxidation of toxins
  - d. all of the above
  - e. none of the above
4. Ribosomes are manufactured in \_\_\_\_\_.
  - a. cytoplasm
  - b. nucleoli
  - c. mitochondria
  - d. smooth endoplasmic reticulum
  - e. rough endoplasmic reticulum
5. Lysosomes contain \_\_\_\_\_.
  - a. hydrolytic enzymes
  - b. genetic material
  - c. stored fats
  - d. proteins
  - e. carbohydrates
6. The process of phagocytosis involves \_\_\_\_\_.
  - a. vacuolar engulfing of particulate matter
  - b. exocytosis
  - c. intake of water by a cell's vacuole
  - d. expulsion of particulate matter from a cell
  - e. expulsion of water from a cell
7. Transformation of energy and storage of energy in the cell are the main function of \_\_\_\_\_.
  - a. ribosomes
  - b. microbodies
  - c. contractile vacuoles