普通高等教育“十二五”精品课程建设教材

动物科学与动物医学

专业英语

SPECIALIZED ENGLISH FOR ANIMAL SCIENCE AND VETERINARY SCIENCE

于向春 肖书奇 刘拥军 ◉主编

中国农业大学出版社
ZHONGGUONONGYEDAXUE CHUBANSHE

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前　言

“动物科学与动物医学专业英语”是旨在提高动物科学和动物医学专业本科生科技英语水平的一门课程。本教材共28课，每课由课文、词汇（附音标）和短语、长难句解析以及课文参考译文几部分组成。

本教材从教学实际要求出发，反映和吸收了动物科学专业和动物医学专业学科领域的研究成果和前沿动态。课文内容涵盖了动物的起源和进化、解剖、遗传育种、繁殖、营养（包括牧草）以及动物免疫、动物疾病、分子遗传学在畜牧业中的应用等。通过学习本教材，可以引导学生逐渐了解英文科技文章的结构、特点和表达方式；熟悉动物科学与动物医学专业英语的基本内容、最新进展、扩大专业词汇量；了解如何撰写专业英语论文摘要等。

编审人员大多来自国家“985工程”或“211工程”高校的教学一线，具备扎实的理论功底和实践经验，因此保证了教材所选材料的全面性、系统性和适用性。

本书可以作为高等农业院校动物科学专业和动物医学专业的本科生系统学习专业英语的教材，也可以作为研究生专业英语学习的辅助材料。

本书的出版得到中西部高校提升综合实力建设项目资金、家畜遗传繁育系列课程国家级教学团队建设项目、家畜育种学国家级精品课程建设项目、海南大学2013年度自编教材资助项目（Hdzbjc1303）、2013年海南省高等学校教育教学课题（Hjjg2013-8）和海南大学2012年度校级教育教学研究课题（Hdjy1201）等的资助，在此表示诚挚的感谢。

限于编者的知识水平，错误和纰漏之处在所难免，敬请读者批评指正！

于向春

2014年3月于海南大学

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Lesson 1 Evolution and Extinction of Animals

Macroevolution

The evolution of the major groups of organisms is known as macroevolution, to distinguish it from the effects of variation, selection and speciation which collectively can be called microevolution, and the emergence of entirely new biological systems which is megaevolution (1). The essential features of microevolution are now well understood but the complex processes of macroevolution and megaevolution are still being researched. Many workers think that factors operating above the changes in life are well documented from fossil evidence but the methods by which entirely new biological systems emerge are not understood.

All macroevolution follows the acquisition of a new adaptation of the adoption of a new lifestyle. Within this new "life-zone" adaptive radiation takes place to produce many new species with diverging features. The new "life-zone" must be unoccupied by a strong competitor or the process of adaptive radiation cannot take place. Macroevolution involves sustained evolution trends. Certain characters tend to undergo progressive development so that organisms become more adapted to particular niches. Each adaptation limits the possibilities for future evolution.

Adaptive radiation within the new "life-zone" tends to produce specializations similar to those adopted by distantly related groups in similar habitats. This is convergent evolution. For example the cacti of the new world are very similar in morphology to the Euphorbiaceae of the old world.

An Example of an Evolution Trend

A classic example of macroevolution is provided by the horse family. The Eocene ancestor of equine was a doglike browsing creature with padded feet. As habitat conditions changed from lush vegetation that could be browsed, to a drier grassland which necessitated grazing and speed of flight from predators, natural selection altered the population(2). Evolutionary changes involved the progressive elongation of the legs and head, and a reduction in the number of toes.

Many variations on this common theme resulted from adaptive radiation within the "life-zone". Evolution in horses from the Eocene to the modern from demonstrates the progres-

sive, sustained development of the main features of the modern horse, *Equus*.

The Origin of New Biological Systems

The emergence of completely new biological types, such as vertebrates from invertebrate, is rare. Only a few major types of biological system have developed in the history of life but almost all of them survive. The origin of these is the most important of evolutionary events but it is the least understood. The main features of megaevolution are:

(a) The breakthrough from one biological system to another, such as from aquatic to terrestrial life, always follows evolutionary experimentation through adaptive radiation. One trend in evolution manages to adapt to an entirely new mode of life.

(b) In order to survive, the breakthroughs must always be rapid and devoid of competition.

(c) Major breakthroughs are followed by periods of adaptive radiation.

(d) Each geological era has been characterized by one dominant life-form. Major environmental changes induce extinctions and the evolution of new systems.

Extinction

Extinction is an integral part of evolution. As new species evolve, others less suited to the environment become extinct. The process of extinction has several basic characteristics:

(a) Extinction is most likely to occur when environments are changing. Those species which cannot tolerate new condition and which cannot adapt to them quickly enough will not survive(3).

(b) Extinction is most likely to occur in species with narrow tolerance limits. Organisms which become specialized for a particular mode of life lose the ability to adapt to changing conditions.

(c) Extinction is often preceded by the development of a relic community. The population of an endangered species becomes progressively smaller until only a few are left. These usually live in a habitat refuge that is, in a place where conditions are still suitable. If environmental conditions improved generally for the species, the relic population may spread out again.

(d) Extinction of species and genera is common. Few orders and classes have become extinct; almost all the phyla have survived from their time of origin to the present.

(e) Types of organisms in which speciation is rapid tend to have the greatest rates of species extinction. The turnover of birds and mammals is often much greater than that of plants.

The rate of extinction has been greatly accelerated by man activities. Industrial techniques and agricultural practices have destroyed habitats and natural food supplies and caused pollution. In the last 300 years, man has completely destroyed over 200 species and has brought another 300 to the verge of extinction. This increased rate of extinction threatens ecosystem stability.

Words and Expression

macroevolution [ˌmækrəuˌevəˈluːʃən] *n.* (动、植物的)宏(观)进化,种外进化,大进化
speciation [ˌspiːʃiˈeiʃən] *n.* 物种形成
microevolution [ˈmaikrəuˌiːvəˈluːʃən] *n.* 微(观)进化
megaevolution [ˌmegəivəˈluːʃən] *n.* 巨进化,种外进化
fossil [ˈfɒsl] *n.* 化石
acquisition [ˌækwiˈziʃən] *n.* 获得
habitat [ˈhæbitæt] *n.* (动物的)栖息地
ancestor [ˈænsistə] *n.* 祖先、原种
lush [lʌʃ] *adj.* (草木)茂盛的;葱翠的
vegetation [ˌvedʒiˈteiʃən] *n.* 植物(总称)
pad [pæd] *n.* (狗、狐狸等动物的)爪垫
browse [brauz] *vi.* (牲畜)吃草
cacti [ˈkæktai](cactus 的复数) *n.* 仙人掌
morphology [mɔːˈfɔlədʒi] *n.* 形态学
Euphorbiaceae [juːˌfɔːbiˈæsiiː] *n.* 大戟科植物
Eocene [ˈiːəusiːn] *n.* 始新世
predator [ˈpredətə(r)] *n.* 食肉动物
Equus [ˈekwəs] *n.* 马属(包括马、驴、斑马等)
vertebrate [ˈvɜːtəbrit] *n.* 脊椎动物;*a.* 有脊椎的
invertebrate [inˈvɜːtəbrit] *n.* 无脊椎动物;*a.* 无脊椎的
aquatic [əˈkwætik] *adj.* 水生的;*n.* 水生动植物
terrestrial [təˈrɛstriəl] *n.* 地球人,陆地生物
integral [ˈintigrəl] *adj.* 完整的;必需的
relic [ˈrelik] *n.* 遗物,遗迹
refuge [ˈrefjuːdʒ] *n.* 避难所;*vt.* 庇护
community [kəˈmjuːniti] *n.* 群落;社群
phyla [ˈfailə](phylum 的复数) *n.* (分类学的)门
class [klaːs] *n.* (分类学的)纲
order [ˈɔːdə] *n.* (分类学的)目

family ['fæmili] *n.*(分类学的)科
genera ['dʒenərə] *n.*(分类学的)属
species ['spi:ʃi:z] *n.*(分类学的)种
verge [və:dʒ] *n.* 边缘

Sentence Structures and Analysis

(1)The evolution (of the major groups of organisms) is known as macroevolution, [to distinguish it from the effects of variation, selection and speciation which collectively can be called microevolution, and the emergence of entirely new biological systems which is megaevolution].

生物体主要种类的进化被称为宏观进化,其与以变异、选择、物种形成为特征的微观进化相区别,也与以全新生物系统的出现为特征的巨进化相区别。

(2)[As habitat conditions changed from lush vegetation that could be browsed, to a drier grassland which necessitated grazing and speed of flight from predators], natural selection altered the population.

随着动物栖息条件从繁茂且可食用的植被带向干旱草地的改变,动物不得不以草为食和快速躲避天敌,这种自然选择改变了这个种群。

(3)Those species [which cannot tolerate new condition and which cannot adapt to them quickly enough] will not survive.

那些不能忍受及不能快速适应新环境的物种将不会生存下来。

Lesson 2 Classification of Domestic Animals

The scientific classification system for animals can be found in almost any zoology or general biology text. All living things are classified into large groups called kingdoms. For many years there were only the plant and animal kingdoms. In recent years, biological taxonomists have proposed the classification of living things into at least three and as many as five kingdoms. In the newer systems of classification, bacteria and fungi are not included in the plant kingdom as they formerly were, and protozoa are excluded from the animal kingdom.

A kingdom is subdivided into large groups called phyla. A phylum is subdivided into classes, a class into orders, an order into families, a family into genera, and a genus into species. If any of these major categories need to be subdivided further, we find subphyla, suborders, and subfamilies being used. Depending upon the particular species being classified, species may be further subdivided into varieties, breeds, strains, or lines.

All domestic animals are members of the kingdom Animalia, phylum chordate, subphylum vertebrate, and either the class Mammalia or the class Aves. Mammals grow hair and produce milk for their young. Birds (avians) grow feathers, lay eggs, have no teeth, and do not have a diaphragm. The diaphragm is a thin muscular tissue that separates the thoracic and abdominal cavities in mammals. Both birds and mammals are homeothermic; that is, they have the ability to maintain a constant body temperature. Thus, they are generally referred to as warm-blooded animals. All other animals, such as reptiles, fishes, and worms, are poikilothermic or cold-blooded. Their body temperatures vary with that of the environment in which they live. Table 2-1 lists the classification scheme for selected domestic animals. The rules of taxonomy (the science of classifying living things) prescribe that the scientific names of an animal include both the genus and species. The term for the species is not capitalized, but all other scientific terms are. Further, the names of the genus and species are either underscored or printed in italicized letters.

Table 2-1 Classification of selected domestic animals

Class	Order	Family	Genus and species
Aves	Galliformes	Phasianidae	*Gallus gallus domesticus* (chicken)
		Meleagrididae	*Meleagris gallopava* (turkey)
	Anseriformes	Anatidae	*Anas platyrhyncha* (duck)
			Anser anser (goose)

continued Table 2-1

Class	Order	Family	Genus and species
Mammalia	Perissodactyla	Equidae	*Equus caballus* (horse)
			Equus asinus (donkey)
	Artiodactyla	Bovidae	*Bos taurus* (European cattle)
			Bas indicus (Zebu cattle)
			Capra hircus (goat)
			Ovis aries (sheep)
		Suidae	*Sus scrofa domesticus* (pig)
	Carnivore	Canidae	*Canis familiaris* (dog)
		Felidae	*Felis catus* (cat)

A species is defined as a group of animals with certain common characteristics, that when mated among themselves will produce fertile offspring. By this definition *B. taurus* (European cattle) and *B. indicus* (Indian cattle) are technically members of the same species. The American bison are members of the family Bovidae and also members the genus *Bos* by some classification schemes. The scientific name is *B. bison*. Bison and cattle will sometimes interbreed and produce fertile offspring. The mule is a member of the genus *Equus*, but is a hybrid of the species *E. caballus* and *E. asinus*, actually a cross between a donkey jack and a horse mare. A donkey jenny mated to a stallion would produce a hinny.

Taxonomists do not always agree as to how some animals should be classified. For example, in some references the domestic pig referred to by the scientific name *S. scrofa*, other references will use the term *S. domesticus*, and one reference uses the term *S. scrofa domesticus*. The wild pig from which our pigs were domesticated called *S. crofa*. The process of domestication does not create a new species, so the latter terminology may be quite appropriate.

Words and Expression

domestic [dəˈmestik] *adj.* 家的，国内的，驯养的
domestic animal [dəˈmestikˈænimәl] *n.* 家畜
kingdom [ˈkiŋdәm] *n.* 王国，界，领域
taxonomist [tækˈsɒnәmist] *n.* 分类学家
taxonomy [tækˈsɒnәmi] *n.* (生物)分类学，分类系统
protozoa [ˌprәʊtәˈzәʊә] (protozoan 的名词复数) *n.* 原生动物
variety [vәˈraiәti] *n.* 种类，变种

strain [strein] *n.* 品系，品种，系群
line [lain] *n.* 血统，系，品系
chordate ['kɔ:deit] *n.* 脊索动物
mammal ['mæməl] *n.* 哺乳动物
ave ['a:vi] *n.* 禽类
avian ['eiviən] *adj.* 鸟的，鸟类的
diaphragm ['daiəfræm] *n.* 横膈膜
tissue ['tisju:] *n.* 组织
thoracic [θɔ:'ræsik] *adj.* 胸的
abdominal [æb'dɔminəl] *adj.* 腹部的
cavity ['kæviti] *n.* 洞穴
homeothermic [həumiəu'θə:mik] *adj.* 恒温的
reptile ['reptail] *n.* 爬行动物
worm [wə:m] *n.* 蠕虫
poikilothermic [ˌpɔikiləu'θə:mik] *adj.* 变温的，冷血的
capitalize ['kæpitəlaiz] *vt.* 用大写字母书写或印刷
underscore [ˌʌndə'skɔ:(r)] *vt.* 画线于…下，强调
mate [meit] *vt.* & *vi.* (使)成为配偶，(使)交配
fertile ['fə:tail] *adj.* 肥沃的，可繁殖的
offspring ['ɔfspriŋ] *n.* 后代，子孙
bison ['baisn] *n.* 野牛
interbreed [ˌintə'bri:d] *v.* (使)异种交配，(使)杂种繁殖
hybrid ['haibrid] *n.* 杂种
jenny ['dʒeni] *n.* 母驴
ass [æs] *n.* 驴子
hinny ['hini] *n.* (公马和母驴)所生的骡子

Lesson 3 Genes Chromosomes and Cell Division

Genetics is a branch of biology that deals with genes and their transmission from one generation to the next and their effects on external traits and characteristics(1). It deals with heredity and variation. As with other subject matter areas, genetics has a language of its own.

Many kinds of traits in animals are controlled by genes. The amount or degree of control varies from trait to trait and from species to species. Environmental factors also play a role in determining how genes express themselves. The many colors and color patterns in animals are inherited characteristics. Color inheritance is used extensively in the explanation of how genes interact and why certain genetic ratios are important. However, we will find that genetics is much more than dominance and recessiveness and 3 : 1 ratios. Knowing how to apply genetic principles helps us to eliminate genetic defects, to select for resistance to diseases and stress, and to increase the productive ability of domestic animals(2).

This lesson deals primarily with the chemistry, biology, and mathematical bases of inheritance. It deals further with how genes are distributed from one generation to the next, and how they function in one-and two-pair crosses.

Genes and Chromosomes

In the nondividing cell, chromosomes are relatively long, slender, threadlike structures found inside the nucleus of the cell. They cannot be seen as separate structures with the aid of a microscope until the cell is in the preparatory stages of division. Chromosomes are important to the study of genetics because they contain the genes. The number of genes that can be found on a single chromosome is not known definitely but estimates vary from less than 100 to more than 1 000.

Chromosome Number

The number of chromosomes in animal cells varies from species to species. Within a species, however, the number remains constant. In fact, if for some reason the number of chromosomes should vary from normal, vital functions are usually affected to the extent that the organism generally dies during embryonic development. The typical number of chromosomes in the body cells of common animals is indicated in Table 3-1.

Table 3-1 The number of animal's chromosomes

Animal	Number	Animal	Number
Pig	38	Cat	38
Rat	42	Rabbit	44
Human	46	Sheep	54
Cattle	60	Goat	60
Donkey	62	Horse	64
Dog	78	Chicken	78

The size of chromosomes also varies. They may be very short with only a few genes or be relatively long with a large number of genes. Another distinguishing feature is the centromere which serves as a point of attachment for the spindle fiber during cell division. The location of the Centromere also varies among chromosomes. It may be somewhat centrally located or be located nearer to one end than the other. All of these differences in the morphology of the chromosomes make it possible to distinguish one from another when they are observed in a dividing cell(3).

In addition to the fact that there is a constant number of chromosomes in the body cells of animals, the chromosomes exist in pairs. The members of each of these pairs are the same shape and length and have their centromeres located in the same position. It is often customary to express chromosome number in terms of the number of pairs typical for any species, such as 30 pairs in cattle, 19 pairs in swine, 39 pairs in dogs, or 23 pairs in humans. The two members of the paired set of chromosomes are called homologs of each other. Homologous chromosomes are described as two chromosomes that are alike in size, shape, and position of their centromeres. Cells that contain chromosomes in pairs are said to be diploid.

Chemical Nature of Genes and Chromosomes

Chromosomes are made up of a complex combination of protein and deoxyribonucleic acid (DNA). The protein acts as a matrix or skeleton to support the DNA. The DNA consists of many molecules connected in chainlike fashion along the length of the chromosome. Each gene is thought to be composed of one molecule of DNA. Therefore, if a particular chromosome contains 200 genes, it would in reality contain 200 molecules of DNA.

Genes carry out their functions by controlling the synthesis of substances called enzymes. Enzymes are made of protein and usually function as catalysts in chemical reactions. The activities of a cell are controlled by many hundreds of chemical reactions. The activities of all cells working together in tissues, organs, and systems ultimately cause the animal to

have a certain appearance or to behave in a certain manner(4). This appearance or manner of behavior is called the animal's phenotype.

Alleles and Loci

The exact position or location of any gene on a particular chromosome is called a locus. Every gene has a locus. For every locus on a particular chromosome there is an identical locus at the exact position on the homolog. This means that the gene that occupies a locus on one chromosome could also occupy the same locus on the other homologous chromosome. However, the genes that occupy these two homologous loci (plural for locus) may or may not be the same. Whether they are the same or different, they will affect the same set of traits. Further, the genes that occupy these homologous loci will not be found on any of the hundreds of other loci on all the other chromosomes in the cell. If the genes at these homologous locations are different, they will have a different effect upon the set of traits that they control. The different genes that can occupy the same loci on a pair of chromosomes are called alleles or allelomorphs. Keep in mind the key parts to the definition of alleles: the genes must be on the same locus of two homologs, they must be different, and they affect the same trait. For example, one gene may cause a cow to possess horns, and the allele of that gene may cause it to be polled (without horns). The presence or absence of horns is the trait. Two phenotypes may exist for this trait: the horned phenotype, or the polled phenotype. Genotype refers to the genes an animal possesses, while phenotype refers to the way the genes cause the animal to appear or behave.

When describing genes and solving genetic problems, it is necessary to use symbols to represent the genes. The most common way is to use letters for gene symbols. There is no standard or accepted pattern to follow, but one way is to use upper and lower case letters to represent alleles if only two alleles are involved. Suppose at a given locus, the possibility of two alleles exists. We may call this the A-locus and use the letters A and a to symbolize the two alleles. Either allele can occupy either locus, so in a group of several animals we might well expect to see the two alleles present in all possible combinations. If an animal possesses two A-genes, its genotype would be written as AA. If another animal possesses two a-genes, its genotype would be written as aa. In these two cases, the genotype of each animal is made up of two identical genes. These genotypes are said to be homozygous. A third possible genotype may exist. It will be made up of one of each of the two alleles (Aa). This genotype is said to be heterozygous.

Before we consider how genes are transmitted from one generation to the next, the subject of cell division should be discussed. An understanding of how cells divide, and how chromosomes duplicate and are transmitted to daughter cells is vital to a fuller understanding

of gene segregation and recombination(5).

Cell Division

Two types of cell division occur in animals. One type involves a single division of a diploid cell to produce two identical diploid daughter cells. This kind of cell division is called mitosis. An understanding of mitosis will help in explaining the second kind of cell division called meiosis. Meiosis involves a series of two divisions whereby four daughter cells are produced from a single diploid parent cell. The four meiotic products are not identical and contain only one-half the number of chromosomes found in the parent cell. The daughter cells are said to be haploid.

Mitosis

The simpler of the two kinds of cell division, mitosis, occurs among the body cells. Body cells, which are also called somatic cells, include all cells except the sex cells or gametes. Mitosis occurs in order to increase the number of cells in growing animals or to maintain the number of cells in tissues as old cells wear out and die. It is not known what causes a cell to begin the process of division. The nondividing cell is usually described as being in interphase. This phase in the life of a cell ends when preparations for mitosis begin. For ease of discussion the process of mitosis is divided into four phases: prophase, metaphase, anaphase, and telophase.

1. Prophase includes most of the activities that prepare the cell for division. In this phase, each chromosome manufactures a complete new chromosome strand. The two strands are called chromatids, and are united as one structure by a common centromere. The DNA, and thus the genes, in each chromatid are identical to one another. From a genetic standpoint, chromosome duplication could very well be considered the most important aspect of cell division.

The other activities that are included as a part of prophase occur mainly to bring about an orderly division of the doubled chromosomes and ultimately of the cell itself. The chromosomes become shorter and thicker than they were in the interphase cell. The centriole, which is located just outside the nuclear membrane, divides and begins to migrate to two sides of the cell. As the centrioles move, the nuclear membrane disappears. By the time the centrioles have completed their migration to what is referred to as the poles of the cell, the spindle has also formed. The spindle is made up of several fibers that seem to extend from centriole to centriole. Each spindle fiber also appears to connect to a centromere of a doubled chromosome.