

高等学校规划教材

地质专业英语

English for Geology

苏朴 胡斌 武永强 编

煤炭工业出版社

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内 容 提 要

本书根据煤炭系统“八五”教材规划对地质类专业英语的要求编写。全书分“基础地质”、“煤田地质”、“水文地质”、“应用地球物理”四个部分,共计二十四课。每课包括课文、词汇、习题、阅读材料。重点课文对构词法、翻译的标准和常见的错误、英语难句翻译、英文摘要写作等内容进行了讲解。

本书内容以地质、水文、应用地球物理等专业基础知识读物为主,可衔接大学基础英语各类教材。本书除了作为地质类有关专业的大学本科专业英语教材外,也可供地质、应用地球物理、水文地质专业的科研、工程技术人员自学专业英语使用。

高 等 学 校 规 划 教 材 地 质 专 业 英 语

English for Geology

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前 言

本书系根据煤炭系统“八五”教材规划精神编写，可衔接大学本科各类基础英语教材。

全书共“基础地质”、“煤田地质”、“水文地质”、“应用地球物理”四部分，共二十四课。大约包含 1500 个专业词汇。每课内容有：课文、词汇、习题、阅读材料等。重点课文对英语难句翻译、构词法、英文摘要写作等进行了讲解，书后附总词汇表。全书按 110 学时编写。课文及阅读材料全部选自美、澳、英等国有关专业的简明教程原著，除个别段落外，一般未作文字改动。为了帮助读者理解课文内容，每课都编入了习题，内容有中、英文互译、课文问答及选择填空等。

本书前六课为基础地质部分，可供地质各专业使用。有关地质类专业选用时，除选用基础地质部分及本专业内容外，可根据学时数酌情选用其它专业内容，一般可按 70 学时组织教学。

参加本书编写工作的有：山西矿业学院苏朴（第一、六、十九、二十、二十一、二十二、二十三、二十四课）、武永强（第二、三、七、八、九、十、十一、十二课），焦作矿业学院胡斌（第四、五、十三、十四、十五、十六、十七、十八课）。全书最后由苏朴汇总、审定。

中国矿业大学任文忠老师、淮南矿业学院陈萍老师对本书的编写提供了很好的意见，在此谨致谢意。

编 者

1993 年 5 月

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Lesson One

Text

The Earth (I)

From classical times it has been known that the earth is roughly spherical in shape. Actually, the planet is shaped more like a slightly flattened ball whose polar radius is about 21 km shorter than its equatorial **radius**. **The average radius is 6371 km. The earth's specific gravity is 5.5.** It is 5.5 times as heavy as an equal volume of water. This specific gravity is greater than that of any other planet in the solar system, but not appreciably different from that of Mercury, Venus, and Mars. Because the average specific gravity of surface rocks is only about 2.7, the material existing deep within the earth must have a specific gravity well in excess of the 5.5 average. Very likely, the material at the earth's center has a specific gravity as high as about 15.

The splendid photographs of the earth taken from space by the Apollo astronauts remind us that our planet is more than a rocky globe orbiting the sun. Whispy patterns of white clouds above the azure blue color tell us of the presence of an atmosphere and hydrosphere. Here and there one can even discern patches of tan that indicate the existence of continents. Greenish hues provide evidence of the planet's most remarkable feature: there is life on earth.

THE ATMOSPHERE

We live beneath a thin but vital envelope of gases called the atmosphere. We refer to these gases as *air*, "Pure air" is composed mainly of nitrogen (78.03%) and oxygen (20.99%). The remaining 0.98% of air is made of argon, carbon dioxide, and minute quantities of other gases. One of these "other" components found mostly in the upper atmosphere is a form of oxygen called ozone. Ozone absorbs much of the sun's lethal ultraviolet radiation, and is thus of critical importance to organisms on the surface of the earth. Air also contains from 0.1 per cent to 5.0 per cent of water vapor. However, because this moisture content is so variable, it is not usually included in lists of atmospheric components.

Each day, the atmosphere receives radiation from the sun. This solar radiation provides the energy that heats the atmosphere and drives the winds.

Distribution of solar radiation is one of the most important factors in determining the various kinds of climate we experience on the earth.

THE HYDROSPHERE

The discontinuous envelope of water that covers 71 per cent of earth's surface is called the

hydrosphere. It includes the ocean, as well as water vapor, the water contained in streams and lakes, water frozen in glaciers, and water that occurs underground in the pores and cavities of rocks. If surface irregularities such as continents and deep oceanic basins and trenches were smoothed out, water would completely cover the earth to a depth of more than two kilometers.

Water is an exceedingly important geologic agent. Glaciers composed of water in its solid form alter the shape of the land by scouring, transporting, and depositing rock debris. Because water has the property of dissolving many natural compounds, it contributes significantly to the decomposition of rocks and, therefore, to the development of soils on which we depend for food. Water moving relentlessly down hill as sheetwash, in rills, and in streams, loosens and carries away the particles of rock to lower elevations where they are deposited as layers of sediment. Clearly, the process of sculpturing our landscapes is primarily dependent upon water.

By far the greatest part of the hydrosphere is contained within the ocean basins. These basins are of enormous interest to geologists, who have discovered that they are not permanent and immobile as once believed, but rather are dynamic and ever changing. There is ample evidence that the sea floors move, and that these movements have a direct relation to the formation of mountains, chains of volcanoes, deep sea trenches and mid-ocean ridges. In the ocean are collected the layers of sediment from which geologists decipher earth history. Here also one finds mineral resources and clues to the location of ore deposits elsewhere on the planet. The ocean provides part of our food supply and has a pervasive influence on the climate we experience.

(From *Contemporary Physical Geology: An Overview of the Third Planet*, pp6-7)

New Words and Expressions

- | | |
|--|---|
| 1. classical ['klæsikəl] a. 传统的; 古典的 | 晴空的 |
| 2. spherical ['sferikəl] a. 球的; 球形的 | 13. atmosphere ['ætməsfɪə] n. 大气; 大气层; 空气 |
| 3. planet ['plænɪt] n. 行星 | 14. hydrosphere ['haɪdrəsfiə] n. 水圈 |
| 4. gravity ['grævɪti] n. 重力; 引力; 地球引力 specific ~ 比重 | 15. patch ['pætʃ] n. 补片; 补块 |
| 5. mercury ['mækjuri] n. 水星 | 16. tan [tæn] n. 棕褐色; 棕黄色 |
| 6. venus ['vɪnəs] n. 金星 | 17. greenish ['grɪniʃ] a. 略呈绿色的 |
| 7. excess [ɪk'ses] n. 超越, 越过; 过量, 过剩 in ~ of 超过 | 18. hue [hju:] n. 颜色; 色彩; 形式; 样子 |
| 8. splendid ['splendɪd] a. 有光彩的, 灿烂的; 壮丽的, 辉煌的 | 19. vital ['vaɪtl] a. 有生命力的; 充满活力的; 生气勃勃的; 生命的; 机能的 |
| 9. astronaut ['æstrənɒt] n. 宇宙航员 | 20. argon ['ɑ:gɒn] n. 氩 |
| 10. rocky ['rɒki] a. 岩石的; 稳固的 | 21. minute [maɪ'nju:t] a. 微小的; 微细的; 不足道的 |
| 11. wispy ['hwɪspi] a. 充满沙沙声的 | 22. ozone ['əʊzəʊn] n. 臭氧 |
| 12. azure ['æzə] a. 天蓝色的; 蔚蓝色的; 无云的; | 23. lethal ['li:θəl] a. 致死的; 致命的 |

24. ultraviolet [ʌltrə'vaɪələɪt] a. 紫外的; 紫外线的
25. irregularity [ɪ'regju'lærɪti] n. 不规则; 不整齐
26. trench [trentʃ] n. 深沟; 地沟
27. exceedingly [ɪk'si:diŋli] ad. 极端地; 非常地
28. geologic [dʒiə'lɒdʒɪk] a. 地质的
~ agent 地质营力
29. alter ['ɔ:lteɪ] vt. 改变; 改动
- ✓ 30. scour ['skaʊə] vt. 冲洗; 冲刷成; 侵蚀
31. relentlessly [ri'lentlɪsli] ad. 无情地

32. sheetwash [ʃi:twaʃ] n. 片流; 层状冲刷
- ✓ 33. rill [ril] n. 小河; 溪流
34. sculpture [s'kʌlptʃə] vt. 刻蚀
35. immobile [i'məʊbaɪl] a. 不动的; 不变的; 静止的
36. dynamic [daɪ'næmɪk] a. 能动的; 动态的
37. ample [æmpl] a. 足够的; 充分的; 宽大的
38. pervasive ['pə(:)və:sɪv] a. 反常的; 歪曲性的
39. decipher [di'saɪfə] vt. 解释

Notes to the Text

- In the ocean are collected the layers of sediment from which geologists decipher earth history. 在海洋, 形成了地质学家藉以推断地史的沉积地层。
倒装句, 主语为 the layers of sediment.
- Here also one finds mineral resources and clues to the location of ore deposits elsewhere on the planet. 这里也是人们发现矿产资源和矿床线索的场地。

Word Building

Word Composition (词的组成)

英语单词的组成具有一定的规律和特点。从词素的角度对英语单词进行分析, 掌握词素的组合及构词法的规律和特点, 进而理解词根的含义, 就会比较容易记住同一词根所派生及合成的一连串同族词。用这种科学方法记忆单词, 就会收到举一反三、触类旁通的效果, 有助于科技工作者在短期内掌握大量科技词汇, 迅速提高阅读英语科技书刊能力。

下面仅就英语构词法及英语词汇的组成作一简要介绍。

1. 英语构词词素

组成英语单词的要素, 即构成一单词的有意义的音节, 叫做词素 (word-element)。每个词素是词的一小部分, 它在词中包含有一定的意义, 从词义的角度来看, 是不能再分的最小词义单位。

一个单词里的各个词素在词中起着不同的作用。如在 workers (工人们) 这个词里, 可以分出 work, 它是构成这个词的词义基础, 称为词根; 构词后缀 -er, 它赋予词以行为主体的意义; 构形后缀 -s 是词形变化 (inflection), 它表达一定的语法意义, 在这里指名词词素和变词词素。一般来讲, 变词词素是附加在词的基本结构上的构形词缀, 也就是构形后缀, 它只是表示词的语法关系, 即名词和代词的数或格、动词的时态、形容词和副词的比较级、最高级等。

2. 构词词素的分类

英语构词词素按词的结构, 可分为词根词素 (或词干词素) 和派生词素 (也叫构词附加词素)。它们在词的结构中各占有一定的地位。词根词素是一个词中最原始的形式, 也是一个词最根本的成分。在一组同族词 (cognate words) 里面, 词根表示词的基本意义。同

族词都是从同一个词根派生出来的词，它们在意义上互有联系；懂得了词根的含义，就可以大体上了解各个派生词的意义。因而，掌握英语词根含义是学会英语单词的一个重要环节。

对于词根有两种不同的理解：一种是把词根严格看作单音节的原始意义单位，这种词根为数不多，在英语中大约只有几百个，它们可以单独成为单词，如 act（动作），man（人），sun（太阳）等；另一种是把词根看作同根词共有的可以辨认的部分，不一定是单音节。例如，central（中心的），excenter（外心），concentrate（集中），concentric（同心的），epicenter（震中），识别出这几个词之中的词根 centr（含有“中心”的意义），它们的不同词义就容易掌握了。

词干词素是未经词形变化的原词，也可以是在加后缀以前词根所发生的一种变形。词根加后缀后随着语言的发展，后缀逐渐失去其单独的意义，而为词根所同化形成词干（stem）。前者比如动词 love 的词根是 lov，词干是 love；后者比如 modify，词根为 mod，词干是 modi，后缀是 -fy。

词根和构词词缀一起组成词干。词干的意义决定词根和构词词缀的意义总和。例如在 reader（读者），readable（可阅读的），reading（读物）这一组词里，词根表示一定的行为。这个意义是这一组词族里各个词都具有的，而词干则随着加缀在词根后面的构词后缀的不同，各有不同的意义。词干和词根同形的词，称为根词或单根词。

派生词素也叫做辅助词素，即构词中的构词词缀。很多词的词根的前头或末尾加上接词部分，借以变更词根的意义，这些叫做构词词缀。

词缀（affix）按构词的结构位置可分为前缀（prefix），后缀（suffix），半后缀（semi-suffix），中缀（infix）四种。

关于词根及各类词缀以及由它们构成的有关地质词汇，将在以后几课分别介绍。

Exercises

1. Question for review:

- 1) What is the general shape of the earth?
- 2) What is the atmosphere composed of?
- 3) What is the hydrosphere?
- 4) Why must the material existing deep within the earth have a specific gravity well in excess of the 5.5 average?
- 5) Where does the greatest part of the hydrosphere exist?

2. Complete the following sentences by choosing appropriate prepositions given below:

in, on, behind, at, with, above, in front of, under, as, around

- 1) The earth is slightly flattened _____ the poles.
- 2) You might think of the earth _____ being constructed much like a baseball _____ a two-layered cores, a thick layer _____ the core and a thin skin _____ the surface.
- 3) The outer core is believed to be composed mostly of iron and nickel _____ a molten

state _____ a very high temperature.

4) The most common element _____ the crust of the earth is oxygen.

5) The mountain is _____ 2.5 miles _____ sea level.

6) There is a yard _____ the house, and a garden _____ it.

7) There is a bridge _____ the river.

3. Choose the correct form from the alternatives in brackets for each of these sentences:

1) The earth which we _____ on is a ball of matter about 7927 miles in diameter.

(are living, have lived, live)

2) The earth _____ round the sun.

(is moved, moves, moved)

3) The earth _____ of three parts.

(is consisted, consists, is consisting)

4) What _____ the earth made of ?

(is, are, was)

5) The atmosphere _____ of oxygen and nitrogen.

(is composed mostly, is consisted mostly, has been made up)

4. Choose one of the following adverbs for each of the sentences below:

generally, perfectly, presently, heavily, regularly, actually, nearly, probably

1) I am coming _____ .

2) It is _____ eight o'clock.

3) _____ speaking, it is not cold here in winter.

4) It will _____ rain tonight.

5) The earth is not _____ round.

5. Translate the following passage into Chinese:

The discontinuous envelope that covers 71 percent of the earth's surface is called the hydrosphere. It includes the ocean, as well as water vapor, the water contained in streams and lakes, water frozen in glaciers, and water that occurs underground in the pores and cavities of rocks. If surface irregularities such as continents and deep oceanic basins and trenches were smoothed out, water would completely cover the earth to a depth of more than two kilometers.

6. Translate the following sentences into English:

1) 科学家认为地球由几层组成。

2) 地球的固态部分称为岩石圈。(lithosphere)

3) 地质学家发现大部分海洋下地壳厚 4~10 英里。

4) 水和空气在地球历史上是作用于地球表面的最重要的因素。

5) 大气圈是由环绕地球固体和液体部分的气体组成。

Reading Material

The Earth (I)

THE LITHOSPHERE AND THE "SPHERES" BENEATH

Somewhat like the concentric shells of an onion, the solid earth is composed of a series of layers. As will be described in a later chapter, the existence of these layers has been deduced from the study of earthquake waves which have passed through the earth. At the surface is the thin outer shell known as the **crust**. The base of the crust is defined by a plane below which the velocity of certain earthquake waves is significantly greater than in the rocks above. A plane of this kind is called a seismic discontinuity, and the seismic discontinuity at the bottom of the crust has been named the **Mohorovicic discontinuity** after its discoverer.

The crust of the earth really consists of two kinds of rock, each with its own distinctive general composition, thickness, and density. The continental crust has a composition somewhat similar to granite, has a relatively low density, and ranges in thickness from about 35 to 60 kilometers. The crust beneath the ocean basins is somewhat denser, rarely exceeds 5 km in thickness, and is composed of blackish rocks similar to those that form the Hawaiian Islands.

By analogy to the fleshy layer that secretes the hard shell of a clam, the layer beneath the earth's crust is called the **mantle**. The mantle has not yet been penetrated by drilling, but earthquake data indicate that it extends from the base of the crust to a depth of about 2900 km. It comprises nearly 83 per cent of the earth's volume. At the base of the mantle is yet another discontinuity that serves as the boundary between the mantle and the core. Geophysicists have recognized two parts of the core: a liquid outer zone and a solid inner core. Both parts are believed to be composed mainly of iron and nickel. As we have noted earlier, the specific gravity of the earth as a whole is greater than that of the common rocks making up its outer parts. Thus, we may conclude that the material of the core is indeed heavy.

Two additional terms for upper zones of the earth's interior have come into wide usage because of their relationship to the movement and evolution of the crust. For example, there exists a layer of the upper mantle, beginning at depths from about 60 to 120 km, and extending to 650 to 700 km in which the velocity of earthquake (seismic) waves is distinctly lower. Geophysicists believe that seismic waves are slowed in this area because it is composed of relatively weak material, which is possibly able to flow plastically. The zone has been named the **asthenosphere**. Above the asthenosphere is a more rigid layer that includes, not only the crust, but an uppermost part of the mantle as well. This cooler and more solid layer is called the lithosphere.

MAJOR FEATURES OF THE CONTINENTS AND OCEAN

It requires only a quick glance at a map of the world to become convinced that the most conspicuous elements of the earth's surface are continents and ocean basins. Both continents and ocean basins contain distinctive geologic features that have developed in response to particular geological processes. For example, the major features of continents are **stable regions** and **orogenic belts**. As is suggested by the name, stable regions are parts of the continents that are no longer disturbed by the kind of geological forces that tend to distort rock layers and raise mountains. Plains and plateaus are characteristic of stable regions. **Orogeny** means mountain building, and thus orogenic belts are zones in which great thicknesses of layered rocks have been strongly compressed, altered, and raised into lofty mountain chains.

Because of a lack of information, the ocean floors were once considered to be rather featureless plains. Actually, they exhibit a variety of major features. Around the edges of the oceans are the submerged margins of the continents called **continental shelves**. The shelves are of enormous importance because they contain many offshore oil traps, as well as deposits of sand, gravel, oyster shells, and diamonds. They are bounded seaward by the steeper continental slopes which in turn drop off into less steep **continental rises**, and eventually into the **abyssal plains** rising above the floors of the abyssal plains in the Atlantic, Pacific, and Indian oceans are perhaps the most impressive features of the ocean basins. These features, called **midoceanic ridges**, tower over 3500 meters above the sea floor. In contrast to the ridges, the ocean floor is cleaved by long narrow earthquake prone, **deep sea trenches**. The Marianas trench in the western Pacific descends to the awesome depth of 11,034 meters below sea level.

The world-encircling mid-oceanic ridges, the deep sea trenches, and even our great mountain ranges are neither haphazardly formed nor randomly located. These features are manifestations of a dynamic unifying process called **plate tectonics**. Plate tectonics is a concept that explains the formation of new oceanic crustal material along the mid-oceanic ridge, the migration of the newly produced ocean floor away from the ridge, and the ultimate descent of that material into the mantle along zones marked by deep sea trenches. It is an exciting concept that cannot be fully appreciated without knowing more about earth materials.

(From *Contemporary Physical Geology: An Overview of the Third Planet*, pp8—12)

New Words and Expressions

- | | |
|--|----------------------------------|
| 1. concentric [kən'sentrik] a. 同一中心的; 同轴的 | 罗维奇 |
| 2. seismic ['saizmik] a. 地震的 | ~ discontinuity 莫霍罗维奇不连续面 |
| 3. crust [krʌst] n. 地壳 | 5. granite ['grænit] n. 花岗岩; 花岗石 |
| 4. Mohorovicic [mouhou'rəvisik] n. (人名) 莫霍 | 6. Hawaiian [hɑ:'waiiən] a. 夏威夷的 |
| | ~ Islands 夏威夷群岛 |

7. analogy [ə'nælədʒi] n. 比拟; 类推
8. fleshy ['fleʃi] a. 多肉的; 肥胖的
9. secrete ['si:krit] vt. 藏匿
10. clam [klæm] n. 蛤
11. mantle [mæntl] n. 地幔
12. geophysicist [dʒi(:) ou'fizisist] n. 地球物理学家
13. plastically [p'læstikəli] ad. 可塑地; 塑性地
14. asthenosphere [ə'θenəsfiə] n. 软流圈
15. lithosphere ['liθəʊsfiə] n. 岩石圈
16. conspicuous [kən'spikjuəs] a. 明显的; 显著的
17. orogenic [ɔ:rədʒenik] a. 造山的
~ belts 造山带
18. orogeny [ɔ'rədʒini] n. 造山运动, 造山作用
19. lofty ['lɒfti] a. 高耸的, 极高的
20. continental [kənti'nentl] a. 大陆的
~ shelves 大陆架; 陆棚

- ~ slopes 陆坡
- ~ rises 陆隆
21. gravel [grævəl] n. 砾; 砾石
22. oyster ['ɔistə] n. 牡蛎; 蚝
23. abyssal ['æbisəl] a. 深渊的; 深不可测的
~ plain 深海平原
24. cleave [kli:v] vt. 劈; 劈开
25. prone [proun] a. 易于...的; 有...倾向的
26. Mariana [məəri'ænə] n. 马里亚纳
~ trench 马里亚纳海沟
27. awesome ['ɔ:səm] a. 可畏的
28. haphazardly [hæp'hæzədli] ad. 任意地
29. manifestation [mænifes'teɪʃən] n. 形式; 现象;
表明; 表现
30. unify [ju:nifai] vt. 统一; 一致; 使成一体
31. plate [pleit] n. 板, 块
~ tectonics 板块构造

Lesson Two

Text

Common Minerals

QUARTZ

The mineral quartz is one of the most familiar and important of all the silicate minerals. It is common in many different families of rocks. As mentioned earlier, quartz represents the ultimate in cross-linkage of silica tetrahedra; it therefore will not break along smooth planes. In quartz, the tetrahedra are joined only at the corners and in a relatively open arrangement. It is thus not a dense mineral, but it is quite hard because of the strong bonding in its framework structure. When quartz crystals are permitted to grow in an open cavity, they may develop the hexagonal prisms topped by pyramids that are prized by crystal collectors. More frequently, the crystal faces cannot be discerned because the orderly addition of atoms had been interrupted by contact with other growing crystals.

棱柱

Such minerals as chert, flint, jasper, and agate are varieties of a form of quartz called chalcedony. Chalcedony is composed of extremely small fibrous crystals of quartz. The crystals are so tiny that their study often requires the use of an electron microscope. Spaces between the small crystals are usually occupied by water molecules. Among the varieties of chalcedony, chert is exceptionally abundant in many sedimentary rock units. It is a dense, hard, usually white mineral or rock. Flint is the popular name for the dark gray or black variety of chalcedony much used by stone-age humans for making tools. Jasper is recognized by its opaque appearance and red or yellow color derived from ironoxide impurities. The term agate is used for chalcedony that exhibits bands of differing color or texture. There are many other varieties of quartz minerals than those briefly mentioned here.

THE FELDSPARS

Feldspars are the most abundant constituents of rocks, composing about 60 per cent of the total weight of the earth's crust. There are two major families of feldspars: the orthoclase or potassium feldspar group which are the potassium aluminosilicates, and the plagioclase group, which are the aluminosilicates of sodium and calcium. Members of the plagioclase group exhibit a wide range in composition—from a calcium-rich end member called anorthite ($\text{CaAl}_2\text{Si}_2\text{O}_8$) to a sodium-rich end member called albite ($\text{NaAlSi}_3\text{O}_8$). Between these two extremes, plagioclase minerals containing both sodium and calcium occur. The substitution of sodium for calcium, however, is not random but rather is governed by the temper-