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地学英语阅读系列教材

赖旭龙 重元兴 刘 芳 赖小春 丛书主编

地学英语阅读教程

Comprehensive English Reading for Geosciences

赖小春 汪卫红 主 编
王晓婧 付 蕾 曾艳霞 胡冬梅 刘雪莲 副主编

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王晓婧　付　蕾　曾艳霞　胡冬梅　刘雪莲　**副主编**

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《地学英语阅读教程》

Preface

I welcome CUG Press's publication of a volume of Earth Science texts in English accompanied by readings by native speakers, and I urge you to listen, read texts aloud, record them and listen and compare yourself.

English is the international language of Earth Sciences used to publish results in international journals and exchange ideas at meetings all round the world. Nowadays Earth Science graduates from Chinese universities including CUG have English language skill in reading, but are behind non-native speakers from Europe, the Americas and the Indian sub-continent in listening, speaking and writing. I have seen an immense improvement at CUG over the last 30 years but my experience in classes, seminars, meetings, thesis defences and editing the English of papers submitted to CUG's *Journal of Earth Sciences* convinces me that further improvement is needed.

Search for the meaning when you read silently. Begin by reading quickly ("skimming") to get the general meaning of a paragraph and write down in English what you judge to be the main meaning. Then read again more carefully. The structure of English sentences is different from Chinese because a writer will begin with the main subject and give evidence in the sentence complement afterwards. For example, a native speaker might write "a *P-T* evolution diagram of the Granites has been drawn using calculated crystallization temperatures and temperature changes during magma evolution", rather than "based on the calculated temperatures of the Granites and temperature changes during magma evolution, a *P-T* evolution diagram of Granite can be drawn".

Spoken English uses voice tones differently from Chinese. Listen to the recordings of the texts for examples. You should already know that a rising tone at the end of a sentence signals a question, "Is this the way to the rock mechanics *láb*?" Voice tone is often raised for emphasis and will help you to recognise key words and phrases as you listen to a talk. "There was a *major change* in Earth's tectonics about 2.1 billion years ago." Falling tones indicate disagreement, "Professor, I think your theory is *wròng*."

Written English derives from speech and you should use every opportunity you

can to listen and speak. Local spoken pronunciation varies but at scientific meetings the English is almost always correct, so if you don't understand a native speaker you need to improve your listening to include several varieties. (Be tolerant of non-Chinese non-native English speakers who face the same difficulties as you.) Chinese learners of English worry about differences between American and British English but they are small compared with the varieties of English spoken in different parts of the United States and the British Isles, and of course there are also distinctive types of English in Canada, Australia, New Zealand, and South Africa. Millions of people in India, Pakistan, Sri Lanka, Bangladesh, Singapore, and some African countries speak English as their first language but have never used it to converse with a British or an American person! We have included examples of non-standard English pronunciation among our readings.

Relax while you are learning and enjoy the texts and readings while you learn from them. Don't worry about making mistakes because your teachers will help you to put them right. The exercises in the text let you practise scientific and language points. Your improved fluency in English will raise your understanding of Earth Science and open up a whole new world of English communication.

Roger Mason

2 February 2018

序

随着中国国际地位的攀升、“一带一路”倡议的推进，国际交流与合作的机会越来越多，中国制造和中国标准亦初见端倪。中国要走向国际，需要越来越多的技术输出，对既懂专业又懂外语的专业技术人才的需求也更为迫切。传统上以通用语言能力为主的大学英语教学活动难以满足国际化专业技术人才的语言需求。因此，不少大学开始改革大学英语教学，增加适应中国国际化战略的专门用途英语（English for Specific Purposes，ESP）教学，针对各专业学科编写的 ESP 教材也相继出版面世。为配合我校“地学”双一流学科人才培养建设，我们依托我校丰厚的地学英语专业文献，借助地学专家的学术指导，编撰了这套《地学英语系列教材》。

该套系列教材，在阅读版块，分为 4 册，遵循由简入深的方式，按照 ESP 教学类别，对所选材料进行分门别类，便于学习者逐级学习使用。教材前两册，即《地学英语阅读教程》和《地学精要》，以一般性学术英语（English for General Academic Purpose，EGAP）为原则编撰。作为学术文献阅读基础，重点介绍地学基础类文章，使学习者对地学类英语文献逐步形成系统的认知，加深对地学类英语文章的文本特色理解，并积累一定的学术文献阅读技巧，为后续两册的学习打下坚实的语言基础，为更高级专业地学学术文献阅读作铺垫。教材后两册，即《地学文献阅读》和《地学语篇语用》，供后续学术英语阅读教学使用，以专用学术英语（English for Specific Academic Purpose，ESAP）为原则编撰。教材摘取真实的学术期刊论文或报告作为阅读文本，使学习者学会快速阅读本专业文献，逐步了解专业文献的写作特点和写作技巧，辅助学生进行专业学术论文写作。通过本系列教材的学习，学习者可以完成由 EGAP 阅读到 ESAP 阅读的平稳过渡，既能提高专业文献阅读能力又能为英语论文写作打下一定基础。

本系列阅读版块教材适合作为大学英语的学术英语阅读课程，每册可满足每学期 24～36 学时的教学需要，也可以作为地学专业双语教学的阅读教材。同时，各册教材重点突出，定位明确，可以作为英语选修课教材，供不同需求层次的学生单独使用。

《地学英语阅读教程》——Basic，基础篇。为 EAGP 阅读基础版，本册以地学基础类文章为阅读文本，浅显易懂，以阅读了解地学类基础知识为目标。

《地学精要阅读》——Progressive，拓展篇。也是 EAGP 阅读文本，重点选取与地学相关的专业文本，文体简洁，知识易懂。学习者通过学习本册教程，可以对地学涵盖的相关领域有一个系统的认知。

《地学文献阅读》——Advanced，提高篇。为 ESAP 阅读文本，重点选取地学专业

学术文章或学术报告，用词专业性强，强调专业文本的书写精确性、简洁性，以及文本结构的严谨性。学习者通过本册教程的学习可以对地学专业类的学术文献有更直接的感性认识，通过阅读加深对学术文本的语言特色和写作规范的理解。

《地学语篇语用》——Proficient，专业篇。为 ESAP 加强型阅读文本，选取地学专业期刊论文或学术报告，用词专业性强。本册教程强调学术文献语篇语用的理解，通过语篇建构和语言使用剖析，以及阅读和写作技巧的训练，学习者可以依据论文语篇特色，尝试书写学术研究论文和学术研究报告。

在有条件的情况下，教材可以 4 册连用，也可以根据不同层次学生需求，选取一两册满足教学需要，其他教材作为辅助拓展阅读材料，供学生自学。

由于地学英语学术文本的特殊性，专业词汇难以上口，我们在每册书的后面都提供了加注音标的词汇总表，便于学习者查阅朗读。本系列教材同时提供立体化教材资源服务，既有纸质版教材书本便于携带阅读，也有 MOOC 作为教学辅导，还可以通过扫描二维码链接语音资源。

此系列教材只是我们进行大学英语 ESP 教学改革的第一步，还会面临各种挑战。我们相信，只要我们加倍努力，不断提高学术英语和地学专业知识素养，不断更新改进我们的学术英语阅读教材，一定会为专门用途英语的教学打开一片天地。

2017 年 12 月

前　言

专门用途英语(English for Specific Purposes, ESP)的教学成为我国高校,特别是理工科院校英语改革及发展的方向。《地学英语阅读教程》秉承 ESP 教学理念进行编写。本书编写的目的在于丰富地质英语的 ESP 教材,提高地质、资源、环境、工程等相关专业学生国际化的迫切需求,及提高相关专业学生和从业人员的阅读能力。

《地学英语阅读教程》共 8 个单元,每个单元包括 4 个部分:单元导读(Preview)、A 篇课文精读和练习、阅读技巧介绍(Reading Skills)、B 篇雅思题型阅读与练习。其中,A 篇阅读材料部分节选自英文原版文章,部分节选自维基百科;B 篇阅读材料和练习选自历年雅思考试真题或者模拟题,是 A 篇阅读材料的进阶版。为了便于教学和自学复习,每篇阅读材料都可以通过扫描二维码的方式获取相应课文和词汇的音频,所有音频的录制均由曾在中国地质大学(武汉)交流的英国学生 Katherine Briggs(第 1、3、5 单元)和 Rob Dolan(第 2、4、6 单元)完成,音频语速保持在 120 个单词/分钟(正常说话语速,大学英语六级考试听力的语速)左右,保证发音的原汁原味的同时,解决部分复杂专业词汇发音难等问题;书后还附有词汇总表(Glossary)和习题答案(Keys)。本书按照两条主线编写:

(1)每个单元都是按照"普通地质学"这门课程的知识框架来选材,由于我们采取了以下措施,这些地学基础文章变得很友善,难度和大学英语课文相当。

★长度适中,每篇控制在 1000 字左右;

★生词量除了术语外控制在 1.5% 内,以减轻学生阅读科普文章的压力(客观地说,除了地学类术语外,词汇量很小);

★课文虽然是地学科普文章,但是没有专业背景知识的读者也能理解。

(2)阅读方法介绍、雅思题型阅读与练习是本书的另一大特色,本书很好地将地学基础阅读材料、阅读方法与雅思训练相结合。

本书是地质、资源、环境、工程等相关专业的学生们从通用大学英语过渡到专业学术英语学习的"专门用途英语",为 1 个学期 24～36 学时的教学使用。本书可以用于以上相关专业本科生和研究生大学英语"阅读进阶"的主要教材,很好地帮助学生从通用英语学习过渡到专业英语学习的同时,为专业学术论文英文摘要等的写作打下基础。本书也是以上相关专业的专业英语基础阅读内容,可以很好地作为《普通地质学》的辅助英文教材和"普通地质学"双语教学的补充教材。本书亦可作为雅思阅读训练的教材。本书特别为以下读者而编写:

★地质、资源、环境、工程等相关专业的本科生和研究生，特别适合本科生第3、4学期和研究生第1、2学期的英语阅读；

★地质、资源、环境、工程等相关从业人员，作为相关从业人员的专业英语基础阅读材料；

★想提高英语阅读技能、了解地学基础知识的学生；

★雅思备考人员。

本书由赖小春统稿，各单元的编写分工如下。

前言：由赖小春编写，葛亚非、任利民提出修改意见；

第1单元　地球科学简介：由汪卫红编写，并由胡冬梅审阅；

第2单元　地球历史与生命进化：由王晓婧编写和审阅；

第3单元　地球板块与地球结构：由汪卫红编写，并由胡冬梅审阅；

第4单元　元素、矿物和岩石：由曾艳霞编写和审阅；

第5单元　地貌学与地理学：由赖小春编写和审阅；

第6单元　大气圈与气候变化：由付蕾编写和审阅；

第7单元　自然资源与环境保护：由付蕾编写，并由刘雪莲审阅；

第8单元　地质灾害与地质工程：由曾艳霞编写和审阅；

词汇总表：在各单元的编写老师分别整理的基础上，由赖小春和付蕾查重；

习题答案：由各单元的编写老师分别整理和审阅。

本书能够顺利出版，首先，十分感谢中国地质大学（武汉）外国语学院、教务处和地球科学学院的大力支持和帮助。同时，葛亚非、任利民、马昌前、喻建新、肖珊等老师为该书的编写多次提供了专业的指导和建议，任利民老师多次为本书的封面设计提供了大量精美的野外实景图片，Katherine Briggs 和 Rob Dolan 为本书提供了专业的课文和词汇录音，在此一并表示诚挚的感谢。

我们付出了辛勤的努力，但由于水平有限，书中难免存在差错或者不当之处，敬请读者批评指正。

编　者

2017年12月

于地大南望山

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Unit 1
Introduction to Earth Science

Preview

Scan and read along the passage

The spectacular eruption of a volcano, the terror brought by an earthquake, the magnificent scenery of a mountain valley, and the destruction created by a landslide all are subjects for the geologist. The study of geology deals with many fascinating and practical questions about our physical environment. Will there soon be another great earthquake in Sichuan? What was the Ice Age like? Will oil be found if a well is drilled at this location? All these are concerns of geology. In this unit, we will examine the science of geology. We will also briefly trace the development of geology, the major areas of geologic studies, and the current advancement of earth system science.

Passage A

The Science of Geology[①]

Scan and read along the vocabulary

physical geology *n.* 普通地质学
historical geology *n.* 地史学
chronological *adj.* 按年代顺序排列的；依时间前后排列记载的
multitude *n.* 群众；多数
precede *vt.* 领先，在……之前；优于，高于；
vi. 领先，在前面

Ⓐ The word "geology" is from the Greek "geo" (meaning "earth") and "logos" (meaning "discourse"). It is the science that pursues an understanding of planet Earth. Geology is traditionally divided into two broad areas—physical and historical. **Physical geology** examines the materials composing Earth and seeks to understand the many processes that operate beneath and upon its surface. The aim of **historical geology**, on the other hand, is to understand the origin of Earth and its development through time. Thus, it strives to establish a **chronological** arrangement of the **multitude** of physical and biological changes that have occurred in the geologic past. The study of physical geology logically **precedes** the study

① This passage is adapted from: Lutgens F K, Tarbuck E J. An introduction to geology [M]//Essentials of geology. 11 th ed. Upper Saddle River, NJ, USA: Pearson, 2012: 1 - 35.

of Earth history because we must first understand how Earth works before we attempt to **unravel** its past. It should also be pointed out that physical and historical geology are divided into many areas of specialisation. Table 1 provides a partial list.

Table 1 Different areas of geologic study[1]

Archaeological Geology	History of Geology	Petrology
Biogeosciences	Hydrogeology	Planetary Geology
Engineering Geology	Medical Geology	Sedimentary Geology
Forensic Geology	Mineralogy	Seismology
Geochemistry	Ocean Sciences	Structural Geology
Geomorphology	Paleoclimatology	Tectonics
Geophysics	Paleontology	Volcanology

Note: Many of these areas of study represent interest sections and specialties of associated societies affiliated with the Geological Society of America and the American Geophysical Union, two professional societies to which many geologists belong.

Geology, people, and the environment

Ⓑ Many of the problems and issues addressed by geology are of practical value to people. Natural **hazards** are a part of living on Earth. Every day they **adversely** affect millions of people worldwide and are responsible for **staggering** damages. Among the hazardous earth processes studied by geologists are volcanoes, floods, Earthquakes, and **landslides**. Of course, geologic hazards are simply natural processes. They become hazards only when people try to live where these processes occur. According to the United Nations, in 2008, for the first time, more people lived in cities than in rural areas. This global trend toward **urbanisation** concentrates millions of people into **megacities**, many of which are **vulnerable** to natural hazards. Coastal sites are becoming more vulnerable because development often destroys natural defenses such as wetlands and **sand dunes**. In addition, there is a growing threat associated with human influences on earth system such as sea level rise that is linked to global climate change. Other megacities are exposed to **seismic** and volcanic hazards where inappropriate land

unravel *vt.* 解开，阐明；解决；拆散 *vi.* 解决；散开
hazard *n.* 危险；灾害
adversely *adv.* 不利地；逆地；反对地
straggering *adj.* 难以置信的，令人震惊的
landslide *n.* 山崩；滑坡
urbanisation *n.* 都市化；城市化
megacity *n.* (人口超过千万的)大城市；巨型城市；特大都市
vulnerable *adj.* 易受攻击的，易受伤害的；有弱点的；脆弱的
sand dunes *n.* 沙丘
seismic *adj.* 地震的；因地震而引起的

use and poor construction practices, coupled with rapid population growth, are increasing vulnerability.

C Resources represent another important focus of geology that is of great practical value to people. They include water and soil, a great variety of **metallic** and nonmetallic minerals, and energy. Together they form the very foundation of modern civilisation. Geology deals not only with the formation and occurrence of these vital resources, but also with maintaining supplies and the environmental impact of their **extraction** and use.

D Not only do geologic processes have an impact on people, but we humans can dramatically influence geologic processes as well. For example, river flooding is natural, but the **magnitude** and frequency of flooding can be changed significantly by human activities such as clearing forests, building cities, and constructing dams. Thus, the impact of human activities on geologic processes is also an important area of geologic studies.

Historical notes about geology

E The nature of our earth—its materials and its processes—has been a focus of study for centuries. Writings about **fossils**, **gems**, earthquakes, and volcanoes date back to the Greeks, more than 2300 years ago. Certainly, the most influential Greek philosopher was Aristotle. Unfortunately, Aristotle's explanations about the natural world were not derived from keen observations and experiments, as is modern science. Instead, they were **arbitrary** pronouncements based on the limited knowledge of his day. He believed that rocks were created under the "influence" of the stars and that earthquakes occurred when air in the ground was heated by central fires and escaped explosively! When confronted with a fossil fish, he explained that "a great many fishes live in Earth motionless and are found when **excavations** are made". Though Aristotle's explanations were inadequate, they continued to be expounded for many centuries, thus **thwarting** the acceptance of more up-to-date ideas.

metallic *adj.* 金属的，含金属的
extraction *n.* 提取，抽出；精炼
magnitude *n.* 大小；量级；〈地震〉震级
fossil *n.* 化石
gem *n.* 宝石
arbitrary *adj.* 任意的；武断的
excavation *n.* 挖掘，发掘
thwart *vt.* 挫败；反对；阻碍

Catastrophism

F In the seventeenth and eighteenth centuries, the **doctrine** of **catastrophism** strongly influenced people's thinking about Earth. Briefly stated, catastrophists believed that Earth's **landscapes** had been shaped primarily by great catastrophes. Features such as mountains and **canyons**, which today we know take great periods of time to form, were explained as having been produced by sudden and often worldwide disasters caused by unknown forces that were no longer in operation.

The birth of modern geology

G In 1795, a Scottish physician and gentleman farmer named James Hutton published *Theory of the Earth*. In this work, Hutton put forth a fundamental principle that is a pillar of modern geology: **uniformitarianism**[2]. It suggests that the physical, chemical, and biological laws that operate today also operated in the geologic past. In other words, the forces and processes that we observe shaping our planet today have been at work for a very long time. Thus, to understand ancient rocks, we must first understand present-day processes and their results. The idea is commonly stated as "The present is the key to the past". Prior to Hutton, no one had effectively demonstrated that geological processes can continue over extremely long periods of time. Hutton persuasively argued that forces that appear small could, over long spans of time, produce effects just as great as those resulting from sudden catastrophic events. Hutton carefully cited verifiable observations to support his ideas. For example, when he argued that mountains are **sculpted** and ultimately destroyed by weathering and the work of running water, and that their **wastes** are carried to the oceans by processes that can be observed, Hutton stated, "we have a chain of facts which clearly demonstrates ... that the materials of the wasted mountains have traveled through the rivers", and "there is not one step in all this process ... that is not to be actually perceived".

Geology today

H Today, the basic **tenets** of uniformitarianism are just as viable as in Hutton's day. We realise more strongly than ever that the

doctrine *n.* 主义;学说;教义;信条
catastrophism *n.* 灾变说;劫数难逃论
landscape *n.* 风景,山水画;地形
canyon *n.* 峡谷
uniformitarianism *n.* 均变论;推今及古原理
sculpt *v.* 造型,雕刻;使成形
waste *n.* 浪费;废物;荒地;损耗;地面风化物
tenet *n.* 原则;信条;教义

present gives us insight into the past and that the physical, chemical, and biological laws that govern geologic processes remain unchanged through time. However, we also understand that the doctrine should not be taken into literally. To say that geological processes in the past were the same as those occurring today is not to suggest that they always had the same relative importance or operated at precisely the same rate. Moreover, some important geologic processes are not currently observable, but evidence that they occur is well established. For example, we know that Earth has experienced impacts from large **meteorites** even though we have no human witnesses. Such events altered Earth's crust, modified its climate, and strongly influenced life on the planet.

❶ The acceptance of uniformitarianism meant the acceptance of a very long history for Earth. Although processes vary in their intensity, they still take a very long time to create or destroy major landscape features. For example, geologists have established that mountains once existed in portions of present-day Minnesota, Wisconsin, Michigan, and Manitoba[3]. Today the region consists of low hills and plains. **Erosion** gradually destroyed these peaks. The rock record contains evidence that shows Earth has experienced many such cycles of mountain building and erosion. It is important to remember that although many features of our physical landscape may seem to be unchanging in terms of the decades over which we observe them, they are nevertheless changing, but on time scales of hundreds, thousands, or even many millions of years.

meteorite *n.* 陨星;流星
erosion *n.* 侵蚀,腐蚀

Notes

(1) Different areas of geologic study: 表 1 中列出的很多研究领域反映了美国地质协会(Geological Society of America, www. geosociety. org)和美国地球物理联合会(American Geophysical Union, www. agu. org)这两大专业地质学家组织下各科研机构的研究领域和侧重点。表 1 中各研究领域的中英文对应分别为:

Archaeological Geology 考古地质	History of Geology 地质学史	Petrology 岩石学
Biogeosciences 生物地球科学	Hydrogeology 水文地质学	Planetary Geology 行星地质学
Engineering Geology 工程地质	Medical Geology 医学地质	Sedimentary Geology 沉积地质学
Forensic Geology 法庭地质学	Mineralogy 矿物学	Seismology 地震学