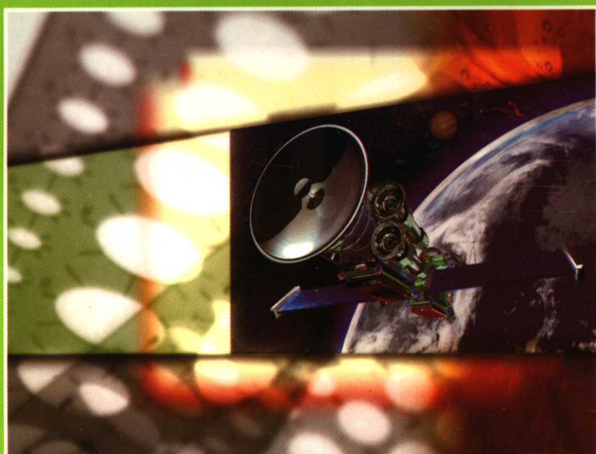
# 高级英语阅读

# Advanced English Reading



## 自然科学篇

## Natural Science Studies

李家荣 刘玉珍 主编

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《高级英语阅读》系列丛书　　丛书主编　国庆祝 刘玉珍

Advanced English Reading — Natural Science Studies

# 高级英语阅读——自然科学篇

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# 序　言

随着中国改革开放的日益深入，中国和世界的联系日益紧密。外语作为连接中国和世界的桥梁，其重要性为越来越多的人所认识，学习外语的人群也越来越大。但是，我们不得不承认，就总体而言，我国的外语教学长期以来走的是一条高投入低产出的道路，应试教育的体制更加重了外语教学只问结果不问过程的错误倾向。外语教学效率偏低的一个重要原因是人们忽视外语教学的规律性和科学性。市面上各种英语教材虽然汗牛充栋，但也问题多多，其中不少是国外教材的简单移植，或是剪刀糨糊的拼凑之作。这些问题教材常常不符合中国学生的实际情况，其内容也缺乏系统性和可操作性。更为严重的是，这些教材的作者本人可能并不在教学一线工作，或本人并不是一个高水平的教师。面对上述问题，天津师范大学外国语学院成立了“外语教学指导与学术研究系列丛书编写委员会”，对外语教材的编写进行全面和系统的规划。编委会由一线教学出色的教授和讲师组成。每位成员又担任一个系列的主编。丛书中每册教材的选题和内容均来自教学实践，并且经过几个轮次的试用，取得了较好的教学效果。我们希望本系列教材的出版能为广大外语教师和外语学习者提供一个较好的选择。

顾　钢

（语言学博士）

# 前 言

《高级英语阅读》系列教材（Advanced English Reading）是以《高等学校英语专业英语教学大纲》为指导，遵照在学习语言中使用语言、在使用语言中学习语言的客观规律，为大学英语专业高年级学生及各个专业硕士研究生编写的阅读课教材。本教材编写的指导思想是通过扩大知识面，打好语言基本功，通过阅读课的教学培养学生获取知识的能力、运用知识的能力、分析问题的能力和创新的能力。

《高等学校英语专业英语教学大纲》指出："21世纪是一个国际化的知识经济时代。我们所面临的挑战决定了21世纪我国高等学校英语专业人才的培养目标和规格：这些人才应具有扎实的基本功、宽广的知识面、一定的相关专业知识、较强的能力和较高的素质。"本系列教材正是以此为指导，通过拓宽学生的人文知识和科技知识，提高他们使用英语的综合能力。

《高级英语阅读》系列教材分四个分册：《社会科学篇》（*Social Science Studies*）、《自然科学篇》（*Natural Science Studies*）、《散文篇》（*Modern Prose*）、《媒体信息篇》（*Media Information*）。本分册为《自然科学篇》（*Natural Science Studies*），包括数学、物理学、化学、医学、天文、航天、生命科学、环境学、地理、地质、工程学等领域的研究。本册由十三个单元组成，每个单元涉及一个研究领域，其中包括三篇课文，介绍该领域所研究的主要内容及人们所关心的问题。

本分册以学科专题形式编排的目的是：

①通过对各专题的阅读、讨论、辩论、翻译，提高学生综合运用英语的能力；

②通过阅读各领域的有关文章，拓宽学生的知识面，培养学生获取信息的能力；

③通过对各个领域问题的专题讨论，提高学生分析问题的能力；

④通过对每个单元的阅读和讨论，鼓励学生发表自己的见解和深入研究自己感兴趣的专题，以提高其科研能力和创新能力。

鉴于本教材是以拓宽学生的人文知识和科技知识，提高他们使用英语的综合能力为目的，所以教师在使用这套教材时，要鼓励学生积极参与课堂活动，大量阅读，并不断地写读书报告，做课堂展示，组织讨论等活动。课文A为精讲课文。所谓"精讲"，并不是逐字逐句地讲解语法，而是将话题延伸或向更深层次挖掘。教师和学生可以针对课文A的话题，了解他人的见解，发表自己的观点，尽可能多地了解某个学科领域中的一个突出问题。课文B为介绍性文章，可让学生课前阅读，对所介绍的学科有个粗线条的认识，课上可不做处理。课文C为泛读课文，可让学生作课堂汇报或是组织课堂讨论。每个单元建议用6课时完成。

由于该教材的课文全部来源于英语原文材料，题材新颖，知识面宽，学生在学习使

用时有一定的困难。为了帮助广大学生和具备相应英语水平的自学者很好地学习和理解这本教材，我们同时编写了配套材料《高级英语阅读学习指导——自然科学篇》，以光盘形式附在书后。该指导针对每单元课文A和课文C，并按原教材的单元课次进行编写，每单元均有以下三部分构成。

①单元导读：介绍该单元的要义，提供课外阅读参考及网址，学生可在此基础上根据自己的需求、兴趣、时间安排自己的学习和阅读。

②课文A详解：其中包括词汇注释、课文注释、习题全解。

③课文C详解：内容、顺序同课文A。

④单元附加练习：其中包括阅读理解、改错、翻译等，并附有答案。

这套教材由多年从事英语教学、有丰富教学经验的第一线教师编写，经专家审定。本分册已经过天津师范大学外国语学院英语专业高年级学生数次试用，受到师生的一致好评。我们又根据学生和任课教师的意见对教材的内容作相应的调整和改进，使我们的教材更具科学性和时代感，更趋完美。我们确信，本套教材将会受到广大英语学习者的欢迎，同时也欢迎各位读者提出宝贵意见。

编　者

于天津师范大学

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# Unit One Introduction to Science

## Text A: What is Science?

### What is Science?

1. Science is the systematic study of anything that can be examined, tested, and verified. The word science is derived from the Latin word scire, meaning "to know". From its early beginnings, science has developed into one of the greatest and most influential fields of human endeavor. Today different branches of science investigate almost everything that can be observed or detected, and science as a whole shapes the way we understand the universe, our planet, ourselves, and other living things.

2. Science develops through objective analysis, instead of through personal belief. Knowledge gained in science accumulates as time goes by, building on work performed earlier. Some of this knowledge — such as our understanding of numbers — stretches back to the time of ancient civilizations, when scientific thought first began. Other scientific knowledge—such as our understanding of genes that cause cancer or of quarks[1] (the smallest known building block of matter) — dates back less than 50 years. However, in all fields of science, old or new, researchers use the same systematic approach, known as the scientific method, to add to what is known.

3. During scientific investigations, scientists put together and compare new discoveries and existing knowledge. In most cases, new discoveries extend what is currently accepted, providing further evidence that existing ideas are correct. For example, in 1676 the English physicist Robert Hooke[2] discovered that elastic objects, such as metal springs, stretch in proportion to the force that acts on them. Despite all the advances that have been made in physics since 1676, this simple law still holds true.

4. Scientists utilize existing knowledge in new scientific investigations to predict how things will behave. For example, a scientist who knows the exact dimensions of a lens can predict how the lens will focus a beam of light. In the same way, by knowing the exact makeup and properties of two chemicals, a researcher can predict what will happen when they combine. Sometimes scientific predictions go much further by describing objects or events that are not yet known. An outstanding instance occurred in 1869, when the Russian chemist Dmitry

Mendeleyev[3] drew up a periodic table of the elements arranged to illustrate patterns of recurring chemical and physical properties. Mendeleyev used this table to predict the existence and describe the properties of several elements unknown in his day, and when the elements were discovered several years later, his predictions proved to be correct.

5. In science, important advances can also be made when current ideas are shown to be wrong. A classic case of this occurred early in the 20th century, when the German geologist Alfred Wegener[4] suggested that the continents were at one time connected, a theory known as continental drift. At the time, most geologists discounted Wegener's ideas, because the Earth's crust seemed to be fixed. But following the discovery of plate tectonics in the 1960s, in which scientists found that the Earth's crust is actually made of moving plates, continental drift became an important part of geology.

6. Through advances like these, scientific knowledge is constantly added to and refined. As a result, science gives us an ever more detailed insight into the way the world around us works.

### Why is Science Important?

7. For a large part of recorded history, science had little bearing on people's everyday lives. Scientific knowledge was gathered for its own sake, and it had few practical applications. However, with the dawn of the Industrial Revolution in the 18th century, this rapidly changed. Today, science has a profound effect on the way we live, largely through technology—the use of scientific knowledge for practical purposes.

8. Some forms of technology have become so well established that it is easy to forget the great scientific achievements that they represent. The refrigerator, for example, owes its existence to a discovery that liquids take in energy when they evaporate, a phenomenon known as latent heat. The principle of latent heat was first exploited in a practical way in 1876, and the refrigerator has played a major role in maintaining public health ever since. The first automobile, dating from the 1880s, made use of many advances in physics and engineering, including reliable ways of generating high-voltage sparks, while the first computers emerged in the 1940s from simultaneous advances in electronics and mathematics.

9. Other fields of science also play an important role in the things we use or consume every day. Research in food technology has created new ways of preserving and flavoring what we eat. Research in industrial chemistry has created a vast range of plastics and other synthetic materials, which have thousands of uses in the home and in industry. Synthetic materials are easily formed into complex shapes and can be used to make machine, electrical, and automotive parts, scientific and industrial instruments, decorative objects, containers, and many other items.

10. Alongside these achievements, science has also brought about technology that helps save human life. The kidney dialysis machine[5] enables many people to survive kidney diseases that would once have proved fatal, and artificial valves allow sufferers of coronary heart disease to return to active living. Biochemical research is responsible for the antibiotics and vaccinations that protect us from infectious diseases, and for a wide range of other drugs used to combat specific health problems. As a result, the majority of people on the planet now live longer and healthier lives than ever before.

11. However, scientific discoveries can also have a negative impact in human affairs. Over the last hundred years, some of the technological advances that make life easier or more enjoyable have proved to have unwanted and often unexpected long-term effects. Industrial and agricultural chemicals pollute the global environment, even in places as remote as Antarctica, and city air is contaminated by toxic gases from vehicle exhausts. The increasing pace of innovation means that products become rapidly obsolete, adding to a rising tide of waste. Most significantly of all, the burning of fossil fuels such as coal, oil, and natural gas releases into the atmosphere carbon dioxide and other substances known as greenhouse gases. These gases have altered the composition of the entire atmosphere, producing global warming and the prospect of major climate change in years to come.

12. Science has also been used to develop technology that raises complex ethical questions. This is particularly true in the fields of biology and medicine. Research involving genetic engineering, cloning, and in vitro fertilization gives scientists the unprecedented power to bring about new life, or to devise new forms of living things. At the other extreme, science can also generate technology that is deliberately designed to harm or to kill. The fruits of this research include chemical and biological warfare, and also nuclear weapons, by far the most destructive weapons that the world has ever known.

**How Scientists Work?**

13. Scientific research can be divided into basic science, also known as pure science, and applied science. In basic science, scientists working primarily at academic institutions pursue research simply to satisfy the thirst for knowledge. In applied science, scientists at industrial corporations conduct research to achieve some kind of practical or profitable gain.

14. In practice, the division between basic and applied science is not always clear-cut. This is because discoveries that initially seem to have no practical use often develop one as time goes by. For example, superconductivity, the ability to conduct electricity with no resistance, was little more than a laboratory curiosity when Dutch physicist Heike Kamerlingh Onnes discovered it in 1911. Today superconducting electromagnets are used in an ever-increasing

number of important applications, from diagnostic medical equipment to powerful particle accelerators.

15. Scientists study the origin of the solar system by analyzing meteorites and collecting data from satellites and space probes. They search for the secrets of life processes by observing the activity of individual molecules in living cells. They observe the patterns of human relationships in the customs of aboriginal tribes. In each of these varied investigations the questions asked and the means employed to find answers are different. All the inquiries, however, share a common approach to problem solving known as the scientific method. Scientists may work alone or they may collaborate with other scientists. In all cases, a scientist's work must measure up to the standards of the scientific community. Scientists submit their findings to science forums, such as science journals and conferences, in order to subject the findings to the scrutiny of their peers.

16. Whatever the aim of their work, scientists use the same underlying steps to organize their research: (1) they make detailed observations about objects or processes, either as they occur in nature or as they take place during experiments; (2) they collect and analyze the information observed; and (3) they formulate a hypothesis that explains the behavior of the phenomena observed.

**About the Author:**

The author of the present article is David Burnie, a professional writer of natural history and science books.

**Notes:**

[1] quark (夸克): a fundamental component of matter; symbol *q*. The most recently discovered quark is the top quark, seen in proton-antiproton(质子—反质子)collision at Fermilab in 1994.

[2] Robert Hooke(罗伯特·胡克)(1635—1703): English physicist, inventor, architect, known for his theory of elastics.

[3] Dmitry Mendeleyev(德米特里·门捷列夫) (1834—1907): Russian chemist, known for his periodic table of elements.

[4] Alfred Wegener (阿尔弗雷德·魏格纳) (1880—1930): German geologist, a pioneer in plate tectonics.

[5] kidney dialysis machine: also called dialyser (肾透析机). It performs haemodialysis, whereby waste products (such as urea or excess salts) are removed from the patient's blood, while blood cells and protein are retained. The system can also be used to provide the patient with

nutrients (e.g. glucose).

## EXERCISES

### I. Paraphrase.

1. For a large part of recorded history, science had little bearing on people's everyday lives.
2. At the time, most geologists discounted Wegener's theory of continental drift, because the earth seemed to be fixed.
3. In practice, the division between basic and applied science is not always clear-cut.
4. In all cases, a scientist's work must measure up to the standards of the scientific community.

### II. Study Questions.

1. What is science?
2. What is the function of new discoveries?
3. What is the function of existing knowledge?
4. What is the negative impact of science on human-beings?
5. What do scientists do?

# Text B: A Brief History of Science

Science exists because humans have a natural curiosity and an ability to organize and record things. Curiosity is a characteristic shown by many other animals, but organizing and recording knowledge is a skill demonstrated by humans alone.

During prehistoric times, humans recorded information in a rudimentary way. They made paintings on the walls of caves, and they also carved numerical records on bones or stones. They may also have used other ways of recording numerical figures, such as making knots in leather cords, but because these records were perishable, no traces of them remain. But with the invention of writing about 6,000 years ago, a new and much more flexible system of recording knowledge appeared.

The earliest writers were the people of Mesopotamia, who lived in a part of present-day Iraq. Initially they used a pictographic script, inscribing tallies and lifelike symbols on tablets of clay. With the passage of time, these symbols gradually developed into cuneiform, a much more stylized script composed of wedge-shaped marks.

Because clay is durable, many of these ancient tablets still survive. They show that when writing first appeared, the Mesopotamians already had a basic knowledge of mathematics, astronomy, and chemistry, and that they used symptoms to identify common diseases. During the following 2,000 years, as Mesopotamian culture became increasingly sophisticated, mathematics in particular became a flourishing science. Knowledge accumulated rapidly, and by 1000 BC the earliest private libraries had appeared.

Southwest of Mesopotamia, in the Nile Valley of northeastern Africa, the ancient Egyptians developed their own form of pictographic script, writing on papyrus, or inscribing text in stone. Written records from 1500 BC show that, like the Mesopotamians, the Egyptians had a detailed knowledge of diseases. They were also keen astronomers and skilled mathematicians — a fact demonstrated by the almost perfect symmetry of the pyramids and by other remarkable structures they built.

A. The Rise of Rationalism

For the peoples of Mesopotamia and ancient Egypt, knowledge was recorded mainly for practical needs. For example, astronomical observations enabled the development of early calendars, which helped in organizing the farming year. But in ancient Greece, often recognized as the birthplace of Western science, a new kind of scientific enquiry began. Here, philosophers sought knowledge largely for its own sake.

Thales of Miletus was one of the first Greek philosophers to seek natural causes for natural phenomena. He traveled widely throughout Egypt and the Middle East and became famous for predicting a solar eclipse that occurred in 585 BC. At a time when people regarded eclipses as ominous, inexplicable, and frightening events, his prediction marked the start of rationalism, a belief that the universe can be explained by reason alone. Rationalism remains the hallmark of science to this day.

Thales and his successors speculated about the nature of matter and of Earth itself. Thales himself believed that Earth was a flat disk floating on water, but the followers of Pythagoras, one of ancient Greece's most celebrated mathematicians, believed that Earth was spherical. These followers also thought that Earth moved in a circular orbit — not around the Sun but around a central fire. Although flawed and widely disputed, this bold suggestion marked an important development in scientific thought: the idea that Earth might not be, after all, the center of the universe. At the other end of the spectrum of scientific thought, the Greek philosopher Leucippus and his student Democritus of Abdera proposed that all matter is made up of indivisible atoms, more than 2,000 years before the idea became a part of modern science.

As well as investigating natural phenomena, ancient Greek philosophers also studied the nature of reasoning. At the two great schools of Greek philosophy in Athens — the Academy, founded by Plato, and the Lyceum, founded by Plato's pupil Aristotle — students learned how to reason in a structured way using logic. The methods taught at these schools included induction, which involves taking particular cases and using them to draw general conclusions, and deduction, the process of correctly inferring new facts from something already known.

In the two centuries that followed Aristotle's death in 322 BC, Greek philosophers made remarkable progress in a number of fields. By comparing the Sun's height above the horizon in two different places, the mathematician, astronomer, and geographer Eratosthenes calculated Earth's circumference, producing a figure accurate to within 1 percent. Another celebrated Greek mathematician, Archimedes, laid the foundations of mechanics. He also pioneered the science of hydrostatics, the study of the behavior of fluids at rest. In the life sciences, Theophrastus founded the science of botany, providing detailed and vivid descriptions of a wide variety of plant species as well as investigating the germination process in seeds.

By the 1st century BC, Roman power was growing and Greek influence had begun to wane. During this period, the Egyptian geographer and astronomer Ptolemy charted the known planets and stars, putting Earth firmly at the center of the universe, and Galen, a physician of Greek origin, wrote important works on anatomy and physiology. Although skilled soldiers, lawyers, engineers, and administrators, the Romans had little interest in basic science. As a result, scientific growth made little advancement in the days of the Roman Empire. In Athens, the Lyceum and Academy were closed down in AD 529, bringing the first flowering of rationalism to an end.

B. Chinese and Islamic Science

For over nine centuries, from about AD 500 to 1400, Western Europe made only a minor contribution to scientific thought. European philosophers became preoccupied with alchemy, a secretive and mystical pseudoscience that held out the illusory promise of turning inferior metals into gold. Alchemy did lead to some discoveries, such as sulfuric acid, which was first described in the early 1300s, but elsewhere, particularly in China and the Arab world, much more significant progress in the sciences was made.

Chinese science developed in isolation from Europe, and followed a different pattern. Unlike the Greeks, who prized knowledge as an end in itself, the Chinese excelled at turning scientific discoveries to practical ends. The list of their technological achievements is dazzling: it includes the compass, invented in about AD 270; woodblock printing, developed around 700, and gunpowder and movable type, both invented around the year 1000. The Chinese were also capable mathematicians and excellent astronomers. In mathematics, they calculated the value of pi to within seven decimal places by the year 600, while in astronomy, one of their most celebrated observations was that of the supernova, or stellar explosion, that took place in the Crab Nebula in 1054. China was also the source of the world's oldest portable star map, dating from about 940.

The Islamic world, which in medieval times extended as far west as Spain, also produced many scientific breakthroughs. The Arab mathematician Muhammad Al-Khwarizmi introduced Hindu-Arabic numerals to Europe many centuries after they had been devised in southern Asia. Unlike the numerals used by the Romans, Hindu-Arabic numerals include zero, a mathematical device unknown in Europe at the time. The value of Hindu-Arabic numerals depends on their place: in the number 300, for example, the numeral three is worth ten times as much as in 30. Al-Khwarizmi also wrote on algebra (itself derived from the Arab word al-jabr), and his name survives in the word algorithm, a concept of great importance in modern computing.

In astronomy, Arab observers charted the heavens, giving many of the brightest stars the names we use today, such as Aldebaran(毕宿五[金牛座 α]), Altair(牵牛星; 牛郎星[天鹰座 α]), and Deneb(天津四[天鹅座 α]). Arab scientists also explored chemistry, developing methods to manufacture metallic alloys and test the quality and purity of metals. As in mathematics and astronomy, Arab chemists left their mark in some of the names they used-alkali and alchemy, for example, are both words of Arabic origin. Arab scientists also played a part in developing physics. One of the most famous Egyptian physicists, Alhazen, published a book that dealt with the principles of lenses, mirrors, and other devices used in optics. In this work, he rejected the then—popular idea that eyes give out light rays. Instead, he correctly deduced that eyes work when light rays enter the eye from outside.

C. Revival of European Science

In Europe, historians often attribute the rebirth of science to a political event — the capture of Constantinople (now Istanbul) by the Turks in 1453. At the time, Constantinople was the capital of the Byzantine Empire and a major seat of learning. Its downfall led to an exodus of Greek scholars to the West. In the period that followed, many scientific works, including those originally from the Arab world, were translated into European languages. Through the invention of the movable type printing press by Johannes Gutenberg around 1450, copies of these texts became widely available.

C.1. 16th Century

The Black Death, a recurring outbreak of bubonic plague that began in 1347, disrupted the progress of science in Europe for more than two centuries. But in 1543 two books were published that had a profound impact on scientific progress. One was De Corporis Humani Fabrica (On the Structure of the Human Body, 7 volumes, 1543), by the Belgian anatomist Andreas Vesalius. Vesalius studied anatomy in Italy, and his masterpiece, which was illustrated by superb woodcuts, corrected errors and misunderstandings about the body that had persisted since the time of Galen over 1,300 years before. Unlike Islamic physicians, whose religion prohibited them from dissecting human cadavers, Vesalius investigated the human body in minute detail. As a result, he set new standards in anatomical science, creating a reference work of unique and lasting value.

The other book of great significance published in 1543 was De Revolutionibus Orbium Coelestium (On the Revolutions of the Heavenly Spheres), written by the Polish astronomer Nicolaus Copernicus. In it, Copernicus rejected the idea that Earth was the center of the universe, as proposed by Ptolemy in the 1st century BC. Instead, he set out to prove that Earth, together with the other planets, follows orbits around the Sun. Other astronomers opposed Copernicus's ideas, and more ominously, so did the Roman Catholic Church. In the early 1600s, the church placed the book on a list of forbidden works, where it remained for over two centuries. Despite this ban and despite the book's inaccuracies (for instance, Copernicus believed that Earth's orbit was circular rather than elliptical), De Revolutionibus remained a momentous achievement. It also marked the start of a conflict between science and religion that has dogged Western thought ever since.

C.2. 17th Century

In the first decade of the 17th century, the invention of the telescope provided independent