科技英语阅读教程 2

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A READING COURSE OF ENGLISH FOR SCIENCE AND TECHNOLOGY

科技英语阅读教程

2

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内容简介

本套教材旨在将英语学习和科学文化知识的学习有机结合起来，培养复合型英语人才，既帮助英语专业学生学习科学技术知识，又帮助非英语专业学生进一步提高英语水平，使他们掌握科学技术知识在英汉语言中的对应关系，提高综合素质，适应社会需求，增强竞争能力。本套教材适合英语专业学生、非英语专业本科生、研究生和广大英语爱好者使用。

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前　言

本套教材旨在将英语学习和科学文化知识的学习有机结合起来，培养复合型英语人才，既帮助英语专业学生学习科学技术知识，又帮助非英语专业学生进一步提高英语水平，使他们掌握科学技术知识在英汉语言中的对应关系，提高综合素质，适应社会需求，增强竞争能力。本套教材适合英语专业学生、非英语专业本科生、研究生和广大英语爱好者使用。

本套教材是在我国高校大力提倡培养复合型英语人才的大背景下推出的。随着我国改革开放和现代化建设的纵深推进、科学技术的高速发展、新兴交叉学科的涌现、人文文化和科学技术之间的相互渗透和融合，我国英语人才教育中单一培养模式暴露的问题越来越明显。单从科技翻译实践看，英语专业毕业生在传统的语言文学培养模式下，科技知识明显匮乏，不能满足实际工作中相关口译、笔译实践的需要，而非英语专业毕业生受应试教育模式以及种种条件的局限，科技知识虽然相对丰富，但英语实践能力和处理科技知识英汉对应关系的能力明显不足。在全球经济一体化和我国加入世贸组织等新形势下，培养复合型英语人才更显迫切。

针对高校英语人才培养中的问题，本教材编写组进行了三次较大规模的调研活动，对不同群体对于复合型英语人才科技文化素质的理解认识、高校英语专业科技文化素质教育现状、复合型英语人才科技文化素质的需求状况等问题，进行了实地调研和问卷调查。通过调研与分析，我们认为，目前高校英语专业科技文化素质教育中主要问题有：一、绝大多数英语专业毕业生科技背景知识相当薄弱，很难适应相关翻译实践的需要；二、多数院校的英语专业尚未开设相关科技知识类课程，或因学时所限，仅在高年级开设少量专业方向课程，但由于缺乏相应的科技知识背景，学生学习困难、兴趣不高，效果不甚理想；三、科技知识类课程所使用的教材或过窄过细，或过深过难，缺乏难度适中、覆盖面广、选材系统的教学内容体系；四、在新的形势下部分教育工作者教育观念陈旧，少数人甚至认为“专业英语无师自通”，“应该以不变应万变”，明确反对复合型英语人才培养模式。

为了帮助英语学习者掌握科学背景知识及英汉语言中的对应关系，并为进一步掌握理工科多专业知识提供基础，教材编写组在考虑目前英语教学实际的情况下，本着既体现英语语言教学特点，又反映现代科学技术现状与发展趋势；既推广科普知识，又覆盖多专业基础背景知识，融科学性、系统性、实用性和可操作性的指导思想，编写了七卷科普英语阅读教程。教程内容横跨数学、物理、化学、生物、生理、医学、心理学、地质、地理、农业、环保、气象、天文、航天、交通、土木、机械、电子等诸多领域。教程推出以后，已经在郑州大学英语专业科技英语方向五届学生中试用，受到师生普遍欢迎。

从实地调研到科研立项，从搜集资料到编写教材，从教材试用到本次修订正式出版，

前后已十年有余。本次修订出版,由于种种条件限制,主要进行了以下调整:一、将原来的七卷压缩为两卷,因此对很多材料和图片不得不忍痛割爱;二、补充或更新部分材料,并对所有内容进行重新编排;三、增加了单元练习,便于学生学习和检测。

在编写和出版过程中参考了大量国内外相关资料,也得到了郑州大学外语学院和国防工业出版社的大力支持,在此谨表谢意。

由于时间仓促,加上编者水平和经验有限,书中难免有不足之处,望广大读者批评指正。

编著者

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UNIT 1 ASTRONOMY, SPACE EXPLORATION
天文学 太空探索

ARTICLE 1 INTRODUCTION 简介

READING ASSIGNMENT

1. What does astronomy deal with?
2. What does astrophysics deal with?
3. Please list the names of some spacecraft.

Astronomy Astronomy is the science that deals with the origin, evolution, composition, distance, and motion of all bodies and scattered matter in the universe. It includes astrophysics, which discusses the physical properties and structure of all cosmic matter.

Until the invention of the telescope and the discovery of the laws of motion and gravity in the 17th century, astronomy was primarily concerned with noting and predicting the positions of the Sun, Moon, and planets. The catalog of objects now studied is much broader and includes, in order of increasing distances, the solar system, the stars that make up the Milky Way Galaxy, and other more distant stellar objects and galaxies. With the advent of scientific space probes, the Earth also has come to be studied as one of the planets, though its more detailed investigation remains the domain of the geologic sciences.

During the 20th century astronomy has expanded to include astrophysics, the application of physical and chemical knowledge to an understanding of the nature of celestial objects and the physical processes that control their formation, evolution, and emission of radiation. Study of the nuclear reactions that provide the energy radiated by stars has shown how the diversity of atoms found in nature can be derived from a universe that originally consisted exclusively of hydrogen. Concerned with phenomena on the largest scale is cosmology, the study of the evolution of the universe. Astrophysics has transformed cosmology from an almost purely speculative activity to a modern science capable of predictions that can be tested.

In spite of its great advances, astronomy is still subject to a major constraint; it is inherently an observational rather than an experimental science. Almost all measurements must be performed at great distances from the objects of interest, with no control over such quantities as their temperature, pressure, or chemical composition. There are a few exceptions to this limitation — namely, meteorites, rock and soil samples brought back from the Moon, and interplanetary dust particles collected in or above the stratosphere. These can be examined with laboratory techniques to provide information that cannot be obtained in any other way. But much of astronomy appears otherwise confined to Earth-based observations.

Space exploration Space exploration is the investigation, by means of both manned and unmanned spacecraft, of the reaches of the universe beyond the atmosphere of the Earth. Spacecraft, vehicles that operate above the Earth's atmosphere, include sounding rockets, Earth satellites, and lunar, planetary, and deep space probes.

On October 4, 1957, the Soviet Union launched the world's first artificial satellite, Sputnik 1, and set in motion a series of programs of space exploration. The first U.S. satellite, Explorer 1, was launched on January 31, 1958, not quite four months after Sputnik 1. Both nations participated during the next decades in a space race, with more than 5 000 successful launches of satellites and space probes of all varieties: scientific research, communications, meteorological, photographic reconnaissance, and navigation satellites, lunar and planetary probes, and manned space flights. The Soviet Union launched the first man into orbit around the Earth on April 12, 1961. On July 20, 1969, the United States landed two men on the surface of the Moon. On April 12, 1981, the 20th anniversary of manned space flight, the United States launched the first reusable manned vehicle, the Space Shuttle.

Many of the spacecraft, such as manned and reconnaissance vehicles, are designed for recovery. Most operational satellites become inert after a few months or years of operation. The North American Air Defense Command (Norad) keeps a constant watch on the thousands of objects of human origin circling the Earth in a variety of orbital paths. Both radar and optical telescopes are used.

For some years the launching of spacecraft was limited to the United States and the Soviet Union. The reason was that the rocket-powered launch vehicles were based on long-range ballistic missiles, which only these countries had developed. France was the third nation to launch a satellite (1965), followed by Japan (1970), the People's Republic of China (1970), and the United Kingdom (1971). Under the auspices of the European Space Agency (ESA), the nations of western Europe developed their launcher during the 1970s to assure themselves of independent launch capability.

NEW WORDS AND EXPRESSIONS

astronomy [ə'strɔnəmi] *n*. 天文学
astrophysics [æstəu'fiziks] *n*. 天体物理学
the Milky Way Galaxy 银河系
stellar ['stelə] *a*. 星的；恒星的；天体的
advent ['ædvənt] *n*. 到来，出现
domain [dəu'mein] *n*. 范围，领域
celestial [si'lestjəl] *a*. 天的，天上的；天体的
cosmology [kɔz'mɔlədʒi] *n*. 宇宙生成学，宇宙论
speculative ['spekjulətiv] *a*. 思索的；推测的
constraint [kən'streint] *n*. 约束，限制
meteorite ['miːtiərait] *n*. 陨石
stratosphere ['strætəusfiə] *n*. 同温层；平流层

sounding rocket 探空火箭，大气观测火箭
earth satellite 地球卫星
lunar probe 月球探测器
planetary probe 行星探测器
deep space probe 深空探测器
artificial satellite 人造卫星
Sputnik ['spʌtnik] 1 东方 1 号
reconnaissance [ri'kɔnisəns] *n.* 侦察，搜索，勘测
meteorological reconnaissance 天气侦察，气象侦察
navigation satellite 导航卫星
anniversary [ˌæni'vəːsəri] *n.* 周年纪念日
recovery *n.* 回收
operational satellite 业务用卫星，商业卫星，作战卫星，军事卫星
North American Air Defense Command 北美空防联合司令部
payload ['peiˌləud] *n.* 有效载荷，净载重量
launch vehicle 运载火箭
long-range ballistic missile 远程弹道导弹
auspices ['ɔːspisiz] *n.* (pl.) 赞助，支持
European Space Agency 欧洲航天局(ESA)
launcher 发射装置

ARTICLE 2 STUDY OF THE SOLAR SYSTEM
太 阳 系

READING ASSIGNMENT

1. What are the nine planets in the solar system?
2. Is lunar exploration important? Why (not)?
3. When is Comet Halley predicted to return next time?
4. What do planetary studies cover according to this article?

The solar system took shape 4 600 000 000 years ago, when it condensed within a large cloud of gas and dust. Gravitational attraction holds the planets in their elliptical orbits around the Sun. Besides the Earth, Mercury, Venus, Mars, Jupiter, and Saturn have been known from ancient times. Since then, only three others have been discovered: Uranus by accident in 1781, and Neptune and Pluto in 1846 and 1930, respectively, after deliberate searches.

The average Earth-Sun distance was originally defined as the astronomical unit (a.u.) and provides a convenient measure for distances within the solar system. The astronomical unit is approximately 150 million kilometers. Mercury, at 0.39 a.u., is the closest planet to the Sun, while Pluto, at 39.5 a.u., is the farthest. As viewed from far above the Earth's North Pole, nearly all planets move in the counterclockwise direction in their orbits, with the two exceptions of Venus and

Uranus.

All of the planets, apart from Mercury and Venus, have satellites very diverse in appearance, size, and structure. Four planets—Jupiter, Saturn, Neptune, and Uranus—have rings consisting of small rocks and particles that are confined to disk-like systems as they orbit their parent planets.

Most of the mass of the solar system is concentrated in the Sun. The solar system also contains a very large number of much smaller objects. In order of decreasing size, these are the asteroids (also called minor planets), comets, meteoroids, and dust particles.

The surfaces of the terrestrial planets and many satellites show extensive cratering produced by high-speed impacts. On Earth, with its large quantities of water and an active atmosphere, many of these cosmic footprints have eroded, but remnants of very large craters can be seen in satellite and aerial photographs of the terrestrial surface. On Mercury, Mars, and the Moon, the absence of water and any significant atmosphere has left the craters unchanged for billions of years, apart from disturbances produced by infrequent later impacts. There is clear evidence for a continued cosmic drizzle of small particles.

Lunar exploration Investigations of the Moon and some understanding of lunar phenomena can be traced back to a few centuries B.C.. In ancient China the Moon's motion was carefully recorded as part of a grand structure of astrological thought. In both China and the Middle East, observations became accurate enough to enable the prediction of eclipses, and the recording of eclipses left data of great value for later scientists interested in tracing the history of the Earth-Moon system.

During the U.S. Apollo missions of the modern era, a total sample weight of 381 kilograms was collected; 300 grams of lunar material also was returned by three unmanned Soviet Luna space vehicles. Less than 10 percent of the samples has so far been distributed for analysis, but planetary science has been revolutionized by these expeditions. A wide range of laboratory techniques has been employed on the lunar samples. The results of the analysis have enabled investigators to determine the composition and age of the lunar surface. Seismic techniques have made it possible to probe the lunar interior. In addition, a retroreflector left on the Moon's surface by Apollo astronauts returns a high-power laser beam emitted from the Earth, enabling researchers to monitor on a regular basis the Earth-Moon distance to an accuracy of a few centimetres. This experiment provides data that can be used in calculations of the dynamics of the Earth-Moon system.

Planetary studies Mercury is too hot to retain an atmosphere, but Venus' brilliant white appearance is the result of its being completely enveloped by thick clouds of carbon dioxide. Below the upper clouds it has a hostile atmosphere containing clouds of sulfuric acid droplets. The cloud cover shields the planet's surface from direct sunlight, but the energy warms the surface, resulting in a very high surface temperature of almost 480℃. Radar can penetrate the thick Venusian clouds and has been used to map the planet's surface. The Martian atmosphere is very thin, only about 0.006 that of the Earth, and composed mostly of carbon dioxide (95 percent), with very little water vapour. The outer planets have atmospheres composed largely of light gases. For example, hydrogen and helium, along with some methane and ammonia, have been detected on Jupiter.

Each of the planets rotates on its axis, and nearly all of them rotate in the same counterclockwise direction, as viewed from above the ecliptic.

Some of the planets have magnetic fields. Jupiter has a stronger magnetic field than the Earth's. Saturn has a magnetic field that is not quite as strong as Jupiter's. Mercury has a weak magnetic field that is only about 1 percent as strong as the Earth's. No magnetic field has been detected around any of the other planets.

Investigations of the minor bodies Approximately 3 500 asteroids have now been identified. Most move in the asteroid belt located between 2.3 and 3.3 a.u. from the Sun. About 250 of these asteroids are larger than 100 kilometres, and their total mass is thought to be roughly 1/2 000 that of the Earth.

Comets orbit the Sun at distances of 30 000 to 100 000 a.u. More than 600 comets have so far been discovered. Most make only a single pass through the inner solar system, but some are deflected by Jupiter or Saturn into orbits that allow them to return at predictable times. Comet Halley is the best known of these periodic comets, with its next return predicted for A.D. 2060. About 30 comets have periods of less than 100 years. Comet masses have not been well determined, but most are thought to be 1 000 000 000 times smaller than the Earth.

Even smaller than comets are the meteoroids, lumps of stony material. Meteoroids vary in size from small rocks to large boulders weighing a ton or more. A few have orbits that bring them into the Earth's atmosphere and down to the ground as meteorites. Smaller meteoroids that enter the atmosphere may heat up sufficiently to vaporize and appear as meteors. Many, perhaps most, of the meteors occur in showers and follow orbits that seem to be identical with those of certain comets. For example, each May the Earth crosses the orbit of Comet Halley, and the meteor shower becomes visible.

Determinations of age and chemical composition The age of the solar system, about 4 500 000 000 years, has been derived from measurements of radioactivity in meteorites, lunar samples, and the Earth's crust. Abundances of the isotopes of uranium, thorium, and rubidium and their decay products, lead and strontium, are the measured quantities.

Assessment of the chemical composition of the solar system is based on data from the Earth, Moon, and meteorites, as well as on the spectral analysis of light from the Sun and planets. In broad outline, the abundances of the elements decrease with increasing atomic weight. Hydrogen atoms are by far the most abundant, with 93 percent; helium is next, with 6.7 percent; and all other types of atoms together amount to only 2.3 percent.

Theories of origin The origin of the Earth, Moon, and solar system as a whole is a problem that has not yet been settled in detail. The Sun probably formed by condensation of the central region of a large cloud of gas and dust, with the planets and other solar-system bodies forming soon after, their composition strongly influenced by the temperature and density. Less-volatile materials could condense into solids relatively close to the Sun to form the terrestrial planets. The abundant, volatile lighter elements could condense only at much greater distances.

The origin of the planetary satellites is not settled. There is still the question as to the origin of the Moon, and professional opinion has been swinging between theories that see its origin and condensation simultaneous with the formation of the Earth, to an explanation in terms of a large impact on the Earth resulting in the expulsion of material that subsequently formed the Moon. For the outer planets with their multiple satellites, many very small and quite unlike one another, the picture is even less clear. Some of the satellites may have formed along with their parent planets, and others may have formed elsewhere and been captured.

NEW WORDS AND EXPRESSIONS

take shape 成形，形成
elliptical [i'liptikəl] *a*. 椭圆的；省略的
Mercury ['mə:kjuri] *n*. 水星
Venus [vi:nəs] *n*. 金星
Mars [mɑ:z] *n*. 火星
Jupiter ['dʒu:pitə] *n*. 木星
Saturn ['sætə:n] *n*. 土星
Uranus ['ju:ərənəs] *n*. 天王星
Neptune ['neptju:n] *n*. 海王星
Pluto ['plu:təu] *n*. 冥王星
respectively [ri'spektivli] *ad*. 各自；各别
astronomical unit 天文单位(长度单位，约为15 000万千米)
counterclockwise [ˌkauntə'klɔkwaiz] *a*. 逆时针方向的
disklike *a*. 盘状的
asteroid ['æstərɔid] *n*. 小行星
meteoroid ['mi:tiərɔid] *n*. 流星体；流星
terrestrial [ti'restriəl] *a*. 陆地的；由陆地组成的
cratering *n*. 坑穴
lunar exploration 月球探索
seismic ['saizmik] *a*. 地震的
seismic technique *n*. 地震探测技术
retroreflector [ˌrestrəuri'flektə] *n*. 反光镜；后向反射器
dynamics [dai'næmiks] *n*. 动态变化
hostile ['hɔstail] *n*. 不适宜的；恶劣的
Venusian [vi:n'ju:siən] *a*. 金星的
Martian ['mɑ:ʃiən] *a*. 火星的
proton ['prəutɔn] *n*. 质子
asteroid belt 小行星带
deflect [di'flekt] *v*. 偏离；使转向
Comet Halley ['hæli] 哈雷彗星
boulder ['bəuldə] *n*. 大石头
meteorite ['mi:tiərait] *n*. 陨石
meteor ['mi:tjə] *n*. 流星；陨星
meteor shower 流星雨
radioactivity [reidiəuæk'tiviti] *n*. 放射性；放射能
isotope ['aisətəvp] *n*. 同位素
uranium [juə'reiniəm] *n*. 铀
thorium ['θɔ:riəm] *n*. 钍
rubidium [ru:'bidiəm] *n*. 铷
strontium ['strɔnʃiəm] *n*. 锶
spectral analysis 光谱分析
in broad outline 概括地说
helium ['hi:liəm] *n*. 氦
volatile ['vɔlətail] *a*. 飞行的；轻快的；挥发性的
expulsion [iks'pʌlʃən] *n*. 驱逐；开除；喷出

ARTICLE 3 STUDY OF THE STARS 恒星

READING ASSIGNMENT

1. What are stellar astrophysicists interested in?
2. What do you know about black holes?

Measuring observable stellar properties The measurable quantities in stellar astrophysics include the externally observable features of the stars: distance, temperature spectrum and luminosity, composition of the outer layers, diameter, mass, and variability in any of these. Theoretical astrophysicists use these observations to model the structure of stars and to devise theories for their formation and evolution.

Apparent stellar brightness is measured in magnitudes. Magnitudes are now defined so that a first-magnitude star is 100 times brighter than a star of sixth magnitude. The human eye cannot see stars fainter than about sixth magnitude, but modern instruments used with large telescopes can record stars as faint as about 26th magnitude.

There are several methods of measuring a star's diameter. From the brightness and distance, the luminosity can be calculated; and from observations of the brightness at different wavelengths, the temperature can be calculated, thus providing a means of calculating the star's radius. Also, it is possible to monitor the intensity of the starlight, which produces diffraction fringes whose pattern depends on the angular diameter of the star, thus calculating the star's angular diameter.

Many stars occur in binary systems, with the two partners in orbits around their mutual centre of mass. Such a system provides the best measurement of stellar masses. From diameters and masses, average values of the stellar density can be calculated, and thence the central pressure. And the central temperature can then be calculated. Thus, for example, in the Sun the central density is 158 g/cm^3, and the pressure is calculated to be more than 1 000 000 000 atmospheres and the temperature about 15 000 000 K.

Other stars, both more and less massive than the Sun, have broadly similar structures, but the size, central pressure and temperature are functions of a star's mass and composition. For a given temperature, there are stars that have luminosity much greater than main-sequence stars. Conversely, stars with a luminosity much less than that of main-sequence stars of the same temperature must be smaller and are termed dwarfs. White dwarfs are stars with temperatures that typically range from 10 000 to 12 000 K, and they appear visually as white or blue-white.