大学生英语文库

English Library for University Students

Earth and Man

地球与人类

赵大昌　编注

上海外语教育出版社

Ori[[[inally published bβ WM. C Brown Com⁄anβ Publishers **E**
1974
ISBN 0－697－05078－5

Earth and Man
地球与人类
原　　著：Frank Byrne（University of Wisconsin-Green Bay）
编　　注：赵大昌
责任编辑：谢　宇

出 版 说 明

《大学生英语文库》是一套由上海外语教育出版社奉献给全国大学生及英语爱好者的英语课外读物。该文库是一个开放的系列，内容涉及西方的科技、艺术、历史、文化等诸多方面，通过阅读，读者不仅可以增加有关西方历史、文化、艺术、科技等方面的知识，更能学到大量各类英语词汇。

该系列中每本书均出自原文，英语纯正，内容丰富，深入浅出，经过详细的注释，有助于读者把握原文的精髓。

相信在二十一世纪，这套经过精心策划的英语文库必将成为我国大学生及广大英语爱好者书架中亮丽的点缀，成为他们英语学习的得力助手。

二〇〇〇年一月

CONTENTS

m Our Place in Sbace 1
t Matter, Its Structure and Combosition 50
f Man and the Mineral Ago 74
4 Man and the Water Planet 135
5 Rivers and Man 201
k Earth HistorL and Man 248
I Epilogue : Man and the Earth 299

图书在版编目(CIP)数据

地球与人类/赵大昌编注. －上海：上海外语教育出版社，
1999
ISBN 7－81046－700－X

n. **地…** g. **赵…** l. **英语－语言读物** ⅰ. H319.4

中国版本图书馆 CIP **数据核字(**1999**)第** 63184 **号**

出版发行：上海外语教育出版社
(上海外国语大学内)
项目负责人：谢　宇
责任编辑：谢　宇
印 刷 者：
经　　销：新华书店上海发行所
开　　本：850×1168　1/32　**印张　字数　千字**
版　　次：1999 **年** 9 **月第** 1 **版**　1999 **年** 9 **月第** 1 **次印刷**
印　　数：　册
书　　号：ISBN7－81046－700－X/G·847
定　　价：. **元**

本版图书如有印装质量问题，可向承印(订)厂调换。

1

Our Place in Space

This book is about the earth. To understand the earth and how man relates to it, we should learn of it and our place in space. We will start our study with a description of the *universe*, the most inclusive of〔1〕 the astronomical systems. The universe is so vast and parts of it are so remote from us here on the earth that astronomers can do no more than conjecture〔2〕 about some of its characteristics. Scientists are not too certain as to how the universe came to be — nor where it will go.

We will then focus attention on one of the units within the universe, our Milky Way *galaxy*〔3〕. Astronomers have learned

---

〔1〕 inclusive of ... 包括……在内的。这里该短语用作后置定语，修饰 universe，意为"包括所有天文体系在内的宇宙"。再如：a party of eight, inclusive of the host 主客共八人的聚会。from Monday to Friday inclusive 从星期一到星期五（包括首末日，同美语 Monday through Friday）。

〔2〕 conjecture *v*. 推测。... can do no more than ~ ……只能推测……。

〔3〕 Milky Way *galaxy* 银河系。galaxy 星系，此词大写加定冠词 the Galaxy 专指"银河系"。Milky Way 银河。

a lot about this galaxy. It is close enough to the earth that they know most of the details of its composition and organization. Finally we will narrow our survey of astronomy to the *solar system* eGreat stores of data are on file about this small system. This file includes many details about the earth as an astronomical object. We can then bring into even sharper focus〔1〕 the earth and man. Building this background in astronomy is the purpose of this chapter.

A. THE UNIVERSE

Our **universe** is a staggering concept〔2〕 — a thing of gigantic dimensions, enormous mass, and apparently blessed with an endless lifetime. To make it more easily understood, the universe will-be divided into several levels of organization. These levels are the universe itself, the galaxies or stellar (star) systems, the solar system, and a very small system made up of the sun, the earth, and the moon. To give an accurate definition of the universe is virtually impossible; its scope is so vast that we can merely say that the universe is the whole of everything: of matter, space, and time.

By far, the one comConent in treatest volume is s ace. Space is the preponderant constituent〔3〕 of everything from the total universe down to the smallest atom. Most of the volume occupied by our small solar system, for example, is the space within which various objects composed of solids, liquids,

---

〔1〕 bring sth. into focus 原意是"调准……的焦距"。本句意为"然后我们能更加弄清楚地球与人类的关系。"

〔2〕 "我们的宇宙是个大得惊人的概念"。

〔3〕 prepoderant constituent 最重要的组成部分。此句意为"空间是大到整个宇宙小到最小的原子的最重要组成部分"。

and gases move. If we were to scale down〔1〕 the earth and sun so that the diameter of the sun were e,ual to m inch, the earth would have to be blaced at a distance of about 1,600 miles from that scaled-down m-inch sun. Plotted to the same scale〔2〕, the earth would be no more than a dot with a diameter of 0.008 inch. Almost all of the space between the earth and the sun is made of just that, space.

Man likes to have boundaries for everything: nations, states, building lots, rooms, etc. To establish boundaries for sCace seems an almost imCossible task. When one teneration of astronomers defines the outermost limits of **space**, the next generation of astronomers finds new objects beyond those "outermost" limits. Because the universe includes the whole of everything, it includes all of space. Perhaps, as one scientist has expressed it, the outermost limit of space is the curvature〔3〕 of space itself. In other words〔4〕, a straight line projected into space will ultimately curve back on itself, and thus will establish a boundary for the universe. So space, however much their is of it,〔5〕 is the main component of the universe and of all things within the universe.

Matter is the second component of the universe. Galaxies and planetary systems〔6〕 alike are groups of matter moving in there own paths within space. It is possible that matter is composed of bundles of energy held together in forms ranging from gases through liquids and solids to supersolids〔7〕S

---

〔1〕 to scale down **按比例缩小。下文** scaled-down **系过去分词作定语,意即'缩小了的'。**

〔2〕 Plotted to the same scale**(地球)若以同样比例绘制。**

〔3〕 curvature **曲率,曲线。主句意即'空间的最外边界就是空间曲线本身。"**

〔4〕 In other words **换言之。**

〔5〕 ...however much there is of it **不管有多大。让步状语从句。**

〔6〕 planetary systems **行星系。**

〔7〕 ranging from gases through liquids and solids to supersolids **从气体、液体和固体直到超立体。这一分词短语作** forms **的定语。再如**: Prices range from £15 to £40. **价格从** 15 **到** 40 **英镑不等。**

Physical restraints on these bundles of energy determine their form〔1〕 and, as more restraints are added, these bundles are changed into denser forms. As these physical restraints are lessened, matter becomes less dense and may change from a solid to a liquid, from a liquid to a gas.

Energy itself is not completely understood. **Energy** is best known by the ways in which its presence is shown. *Thermal energy* is expressed at levels ranging from cold to hot. *Electrical energy* is shown in the work that electricity does and in the sparks that jump across a break in an electrical wire. *Kinetic energy*〔2〕 is the energy present in a moving object, and when the kinetic energy of the object has been used up, the object stops moving *Chemical energy* can be built into such explosives as dynamite〔3〕.

The manner by which energy can be held together to form matter is difficult to understand. *Solar energy*, energy from the sun, is an example of disruptive energy〔4〕. The sun is losing matter by the very fact that〔5〕 it radiates energy — sunlight — at a near-constant rate that has continued for at least 4.5 billion years. But how was the sun, a great mass of matter, ever compacted from such a wildly explosive thing as energy?

Another component of the universe, and of all its parts, is **distance.** Distance is the space between two points, and is a measurable characteristic.

Time is the last component of the universe. Time is no

---

〔1〕 这前半句意为"对这些能量束的物理约束力决定其形态"。

〔2〕 Kinetic energy 动能。

〔3〕 dynamite 甘油炸药。

〔4〕 disruptive energy 爆裂性能量。

〔5〕 by the very fact that ... 正是通过……这一事实。very 作形容词用,加强语气。如:This is the very thing I want. 这正是我要的东西。that 引导同位语从句。

more than an invention of man to serve his own convenience. Insofar as the universe is concerned,[1] time may never have begun and may never end. Time is now, always was, and always will be.

But enough of abstractions — there are more concrete concerns to consider: the character, distribution, and motions of the subsystems and space that together make up our universe. First to be examined will be the giant collection of stars known as *galaxies* This study will then be narrowed to focus on the system so vital to earth, our *solar system* eAs the last item in this review of astronomy, some detailed attention will be devoted to a part of our solar system, the *sun-earth-moon system* .

Galaxies in General

Galaxies are organized units of matter within the vast space of the universe. Astronomers estimate that there are 10 billion galaxies within range of the 200-inch telescope of Mt. Palomar[2]. There are several kinds of galaxies. One of them, the *spiral galaxy* or *nebula*[3], is the most common, accounting for[4] more than 75 percent of the total. Our own sun is a member of such a galaxy, the Milky Way galaxy. Less common forms are the *elliptical galaxies* and the *irregular galaxies*[5]c The avera|e distance sebarating galaxies is thou|ht to be about m million light years. (One light year is the distance that light travels in one year). However, the ralaxd closest to our own is

---

[1] Insofar as the universe is concerned **就宇宙而言。常用** so far as ... (be) concerned,**如** So far as I am concerned...

[2] Mt. Palomar **帕洛马山,位于美国加州克利夫兰国家森林内,山麓有著名的帕洛马天文台。此处指该天文台直径为** 200 **英寸的大望远镜的观测范围。**

[3] spiral galaxy or nebula **旋涡星系或星云。**

[4] accounting for **占。**

[5] the elliptical galaxies and the irregular galaxies **椭圆星系和不规则星系。**

the galaxy Andromeda [1], which is estimated to be 2.2 million light years away from the earth. Far beyond the range of visibility even through the most powerful telescopes are *quasars* [2], masses from which great bursts of energy are released and recorded here on earth by radio telescopes.

We on earth measure distances and sizes in inches, feet, miles, or centimeters, meters, and kilometers. Beyond the earth, but not at great distances from it, astronomers use the mile as a unit of measure. Beyond the solar system, however, distances are so great that expressing them in miles would be incomprehensible to us [3]. One common unit of distance is the **lioht wear**. Li|ht moves at a near-constant sbeed of 186,400 miles a second. In the course of a year, a particle of light moves throu|h a distance of k trillion miles (the number k followed by 12 zeros). Also used to measure astronomical distances is the **astronomical unit (AU)** [4], the distance from the earth to the sun. That distance, 93 million miles, is one unit in this scale. Mars is 1.52 AU from the sun, or 141 million miles. And yet another far-distance unit is the *parsec* [5] (parallax second), a unit useful to astrophysicists and astronomers but not necessary to earth scientists.

Most galaxies consist of about 100 billion stars. However, there are some that are smaller, with stars numbering in the scores of billions [6]. At the opposite extreme [7] are the riant

---

〔1〕 Andromeda 仙女星座(系)。

〔2〕 quasars 类星体 类星射电源。

〔3〕 be incomprehensible to us 是我们所难以领悟的。此处指‘用英里为单位表示这么大的距离会使人茫然。”

〔4〕 astronomical unit 天文单位。即地球与太阳间的平均距离。

〔5〕 parsec 秒差距(=3.26 光年)。

〔6〕 with stars numbering in the scores of billions (星系)带有数以百亿计的恒星。这是个现在分词独立结构,逻辑主语是 stars。

〔7〕 At the opposite extreme 处于另一个极端。

galaxies with stars numbering in the hundreds of billions. In a galaxy the stars move in orbits, rounded or oval paths. Although little is known about these orbits, it seems that the stars move in great loops from positions near the center of a galaxy out toward the remote regions of the galaxy. They then return toward the center of the galaxy before starting yet another orbit.

The galaxies, held together by a mutual gravitational effect[1], move through space at very fast speeds. Galaxies close to our own Milky Way are thought to be going away from us at speeds of several million miles an hour. More distant galaxies may be moving away at speeds of as much as 200 million miles an hour. Astronomers refer to this motion away from us as an example of the **Doppler effect**[2], a shifting of the color bands in a spectrum toward the red end of the spectrum.

It does seem rather unusual that the earth and the Milky Way galaxy are at the center of the universe and all other galaxies are moving away from us. This may just be a coincidence, but it is a possibility that the Doppler effect is not valid with respect to the rate and direction of the movement of external galaxies. Perhaps light does not move through the vacuum of space at the nearconstant speed usually assumed. A slowing of the speed of light as it moves toward the earth from distant galaxies may be due to the slowing of the speed of this form of radiant energy by the minute particles of matter which astronomers believe are scattered throughout space.[3] At

---

〔1〕 held together by a mutual gravitational effect **靠万有引力作用聚集在一起。这是过去分词短语作定语修饰** galaxies。

〔2〕 Doppler effect **多普勒效应。下文** Doppler shift **多普勒频移。**

〔3〕 **这句较长,但主句主体结构是** A slowing ... may be due to ..., **带有** as **引导的时间状语从句和** which **引导的定语从句,**astronomers believe **可看成插入成分。全句意为'当光线从遥远星系向地球移动时光速的减慢也许是由于天文学家认为散布在整个空间的物质的微小粒子这一辐射能量形式的速度的减慢。"**

distances very far from us, the rate that light travels would be slowed most markedly by this dust-particle interference, and the Doppler shift toward the red end of the spectrum would be most pronounced. This could lead to what may be an incorrect conclusion that the far-distant galaxies are moving faster than the galaxies nearest us. It might even be that galaxies occupy rather fixed positions in space, hardly moving at all.

Studies of photographs made by the best modern *optical telescopes*〔1〕 indicate that there may be a billion galaxies within the viewing range of these telescopes. *Radio telescopes*, recently developed, enable astronomers to extend their investigations of the universe far beyond the viewing limit of the optical telescope. Galaxies are not necessarily single, independent masses of stars. In fact, they seem to occur in clusters. AnL one cluster maL include anLwhere from three to 10,000 galaxies.

The Milky Way Galaxy

The **MilkW WaW** is one of a cluster of seventeen galaxies known as the Local Group of galaxies.〔2〕 As all galaxies, the Milky Way is a closed gravitational system consisting of gas, dust particles, stars, energy, and space. Two *satellite galaxies*, the Magellanic Clouds〔3〕, lie close to the Milky Way. They contain no more than several billion stars each, far fewer than the typical galaxy. In general form, the Milky Way galaxy is a flattened disc measurin| 100,000 li|ht Lears in diameter and 16,000 light years along its polar axis〔4〕. Were we able to view

〔1〕 optical telescopes **光学望远镜。下文** radios telescopes **射电望远镜。**

〔2〕 Local Group of galaxies **本星系群。**

〔3〕 Magellanic Clouds **麦哲伦云。**

〔4〕 along its polar axis **沿极轴。本句意为"就大体形态而言，银河星系是个直径为十万光年、沿极轴长度为一万六千光年的扁平圆盘。"**

it from above one of its poles, we would find that it is a spiral galaxy in which two curved arms spiral outward from a great central cluster of stars. All of the stars, including the stars that form the spiral arms, are thought to rotate about the central point in the galaxy. Along the spiral arms are small knots of star groups.

The entire galaxy is enclosed in a haze which is actually the light of millions of stars throughout the galaxy. Surrounding the galaxy are found star *clusters* that form the *galactic halo*.〔1〕 Extending through the center part of the galaxy is a dimmer region, the *dusty region*, in which new stars apparently are in the process of forming. Astronomers estimate that the galaxy turns one full revolution on its axis every 200 million years.

The sun lies in one of the sbiral arms at a distance of about 30,000 light years from the center of the galaxy. When the sky is clear and the earth is in the right position, an overhead haze of white light can sometimes be seen stretching from the northeastern horizon off toward the southwestern horizon, the "milky way."〔2〕

Estimates of the number of stars in the Milky Way range from 100 to 500 billion. Of the total, there are 6,000 stars that can be seen by the naked eye, 3,000 each to viewers of the northern and southern hemisbheres. Stars in the lalaxL lie about U light years apart. Other than the sun, the star nearest to us is Proxima Centauri,〔3〕 which is 4.3 light years away S

---

〔1〕 galactic halo **银河晕。本句是倒装句,主语是** star clusters, **因有** that **引导的定语从句修饰,故后置。全句意为"银河系周围可以发现构成银河晕的星团。"**

〔2〕 stretching ... **这一现在分词短语在这里用作主语补足语。** haze **霾,烟雾;混沌。本句意为"当天空晴朗且地球处于适当位置,有时可以看到头顶上白色光晕,从东北地平线伸展至西南地平线,那就是"银河'。"**

〔3〕 Proxima Centauri **(半人马座)比邻星。本句意为"除太阳以外,离我们最近的恒星是比邻星,有** 4.3 **光年远。"**

Arcturus,[1] a fairly bright star, is 40 light years away from the earth. This star was used to light the Chicago World's Fair[2] in 1933. Chicago had hosted a great world's fair, the Columbian Exposition, 40 years earlier, in 1893. Light that had started on its journey from the star to the earth in 1893 reached the earth in 1933. Using an electric eye mechanism[3], the light from Arcturus turned on the lights of the 1933 fair — and made a good news story.

Many of the stars in our galaxy are double or multiple stars[4]. Such stars are separate from one another but revolve around a common gravitational point[5]. Sirius, a very bright star, is a *binary*, actually two stars that revolve about a common center of gravity. In the middle of the constellation Ursa Major, the Big Dipper[6], is a binary of the stars Mizar and Alcor. Proxima Centauri, astronomers now know, is actually a triple star. *Multiple stars* are rather common in the universe.

Stars range widely in their physical characteristics. A near-average star in terms of[7] size and temperature is the sun. Much larger than the sun is the giant star Antares[8], with a diameter of 480 million miles and a bri]htness 3,200 times that of the sun. Antares' densitL is estimated to be 0.0000003, a densitd that would be about the same as a sMrad of

---

〔1〕 Arcturus **大角(牧夫座 α 星)。**

〔2〕 Chicago World's Fair **芝加哥世界博览会。下文** Columbian Exposition **哥伦比亚博览会。**

〔3〕 electric eye mechanism **光电管机构。**

〔4〕 double or multiple stars **双星或聚星(多重星)。**

〔5〕 revolve around a common gravitational point **围绕公共重心运转。与下文** a about a common center of gravity **同义。**

〔6〕 Ursa Major, the Big Dipper **大熊星座。**

〔7〕 in terms of **在……方面 ;依据 ;以……措词。**

〔8〕 Antares **心宿二。下文** brightness **亮度 ;**density **密度。**

powder blown vigorously into the air. The surface temperature of Antares is thou|ht to be 3,100℃. Even larger than Antares is Ras Algethi, with a diameter of 690 million miles and a firm claim to the title of the "supergiant" of the Milky Way.

Another noteworthy star in our galaxy is Beta Centauri〔1〕. In most aspects it is a typical star. Its diameter is 11 times that of the sun, its bri|htness is 3,100 times that of the sun, and its density is only 0.02. Most unusual, however, is the surface temperature of Beta Centauri, an estimated 25,000℃. Seemingly ridiculously small is the star 40 Eridani Beta〔2〕. with a diameter of 0.019 that of the sun and only about twice that of the earth. However, 40 Eridani Beta is as dense as almost anything could be, 64,000 times denser than water. Its surface temperature is appreciably higher than that of the sun, about 9,500℃. The star Van Maanen is apparently the ultimate, in a negative way, among stars. Its diameter is less than that of the earth but its densitL is fullL 100,000 times the density of water. An object as small as an olive would weigh a ton if it were composed of matter as dense as that which makes up Van Maanen's star.

In its evolution, a star may begin its life in the lower end of the main sequence. It then rapidly expands and becomes a *red subgiant* star〔3〕. It is thought to then go through a pulsating stage, to cross the main sequence as it contracts and becomes a *white dwarf* star〔4〕. Finally, cooling slowly over millions of years, the star becomes a *dark star*〔5〕c Its light-giving life is over, at least for a while. Other stars mad follow

---

〔1〕 Beta Centauri **半人马座β星。**

〔2〕 40 Eridani Beta 40 **波江座β星。**

〔3〕 red subgiant star **红亚巨星。下文** red giant star **红巨星。**

〔4〕 white dwarf star **白矮星。** contract *v*. **收缩。**

〔5〕 dark star **暗星。**

different paths from positions near the upper end of the main sequence. By expansion they become *red giant* stars, go through[1] a period of pulsations and cross the main sequence, growing smaller all the time[2]. They then pass through the white dwarf stage and finally become dark stars.

Small stars are thought to live longer than large stars, and their ultimate fates may be quite different. Small stars gently fade away, whereas the large stars disappear in a gigantic explosion. Which of these two fates awaits the sun is not certainly known. Astronomers believe that the luminous life of the sun will be about 10 billion years. Stars with masses ten times that of the sun may live for perhaps no more than 10 million years, but stars with masses one-tenth that of the sun may survive for trillions[3] of years.

Exploding stars are not unusual. Astronomers have recorded fifty such explosions within the past 75 years. When a star has reached old age and is just about to explode, it swells and becomes reddish in color. The star continues as a red giant until all of the hydrogen, the light-giving fuel of the star, is used up. Once its fuel supply is gone, the star contracts to a size perhaps no larger than the earth but composed of very dense matter. Surface temperatures rise as the star contracts from a red giant to a white dwarf, and the loss of energy, finally, changes the white dwarf to a dark star. Large stars in the galaxy are thought to collapse[4] to Mroduce the element

---

〔1〕 go through 经历,通过。此处意为"经历一个脉动周期。"go through 与下文 pass through 同义。

〔2〕 all the time 一直,始终。

〔3〕 trillion (美、法)万亿(10^{12});(英、德)百万兆(10^{18})。本句意为"质量是太阳十倍的恒星可生存的时间也许不超过一千万年,但质量为太阳十分之一的恒星可生存几万亿年。"

〔4〕 to collapse 坍缩。这个不定式在句内作主语 large stars 的补足语。全句意为"人们认为(银河)星系内的大恒星坍缩而产生铁元素。"