英汉对照科技读物

了解科学

江苏科学技术出版社

UNDERSTANDING SCIENCE

了解科学

（英汉对照科技读物）

〔美〕 W. H. 克劳斯 著

阎兴朋 译注

江苏科学技术出版社

封面设计：宋正玉

了 解 科 学

（英汉对照科技读物）

江苏科学技术出版社出版
江苏省新华书店发行
镇江前进印刷厂印刷

1980年4月第1版　1980年4月第1次印刷
印数：1— 18,500 册
书号：13196·023　　定价：0.80 元

前　言

本书为英汉对照科技读物。原著为美国W. H. 克劳斯（William H. Crouse）所著的 UNDERSTANDING SCIENCE（A Technical Reader）。为适应具有初步英语知识的读者提高英语阅读和翻译能力的需要，现根据1975年版本加以译注出版。

本书内容包括化学、电子学、力学、无线电、核物理等方面的基础理论知识。作者从不同的角度通俗活泼地概述了物质的构造、电机、半导体、计算机、雷达、激光、原子能以及航空与空间技术等方面的科学技术，并扼要地叙述了这些技术的历史、现状及其发展趋势。

全书共分二十二篇。考虑到阅读翻译的实际需要，每篇后均选附科技文献资料中常见的短语和技术词语、语法注解和参考译文。书末附英汉对照度量衡表、度量衡比较表和化学元素表。

本书译注过程中，承蒙扬州师范学院外文系王楫同志的帮助，并蒙南京大学化学系曾成同志、物理系张淑仪同志、南京航空学院顾伟刚同志等审阅，徐州师范学院外文系冯大平同志亦给予了热情帮助。在此谨表示衷心感谢。

由于水平所限，缺乏经验，译注中难免有错误之处，欢迎读者批评指正。

译注者

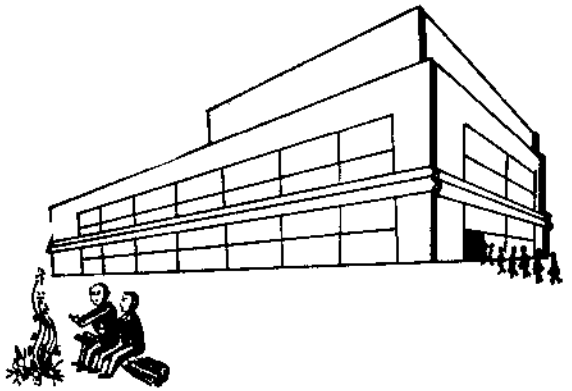
一九七九年五月

CONTENTS

目　录

1. THE ATOM

A man trying to see a single atom would be somewhat like a man trying to see a single drop of water in the ocean while flying many miles above it[1]. He would see the results of a great many drops of water having come together. But he certainly would not be able to see a single drop of water.



In much the same way, we can see the results when a great many atoms have grouped together to form a grain of sand or a drop of water. But there is no method known to science today that can make it possible for us to magnify a drop of water enough to see one single atom—atoms are so very, very small[2]. In just

one drop of water there are about 3,300 billion billion atoms! That number is written by putting eighteen zeros after the 3,300! How long do you think it would take you to count that many atoms, if you could count one a second, day and night? It would take one hundred thousand billion *years*! We can begin to realize how tiny atoms are when we know it would take that long just to count the number of atoms in a single drop of water.

In spite of its smallness, however, we can get a reasonably clear picture of the atom by using an instrument that is more powerful than any microscope. That instrument is our imagination, and with its help we can magnify the atom enough so that we can examine its make-up.

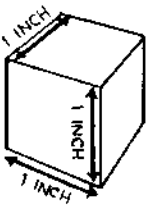
A DROP OF WATER IS MADE UP OF BILLIONS OF ATOMS

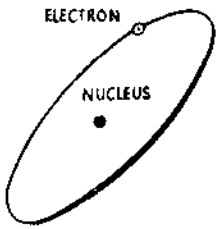
Examining an atom

Let us examine the simplest of all the atoms—an atom of hydrogen. Hydrogen is a gas, the lightest-weight gas there is. In fact, no other substance in the

world is as light as hydrogen.

We will start with a cubic inch of hydrogen at atmospheric pressure (or the air pressure at the earth's surface). If it were at a temperature of 32 degrees Fahrenheit[3], this cubic inch of hydrogen would contain about 880 billion billion atoms. Next, suppose we could increase the size of this cube until it became large enough to contain the earth. It would then measure 8,000 miles on each side. Now, if the atoms in the cube were increased in size a like amount, we should find that they had become large enough to see—for each





THE ATOM ITSELF IS LARGELY EMPTY SPACE

atom would now measure about 10 inches in diameter!

You would note, first of all, that the atom is largely empty space. Then, if you could slow down the moving parts of the atom, you would see that it consists of nothing more than two particles! There is one particle at the center. Another particle whirls around this central particle at a tremendous speed—much as a ball on the end of a string might be whirled around your head.

The center of the hydrogen atom consists of a single particle called a "proton". The smaller particle which is whirling madly about the proton is called an "electron". This, then, is the hydrogen atom: a proton in the center, and an electron whirling about it.

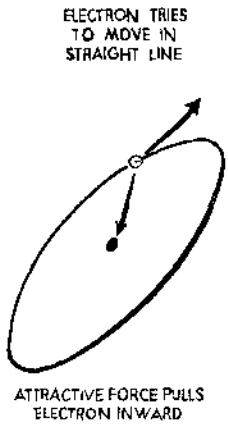
The riddle of electricity

The proton and the electron are two forms of electricity. The proton has a charge of positive electricity. The electron has a charge of negative electricity.

When we have said this, we can go no further. For we are up against one of the great mysteries of the universe: the riddle of electricity itself. No one can say—yet—just what these basic positive and negative charges of electricity *are*. But this we do know[4]: they are two of the basic building blocks from which the atom is constructed.

Between these two tiny particles, the proton and the electron, there is a powerful attraction—the attraction

that is always present between negative and positive electric charges. This attraction tends to pull the electron in toward the proton. Counterbalancing it is the tendency that the electron has to move in a straight line[5]. In other words, if there were no attraction, the electron would fly away from the proton in a straight line. But the attraction between the proton and the electron overcomes this tendency, so that the electron continues to whirl about the proton. This is very much like the combination of forces that are set into motion when you whirl a ball on the end of a piece of string. If the string should break, the ball would fly away from your hand But if it does not break, the string acts as an attractive force between your hand and the ball. The string keeps the ball moving in a circular path around your hand.



Two important ideas we have discussed in this chapter are (1) all material things in our world are made up of tiny particles called atoms, and (2) the hydrogen atom is made up of two electric particles, a proton and an electron.

Phrases and Expressions

be able to	能够
in...way	以……方法(方式)
in spite of	尽管,不顾(管)
as...as...	和……一样
start with	从……着手(开始)
first of all	首先,第一
slow down	(使)慢下来,减速
consist of...	由……组成(构成)
more than	多(大)于,不只是,不止
at...speed	以……速度
much as	与…几乎一样,与…非常象
be up against	面临,遭遇(困难等)
in other words	换句话说,换言之
in fact	事实上
(be) set into motion	(使)运转,开(启)动
act as	起……作用,作为,充当
be made up of	由……构成(做成)
billion	十亿〔美、法〕;万亿〔英、德〕

Notes:

〔1〕 A man trying to see ... while flying many miles above it;

句中两次出现的 trying to see... 均为分词短语(意思

相当于 who is trying to see...)，作定语，修饰 a man，可译为：如果有人想要看到……。while 为从属连词，后面省略了 he is，while... 在句中作时间状语。

〔2〕 But there is no method known to science today that can make it possible for us to magnify a drop of water...that 是关系代词，引导定语从句，修饰 method。make 作"使……"讲，其后的 it 为形式宾语，真实宾语是不定式短语 to magnify... 。

〔3〕 If it were at...

是虚拟语气，表示假设的条件。

〔4〕 But this we do know; they...

此句是倒装句，原为：But we do know this; they...。do 在这里起加强谓语动词 know 的语气的作用，强调我们"的确"知道。they... 是 this 的同位语(句)。

〔5〕 Counterbalancing it is the tendency that...

Counterbalancing 是动名词(gerund)，后跟宾语 it，构成动名词短语，做全句的主语。that the electron... 是定语从句，修饰 tendency，为便于理解，故与主句拆开翻译。这句的直译是：……而电子要作的直线运动则抵消了这一引力。

Translation

1. 原　　子

如果有人想要看见单独的一个原子，那就简直象从飞行在海洋上空几英里高的飞机上看见大海中的一滴水一样困难。他能看到的只是无数水滴汇成的大海，却肯定不能看到单独的一滴海水。

同样，我们只能看到由许许多多原子组合成的一粒沙子或一滴水珠。但是，今天的科学还没有办法使我们能把一滴水放大到足以看清它的一个原子的程度，因为原子实在太小了。仅仅在一滴水里大约就有33万亿亿个原子。要把这个数字写出来，就得在3,300后面加上18个"0"！你可想过，如果一秒钟数一个，昼夜不停．你要花多少时间才能数完这么多的原子？需要一百万亿年！知道了数清一滴水中的原子需要这么长的时间，我们就能体会到原子该是多么的微小呀！

一滴水由以几十万亿亿计的原子组成

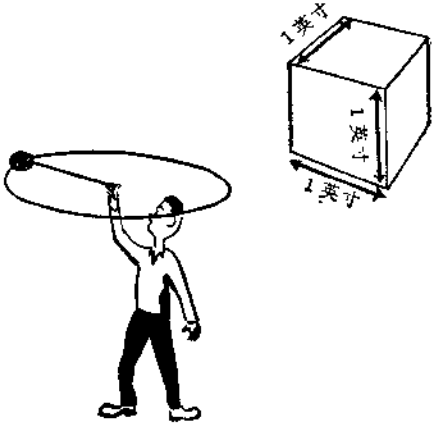
原子尽管很小，然而我们能用比任何一种显微镜放大能力更强的仪器就可以得到一个相当清晰的原子图形。这种仪器就是我们的想象力。借助这种想象力，我们可以把原子放大，大到可以对它的结构进行研究。

研　究　原　子

让我们来研究一下所有原子中的最简单的一种原子——

即氢原子。氢是一种气体，而且是所有气体中重量最轻的气体。事实上，世界上再也没有象氢一样轻的物质了。

我们先拿在大气压力(地面的气压)下的一立方英寸的氢作个例子。假如温度在华氏32°时，这一立方英寸的氢约含88,000亿亿个原子。现在假设我们把这个立方体的容积扩大到足以把整个地球装进去，那么，测量这一立方体每边的长度就为8,000英里。如果这个立方体内氢原子的体积也以同样的比例增大，那么我们就会发现这些原子已大到能看得见了，因为这时每个原子的直径已约为10英寸了。



原子本身的结构大部分是空空的

首先，你会注意到，原子内大部分是空空的。如果你能够把原子的运动部分的速度减慢，那么，你会看到原子只不过是两个粒子组成的！一个粒子在它的中心，另一个则以惊人的速度绕着中心粒子旋转——就好象你在自己的头顶上甩转拴在绳端的小球那样。

氢原子的中心只有一个粒子，称作"质子"，围绕着这个质子疯狂地旋转的另一个较小的粒子，称为"电子"。一个质

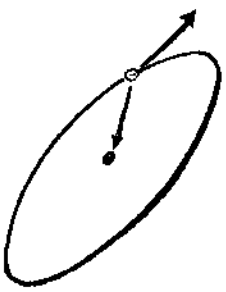
子居中，一个电子绕着这个质子旋转，这就是氢原子。

电　之　谜

质子和电子是电的两种形式。质子带正电荷，电子带负电荷。

我们说到这里，就再也深入不下去了。因为我们碰到了宇宙万物中最为神密的事物之一，就是电本身之谜。至今还没有一个人能讲清这些基本的正电荷和负电荷是什么。但是，我们倒的确知道这点：它们是原子结构中的两个基本组成部分。

在质子和电子这两个微小粒子之间，有着强大的引力，也就是正电荷和负电荷之间始终存在着的引力。这个引力总想把电子朝着质子方向拉，而电子总是要作直线运动，于是两种力量达到平衡。换句话说，假若没有这种引力，电子将以直线飞离质子。但是质子和电子间的引力克服了这个趋势，所以电子就一直绕着质子转。这很象你甩转系在绳端的小球使之运动时，所出现的力的合成情况。如果绳子断了，球就会脱手飞走；反之，如果绳子不断，绳子就在手和球之间起着引力作用，绳子使球永远绕着你的手作圆周运动。

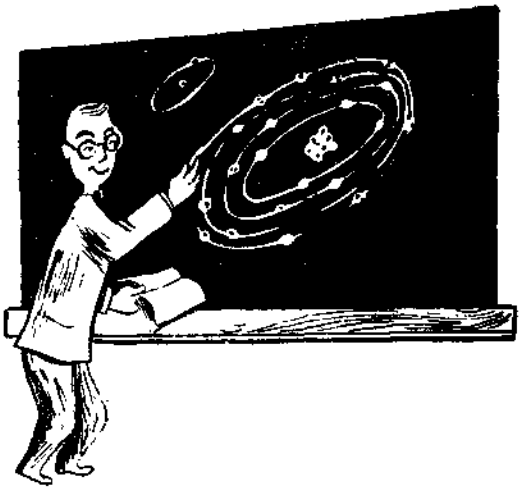


引力总想把电子朝里拉

本章我们讨论的两个重要概念是：(1) 世界上所有的物质都是由叫做原子的微粒子所组成。(2) 氢原子是由两个带电粒子，即一个质子和一个电子所组成。

2. MORE COMPLEX ATOMS

The hydrogen atom is the simplest and lightest of atoms. The atoms of other elements are more complex and heavier. The actual weights are, of course, exceedingly small. It would take 754 million billion billion atoms of hydrogen to weigh a pound!



The next element above hydrogen, as we go from the simplest to the most complicated elements[1], is helium. Helium, like hydrogen, is a gas. It is heavier than hydrogen because its atoms have more particles in them than the hydrogen atoms do. Next to hydrogen,