

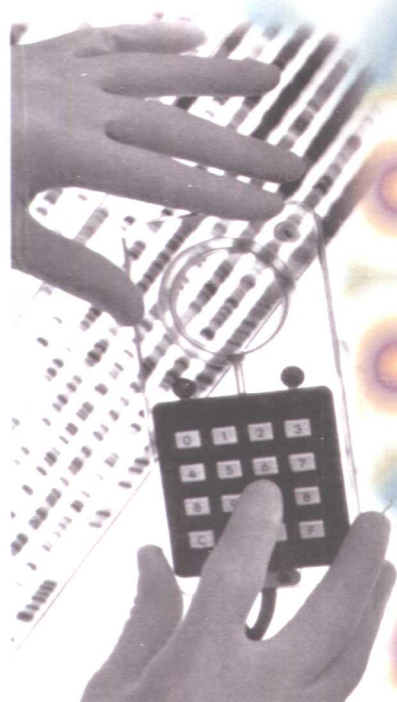
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DNA: The Thread of Life

DNA: 生命的延续

[美] Frank H. Wilcox 著

王 崑 陈 凯 译



科学普及出版社



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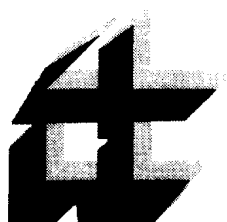
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Introduction



The storage of a large amount of information in a small space is becoming more and more common in our world. Whole newspapers are condensed onto small bits of microfilm. Volumes of data are stored in tiny microchips. Not very many years ago, a computer occupied a large room, but now one will fit on the top of a small desk.

This kind of storage of large amounts of information is not at all new. In each of the many cells that make up our bodies, we have information stored in the form of DNA. This information directs

引言



在我们生活的世界中，利用小空间存储大量信息正变得越来越普遍。整张报纸的内容被压缩进小小的微缩胶片上，成卷的数据被存储到微小的芯片里。不久以前，安放一台计算机还需要一间大房子，但是现在一个小小的桌面就可以摆放一台计算机了。

这种大容量信息的存储根本不是什么新鲜事了。在构成我们身体的每一个细胞里，信息是以 DNA 的形式存储的。这些信息支配着人体内所有复

the operation of all the complex functions of the body . It also controls the formation of new cells and of new living beings, starting from a single cell . Differences in the information stored in DNA are responsible for the inherited differences among people, such as those of height, facial appearance, and skin color .

Each cell in the body has the means of packaging and storing the information of DNA in a small space . The cell can use some or all of the information, depending on its needs, and can make accurate copies of the DNA to pass the information on to new cells . The cell even has what amounts to its own word processor to correct mistakes made in copying DNA .

Genetics is the science that studies the information of life contained in DNA .

杂功能的运转。它还控制着源自单一细胞的新细胞、新生命的形成。DNA中所存储的信息的差异决定了人的遗传差异，如身高、相貌以及肤色。

人体的每一个细胞都有办法压缩DNA信息并将其存储到小空间里的。够根据其需要，细胞可以使用一些或全部信息并能精确地复制DNA，从而把信息传送给新细胞。细胞甚至有自己的文字处理器，来校正用它复制DNA时所产生的错误。

遗传学是研究包含在DNA中的生命信息的科学。许多有关遗传学

Introduction

Many of our early ideas about genetics came from experiments in crossbreeding animals and plants that were different from each other, such as plants with red or white flowers or animals with long or short hair. Only recently, however, have we gained a real understanding of genetics. And we are constantly learning more, thanks to important new techniques that involve a special type of DNA called **recombinant DNA**. In this book, you will learn about our newly gained knowledge of just what genetic information is, how it is used, and how it can be changed.

的早期认识来自于相互不同的动物、植物之间的杂交试验，例如开红花或白花的植物、或是长毛动物与短毛动物。但是，直到近日我们才对遗传学有了真正的了解。由于一些新技术的出现，我们对 DNA 知道得越来越多，如一种称之为**重组 DNA**的特殊类型 DNA 的发现。在这本书中，你会了解到什么是遗传信息这样的新知识，它是如何被使用的，以及它是如何被改变的。

1. What is DNA?



You have just learned that the genetic information in cells is contained in DNA. But what is DNA? What is it made of? And, more important, what is it about DNA that provides the cell with information? This chapter will present some answers to these basic questions.

DNA is a chemical substance with a rather complex structure, but fortunately we can understand its makeup without chemical formulas or a lot of scientific jargon. A piece of DNA is like a miniature ladder, with two sides and rungs connecting the sides. The sides of the

1. 什么是 DNA?



你刚刚了解到细胞中的遗传信息被包含在 DNA 里。但是，什么是 DNA 呢？它是由什么构成的呢？而且，更重要的是，DNA 是如何给细胞提供信息的？这一章将回答这些基本的问题。

DNA 是一种结构十分复杂的化学物质，但幸运的是，我们能够不必用化学公式或许多难懂的科学术语来理解它的构成。一段 DNA 就像是一个袖珍梯子，有两条边和与之相连的横杠。DNA 梯子的两条边相互盘绕，如同

1. What is DNA?



DNA ladder are twisted around each other, as in a spiral staircase, with 10 rungs for each turn.



This tells us something about the shape of DNA, but we need to know more in order to learn about the information that DNA contains. We need to know what DNA is made of. It consists of three substances that are connected together in a very orderly manner. One of these is **phosphate (P)**, a chemical similar to phosphoric acid. Another is a sugar called **deoxyribose (D)**, a smaller version of the sugar glucose. The third substance is a **base**. Four different bases

1. 什么是 DNA?

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盘旋的楼梯，每一个弯曲拥有 10 条横杠。



上面的解释告诉了我们关于 DNA 形状的一些知识，但想要了解 DNA 中所包含的信息，我们则需要知道的更多。我们需要知道 DNA 是由什么组成的。DNA 由三种物质构成，这些物质以非常有序的方式连接在一起。其中之一是**磷酸盐(P)**，它是一种类似于磷酸的化学物质。另一种是称为**脱氧核糖(D)**的糖，它是较小类型的葡萄糖。第三种物质称为**碱基**。DNA 中存有四



## 1. What is DNA?

are present in DNA, each with a different shape. The four bases are **adenine** (A), **cytosine** (C), **guanine** (G), and **thymine** (T).

The way in which these three substances are arranged is very important to the function of DNA. It will be easier to understand this arrangement if we look at a section of DNA that is not twisted and use letters for the different parts. Still thinking of DNA as a ladder, we can say that each side piece of the ladder is a strand that is formed by units of phosphate joined with units of deoxyribose. The units alternate with each other, like this:

P-D-P-D-P-D-P-D-P-D-P-D-P-D-P-D-

The two side pieces or strands of