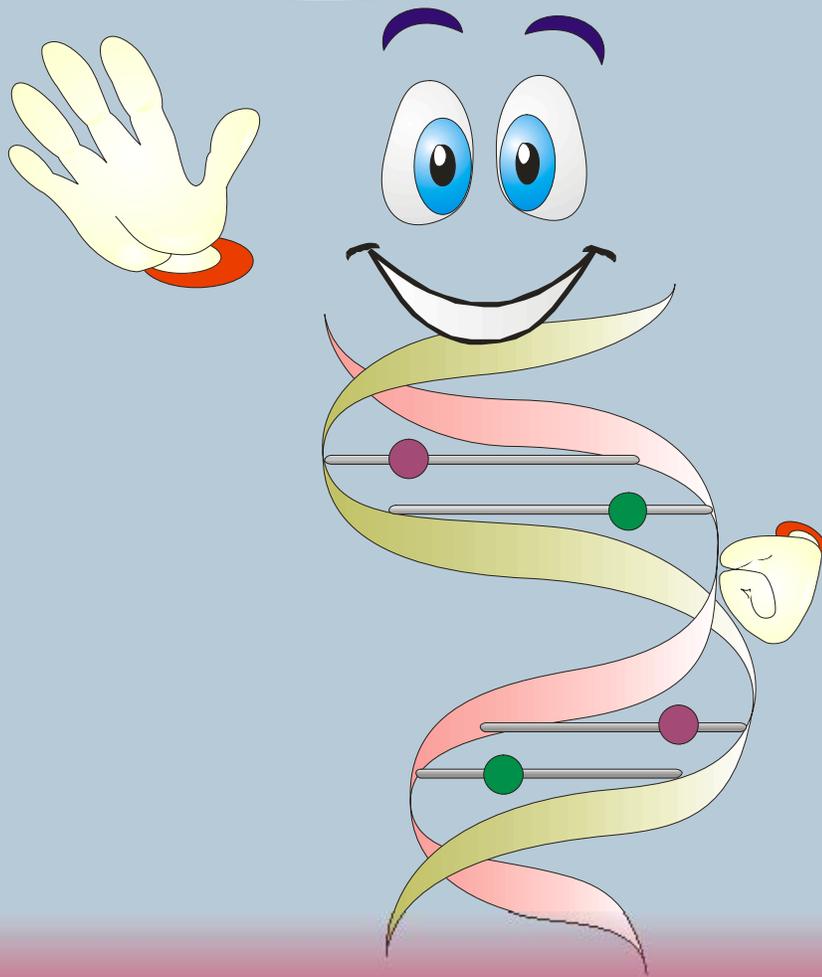


My Name Is GENE



Written & Illustrated by

N.L. ESKELAND, PH.D. & N.C. BAILEY, PH.D.

THIRD EDITION

My Name Is GENE

THIRD EDITION

N.L. ESKELAND & N.C. BAILEY

Science2Discover, Inc.

Del Mar, CA

Book Cover designed by Eric Beck & Celeste Bailey

Illustrations done with CorelDraw

ISBN 0-9673811-9-3

Copyright © 2006, by N. C. Bailey and N. L. Eskeland

All rights reserved. Third Edition 2007

Reproduction or translation of any part of this work beyond that permitted by Sections 107 and 108 of the 1976 United States Copyright Act without the permission of the copyright owners is unlawful. Requests for permission or further information should be addressed to the publishers:

Science2Discover

P.O. Box 2435

Del Mar, CA 92014-1735

Web site: <http://www.science2discover.com>

Printed in the United States of America

PREFACE

God created us in His own image. He wonderfully made us to reflect His glory and wisdom. Much of what makes each one of us unique could be traced to our genetic code. This book deals with the functions of this genetic code we call GENE, as well as the scientific advances made as the result of this great discovery.

We hope that you find this book informative and enjoyable. However, most of all, we hope that you will be more in awe of God's infinite power and love. He created every fiber of us with great care and purpose.

In Him,

The Authors

To all future scientists: May you be filled with love and awe for God as you discover His infinite wisdom and creativity!

TABLE OF CONTENTS

CHAPTER 1	9
WHO AM I?	9
What do I look like?.....	11
Review Questions	19
CHAPTER 2	20
MY HOME AND MY JOB	20
Cell Structure	20
My Job	27
What do I do all day?	27
How do I replicate myself?.....	27
How are RNA and proteins made?	27
What else is happening to my home every day?.....	36
Cell Cycle.....	37
How do animals and plants reproduce?	39
Sexual Reproduction	39
Asexual Reproduction.....	42
Advantages and Disadvantages of Sexual and Asexual Reproduction....	42
Review Questions	44
Discussion.....	44
CHAPTER 3	45
HEREDITY	45
Mendel’s first hypothesis.....	46
What is homozygous or heterozygous for a trait?	48
What do phenotype and genotype mean?	48
Mendel’s First Law	50

Mendel’s Second Law	56
Examples of Things You Inherit.....	61
Inherited versus Acquired Traits.....	63
Review Questions	64
Discussion.....	65
CHAPTER 4.....	66
CLONING	66
What is the purpose of cloning me?	69
In Medicine:	69
Genetic Testing and Screening	69
Gene Therapy	73
Antisense Technology	74
Vaccines	77
In Agriculture.....	78
In Forensic Medicine	80
Review Questions	81
Discussion.....	81
CHAPTER 5	82
IN THE LABORATORY	82
How is cloning done in the laboratory?.....	82
Dolly’s Story	85
Review Questions	86
Discussion.....	86
CHAPTER 6	88
A MUTANT!	88
Type of Mutations.....	89

Selective Breeding	92
The Human Genome Project	94
Review Questions	95
Discussion	95
GLOSSARY.....	96
BIBLIOGRAPHY	101
RECOMMENDED WEB SITES ON THE GENE.....	102

CHAPTER 1



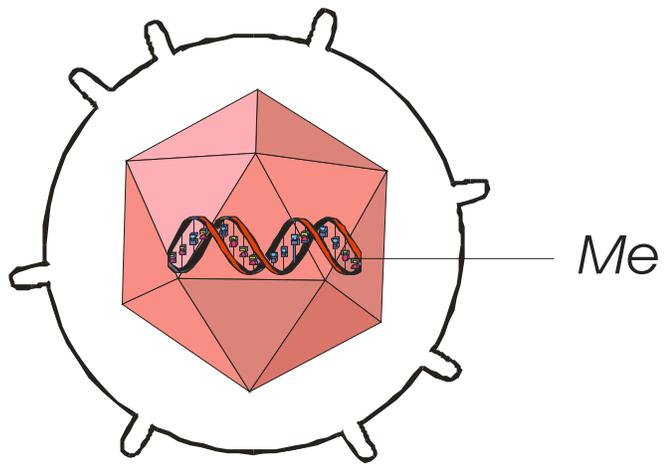
WHO AM I?

And God said, “Let the land produce vegetation; seed-bearing plants and trees on the land that bear fruit with seed in it, according to their various kinds.” And it was so. And God said, “Let the land produce living creatures according to their kinds...” – Genesis 1:11, 24 (NIV)

And God said, “Let us make man in our image, in our likeness, and let them rule over the fish of the sea and the birds of the air, over the livestock, over all the earth, and over all the creatures that move along the ground.”
–Genesis 1:26 (NIV)

In the beginning, God created the heavens and the earth and all living organisms; and, of course, that includes me. All things were created with specific purpose. No organism could exist without my creation. I live in every organism, from the complex, multi-celled humans, all the way to a *virus*. (All words written in *italic* are explained in the Glossary section at the end of this book). I am the source of information that is passed from one generation to the next. Thus, I insure diversity and survival of the species, according to God’s perfect plan.

Can you guess who I am? Figure 1 shows a picture of me inside a virus.



I am inside a virus

Figure 1

Did you ever squirm in delight, or horror, when your parents, relatives or friends came up to you and said, “You look just like your mom!” Well, there is a lot of truth to that. Half of you comes from your mother; the other half comes from your father, which makes a blending! This phenomenon is called *heredity*.

My name is Gene and I am the unit of heredity, which carries information from one generation to the next.



Microscope

What do I look like?

For ages and ages, I thought that I was invisible since a naked human eye couldn't see me. A microscope couldn't do the job either. I always wondered why my Creator made me so tiny. It could be so I wouldn't take up too much space. Nobody knew how I looked or how I really worked. I was a mystery to scientists. Then, one day in 1953, that changed. An Englishman named Francis Crick and an American named James Watson finally unraveled my quite large physical form. They used a rather complicated technique called *x-ray diffraction* that was developed by two English scientists, Rosalind Franklin and Maurice Wilkins.

I was the greatest discovery of the century, and my discoverers were rewarded. In 1961, Drs. Watson, Crick and Wilkins won the Nobel Prize in

Medicine. A picture of Watson and Crick is shown in Figure 2. Unfortunately, Dr. Franklin died before she received the famous award.

Have you ever seen train tracks from a distance? They seem squiggly. I look kind of like that, except that my tracks widen, then narrow and cross themselves, then widen again, and so forth. My form is known as a double-helical structure. It is composed of two intertwined, stringy, spaghetti-like strands called nucleic acid or DNA (deoxyribonucleic acid). DNA is illustrated in Figure 3.

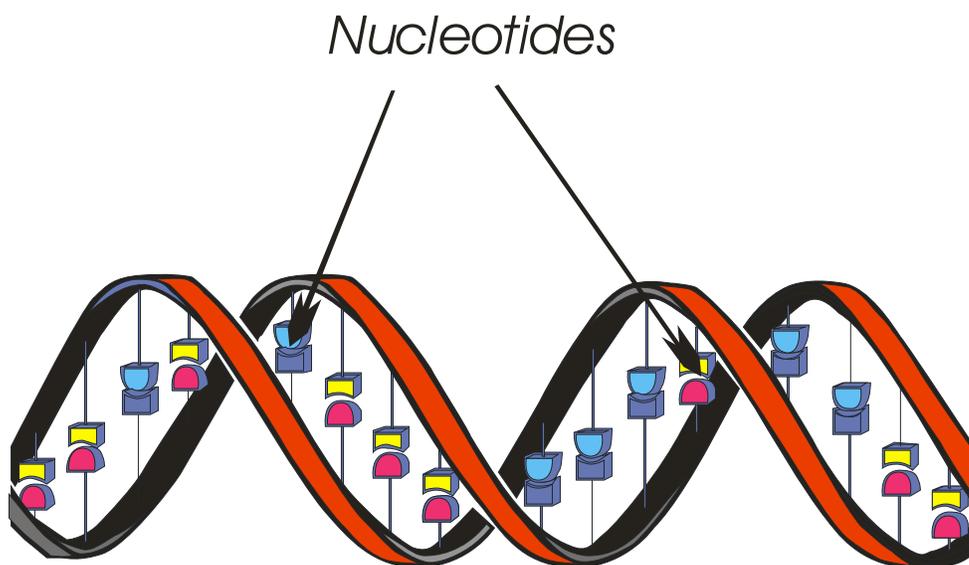
The DNA consists of four *molecules* called nucleotides. A nucleotide is made up of a base, a sugar molecule and a phosphate group. I, the unit of heredity, am stored as a code made up of the four nucleotides running along the length of each strand and joined together in pairs. The bases are: 1) adenine, 2) cytosine, 3) guanine, and 4) thymine. Since these terms are used so many times by scientists, they refer to them as A, C, G, and T, respectively. A and G are purines- each consists of two diffused rings; and C and T are pyrimidines- each consists of one ring. The nucleotides are linked together in a chain (for example: A-C-G-T). These chains are called *sequences*. You can see the sequences in Figure 3. The two strands are held together by special bonds, called *hydrogen bonds*, which make me look like train tracks. To protect me from damage, God paired the correct bases together: A always pairs with T while C pairs with G. You can see pairing between the bases in Figure 4.

Because of the DNA's threadlike appearance, it is sometimes called "The thread of life".



Francis Crick & James Watson

Figure 2



The DNA

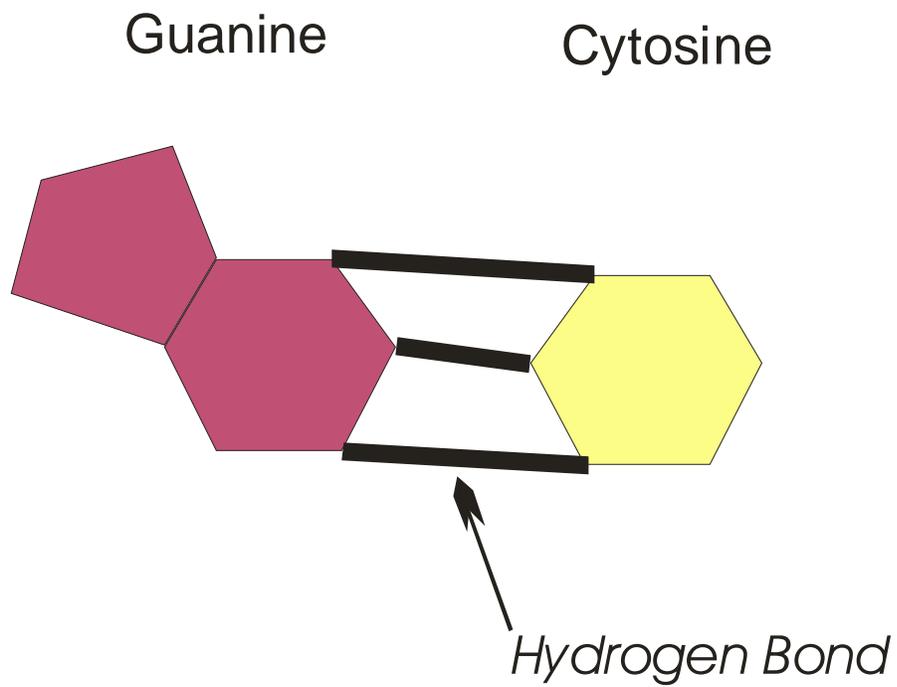
Figure 3

Exercise 1 (Figure 5): Which nucleotides go on the other strand of DNA? Add the correct nucleotides where the green circles are.

A piece of DNA is not considered a gene, but the entire DNA sequence necessary to make a functional *protein* or *RNA* (ribonucleic acid) molecule is. Imagine a word search game, where at first glance, the letters seem scrambled and make only incomplete, meaningless words. As you continue with your search, you eventually find real words. Likewise, a DNA sequence which does not code for a complete protein or RNA, is without meaning and, hence, not a gene. We shall talk more about proteins and RNA later.

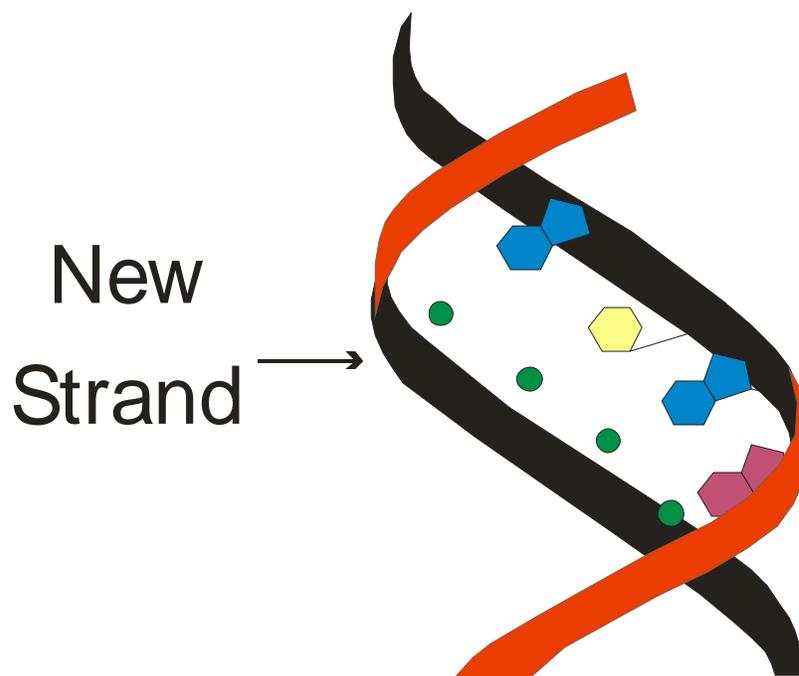
The first DNA was discovered in *bacteria* that cause the illness pneumonia. That is when scientists accepted that DNA is the basis of heredity in bacteria and in higher *organisms*. Figure 6A shows how microorganisms look to the naked eye. Figure 6B shows how these organisms look under the microscope. The bacteria are grown in a special culture dish with a cover, called a *petri dish*. The bacterium that causes pneumonia, is known as pneumococcus, and is shown in Figure 6B.

Heredity is not the only thing that makes me important. I do a lot of other things under God's direction, such as cure certain illnesses, make flowers and plants healthier and tastier (if they are edible), and other important duties to ensure your survival.



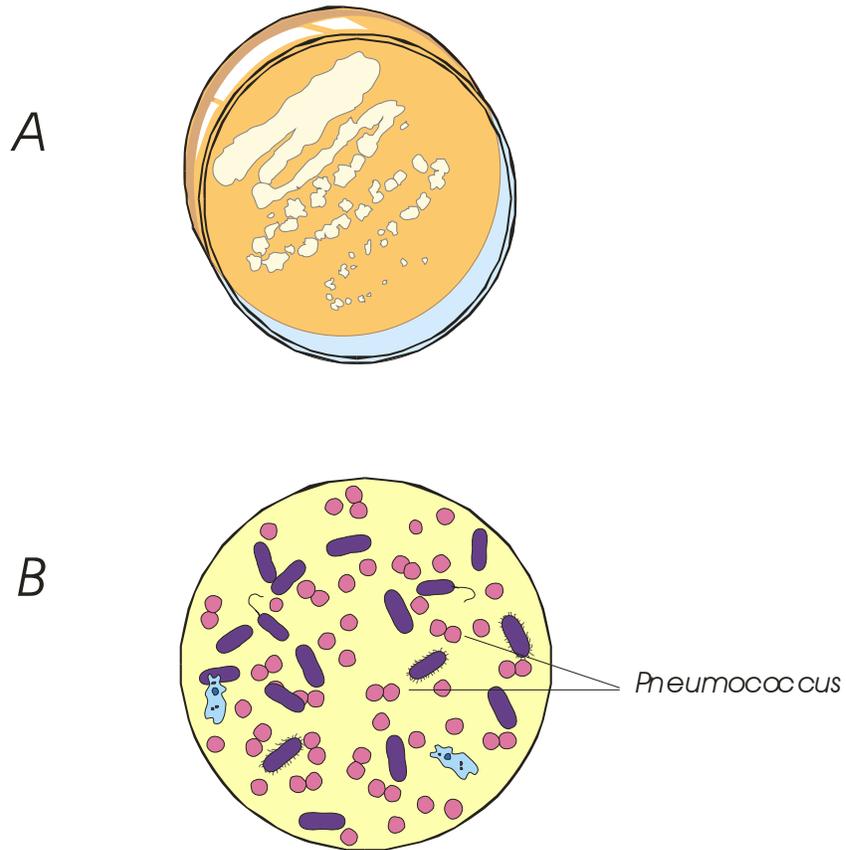
Paired Bases

Figure 4



Exercise 1

Figure 5



Assorted microorganisms

Figure 6

You probably learned by now that I am very special and famous. In contrast to many celebrities who jealously guard their privacy, I would like you to be my guest at my home in the next chapter.

Review Questions:

1. Who discovered DNA?
2. What are the names of the four bases?
3. What type of bond holds the nucleotides together?
4. In what organism was DNA first discovered?