MODULE 1

WHO AM I AND WHY DOES HEALTH MATTER?

Powerhouse Update

When NASA is planning a mission, the scientists pay great attention to the details of space suits to protect the lives of the astronauts from the harsh conditions of space travel.

When God created you, He paid great attention to your body, which we will call your **powerhouse**. God designed your body so that it would be compatible with the environment on the Earth. It would have to be sturdy, heal itself whenever possible, sense the world around it, and be able to grow, adapt, and resist infection.

When an astronaut steps into a 12-million-dollar space suit, great care is taken not to rip it or disconnect any of the structures sewn into it. You live in a powerhouse of even greater value! With good health and nutrition choices, your powerhouse will work better for you during your mission here on this planet.

In addition to the natural body structure passed to you through your family line, you also have a personality with your own temperament and preferences. In this first module, we will look at the powerhouse you have inherited and aspects of your personality that are natural to you.

WHY STUDY HEALTH?

Look in the mirror. Do you see that person staring back at you? Of all the people of the world that you could be, you are yourself, living out the life God has chosen for you. No one else can be you, nor can you ever live out someone else's destiny. You have a unique part to play.

Yet you probably struggle with your identity, your dissatisfaction with your behavior or lack of skill, your disappointment with relationships that break, your inability to achieve the top place in competitions, and your frustration with having to endure years of life as a teenager, somewhere between childhood and grown-up. You might be the same size as your parents, but you don't have the same responsibilities or the same freedoms. And it is probably not yet clear to you who you will be as an adult.

Figure 1.1

Who are you?

Think about this.

Dr. Ravi Zacharias, a Christian apologist and evangelist born in India, says, "The word *individual* comes from the Latin which means 'cannot be divided.' You are a composite whole. One entity. God gave you that life. He has wired you and uniquely gifted you as an individual. He wants you to live out that individuality in the distinctive way He has made you" (2013b).

Some things about your personality and body are not chosen by you but are the expression of the genetic material you received from your biological parents at conception. Your amazing development followed the instructions written there and produced your **nature**, which is your natural appearance and personality. Your nature includes your physical structure, dictating whether or not you have dimples or short arms. Nature also includes your inherited abilities and weaknesses, including weaknesses that affect your health. Additionally, your nature includes your **temperament**—your natural reactions to people and situations. Think of your nature as your default settings. Even before you took your first breath, your nature was established.

Complicating these settings are your experiences in life, your story. We can call this **nurture**. Nurture shapes your natural state with tools that are sometimes cruel and sometimes kind. Nurture includes interactions with family members and others, as well as what you learn in your formal education and through life experiences. Nurture can be a variable you control when you choose your diet or exercise, or it can be out of your control as you encounter accidents, hardships, or illness. You can blame nurture for birth-order tendencies, how you handle fear, and what you do when given an opportunity for success.

As you develop into an adult, you grow in power over your future. Daily decisions become habits, and habits become lifestyle. And your lifestyle lived year by year will define your health—how you look, feel, and act. So what is health? Let's look at life as a whole and at health as holistic. **Health is the pursuit of balance physically, socially, mentally, emotionally, and spiritually.** Physical health provides enough energy for vigorous activity. Social health gives you a secure group of family and friends. Mental health is living with a good grasp of reality. Emotional health helps you express your feelings in appropriate ways. Spiritual health is confidence that you are growing in your relationship with God.

What is remarkable is that each of these areas affects the others. For instance, if you have a cold, you are not going to perform your best when you take that history exam. If you have not spent time and energy in Bible study and prayer, you might not have the patience to deal with your little sister. If you and your best friend just had a loud disagreement, you might not feel like eating supper.

Figure 1.2

You should always think about how you prioritize activities to make sure they are balanced.

Good balance in life's spheres will give you hope for the future, enjoyment of each day, and the ability to manage stress and control your appetites. Health is about how you optimize your ability to engage fully in life. It is far more than not being sick!

The balance of your health changes every day, and seasons of life will bring new challenges to your health. Eventually, in spite of all efforts to maintain it, your God-given, fragile, magnificent life on

Earth will come to an end and you will go on to your eternal reward. Until then, pursuing health is good stewardship of the life you have been given.

God has designed you to have enough energy and strength for tasks He gives you. You can direct your appetites, deal with stress, and defeat most infections with the natural package you live in. Within just a few years, you will be solely responsible for big decisions about how to stay healthy as long as possible. The choice will be yours.

Some young adults decide just to let life happen. It's as if they think they are from some other planet where people only need 4 hours of sleep each night and can sit comfortably in the same place all day. They think junk food doesn't make them tired, social media brings them all the friends they will ever need, entertaining themselves is the most important thing they do, and whatever feels good at the time is the best choice. Falling into these bad habits usually results in regret. Ideally, you can have both feet planted firmly in reality and avoid many of the errors of those around you. Pursuing good health and nutrition is simply doing the best you can with what you've got! A good place to start is to know yourself better. First, we will examine your *nature*, those inherited characteristics that you carry. We'll save *nurture* and its effects on you for later.

GENETICS

Imagine some older relative approaches you at a family reunion, lifts an eyebrow, and says, "Do you know how much you look like your Uncle Ernie?"

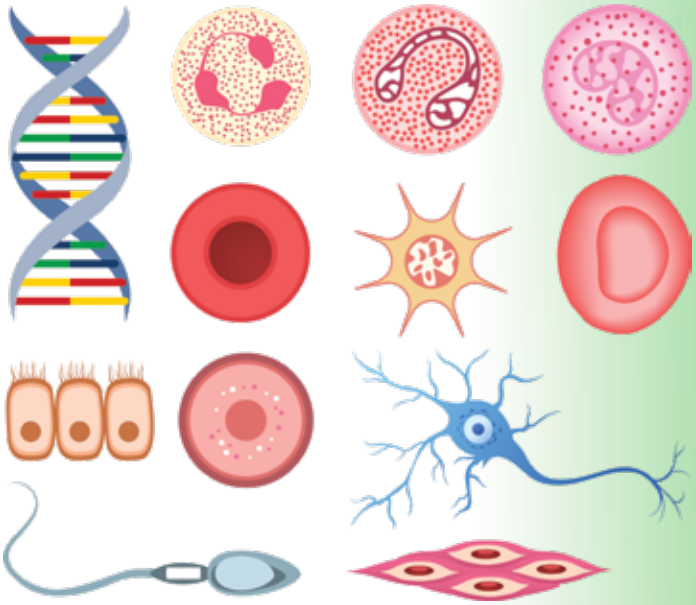
Uncle Ernie? You know Uncle Ernie died before you were born. You had no idea you looked like him. You pick up a faded black-and-white photo of Ernie. Perhaps it is the way his eyes squinted when he smiled or the way his hair stood up. You probably don't see much resemblance between yourself and Uncle Ernie, but your relatives do. That's genetics. You are unique to the world, but you carry the genetic predispositions and appearance of your ancestors. These inherited characteristics are called **traits**. **Genetics** is the study of these traits, carried on **chromosomes** (tiny structures full of information), which are passed from generation to generation.

Chromosomes

Your body is made up of trillions of microscopic, basic building blocks of life called **cells**. Almost every cell contains a **nucleus**, a central area enclosed by a membrane. Inside this nucleus are 46 chromosomes, which are long, fragile strands of **deoxyribonucleic acid (DNA)** covered with protective coating. Forty-six chromosomes are found in every nucleus in almost every cell in your body! If all of the DNA strands in a single cell were placed end to end, the DNA would be about 2 yards long.

Figure 1.3 shows various human cells. Notice that each one has a nucleus,

Figure 1.3
DNA and the Human Cell Nucleus



DNA (top left) is stored in the nucleus, the central dark area in each of these human cells.

a central dark area, where the DNA is stored. In the upper left corner is a drawing of a section of DNA.

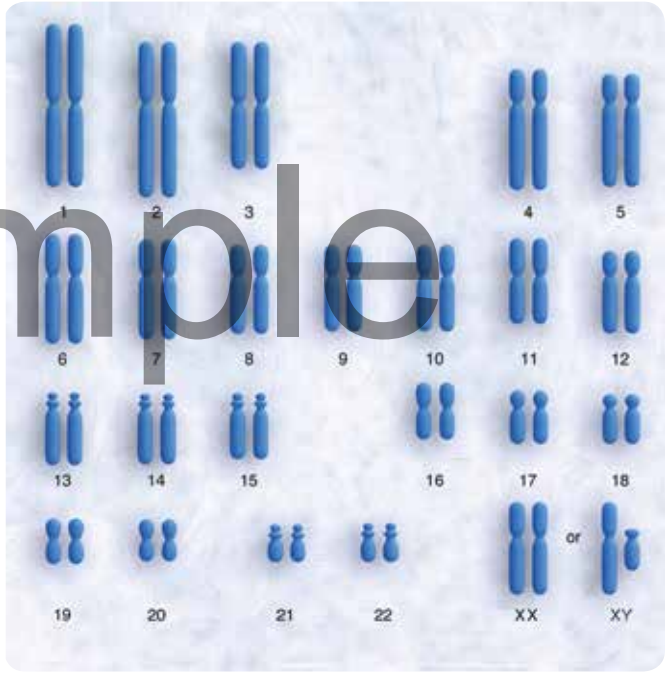
When you examine cells under the microscope, you don't often see chromosomes because most of the time they are unwound and spread out thinly in the nucleus. During cell division, though, as 1 cell splits into 2, the chromosomes become tightly wound (figure 1.4) and form structures that are visible under the microscope. The word *chromosome* means "colored body."

Once chromosomes have become visible, a photo can be taken of the cell nucleus that contains them. The photo can be printed, and a technician can cut up the photo and arrange the chromosomes by size and shape for closer study. Figure 1.5 is a drawing of such a study.

Figure 1.4
Creating a Chromosome

A long DNA strand twists up to form a visible chromosome.

Figure 1.5
Human Chromosomes Arranged by Size and Shape



Right away, it's clear that the 46 chromosomes match up into 23 **homologous** (ho-moll'-luh-gus) **pairs**—chromosomes that look similar but have subtle differences—because one chromosome in each pair comes from the person's mother and the other comes from the father.

Let's go back to the beginning. Each person's life begins as a single cell that forms at conception, when the father's sperm unites with the mother's egg. Most cells in the human body have *23 pairs* of chromosomes; but **reproductive cells**—sperm and eggs—divide their pairs and have only *23 single* chromosomes each. Whether the person gets the right or left chromosome of each pair from each parent is random.

Figure 1.5 shows that the chromosomes that would be pair 23 do not always fit the pattern of similarity. The 23rd pair determines the gender of the individual. A female has XX for the 23rd pair. A male has XY.

Because males have an X and a Y, the sperm cells they form contain 22 regular chromosomes and either an X or a Y chromosome. The egg cell of the mother contains the 22 regular chromosomes and always contains an X. If the sperm carries an X, the conceived child will have XX and be a girl. If the sperm carries a Y, the child will be male with XY for his 23rd chromosome pair.

Because the chromosomes come in pairs, each cell contains 2 copies of human genetics. The copies are slightly different from each other, often resulting in 2 versions of human traits.

No one else shares your exact genetic combination. Identical twins begin with exactly the same chromosomes, but studies have found that these twins have subtle genetic differences. Your sisters and brothers will receive a different assortment of chromosomes from your parents than you did. For example, perhaps you have your mother's right chromosome in pairs 5, 6, and 7, and your brother has her left

chromosomes in those pairs. With different siblings getting right or left chromosomes, you can see how genetically diverse even one family can be!

The single cell that was you at your very beginning divided again and again until it formed your body, now made up of around 60 *trillion* cells. Before each cell divided, the DNA had to be copied so that both new cells could each have all 46 chromosomes.

DNA Structure

The DNA is shaped like a twisted train track, as seen in figure 1.4. This shape is called a double helix. The outside strands are made of a special sugar (deoxyribose) joined together by phosphates. Between the sugar strands are crossbars, like railroad ties, of 2 joined **nucleobases**. A single nucleobase, with the section of sugar track it is attached to, is called a **nucleotide**.

Only 4 nucleobases are used in DNA, which means that genetic information is passed in a language—a code—that has only 4 letters to choose from! This might seem too simple, but don't be fooled. It's more complicated than it looks at first. Everything depends upon the order of the nucleobases and where the first letter for that information starts on the chromosomes.

Let's look at some analogies. In English, even though the words *face* and *cafe* have the same letters, the order of the letters makes the words very different. In DNA, if the nucleobases are switched from the original order, the resulting code may contain an error.

Also, you know where to start a thought in English because punctuation and word spacing provide clues. If you looked at a squeezed-together sequence of words like *initiateinfractionrightaway*, you might see *action right away* and miss *infraction*. If a DNA code is read starting at the wrong place, essential parts of it might be missing.

The code includes the recipes for attaching amino acids together to make proteins that are essential throughout life. However, most of the length of the code is for control of the cellular processes. For example, switches must be built to start protein manufacture and later turn off the systems when the needs are met. Sophisticated controls begin cell division or change the function of the cell as it ages.

The Human Genome

The **genome** is the sequence of the 3.1 billion nucleobases in human DNA, which scientists painstakingly read and recorded in a colossal undertaking called the Human Genome Project, completed in 2003. Figure 1.6 shows a bookcase that contains the first printed copy of the human genome. It fills more than a hundred books, each a thousand pages long, in type so small as to be barely legible.

We've recorded the 3.1 billion letters of the genome, but that doesn't mean we understand it! The complexity and intricacy of this language will take years to decipher, if it ever *is* deciphered fully.

The genome is the typical order of nucleobases on one of each of the homologous pairs of chromosomes. That means that the genome letters are not exactly a list of *your* nucleobases on *your* DNA, but the genome comes close to what any person has, since most people carry 99.9% of the same code. This, of course, makes sense given our common origin from the Garden of Eden. Scientists hope that what we learn from the genome will help treat diseases.

"On Your Own" questions are scattered through each module. You should be able to answer the questions by the

Figure 1.6
Human Genome in Print

One shelf won't do! The human genome in print fills more than 100 thousand-page books.

information that you have read. Give them a good try. You can check your answers at the end of each module. Answer "On Your Own" question 1.1 now.

On Your Own

1.1 How many copies of genome-length DNA would be in a nucleus in a typical human cell?

Think about this.

In a commentary penned for CNN.com, Dr. Francis S. Collins wrote, "As the director of the Human Genome Project, I have led a consortium of scientists to read out the 3.1 billion letters of the human genome, our own DNA instruction book. As a believer, I see DNA, the information molecule of all living things, as God's language, and the elegance and complexity of our own bodies and the rest of nature as a reflection of God's plan." (2007)

If the human family carries the same genome, how is one person different from another genetically? For each person, the code is slightly different by only one base in a thousand, but in that distinction is diversity. **Traits**—qualities that are visible or measurable in a person—are produced by sections of chromosomes called **genes**, which carry the precise sequence for each of your specific inherited traits. The entire collection of your genes (about 25,000 in all) is called your **genotype**.

Since you have 2 parents, you have 2 varieties of each trait—1 on each of the homologous chromosomes. Both parents contribute to a person's genotype, but often only 1 variation of the trait is visible or **expressed**. Between 2 genes for the same trait that you have inherited, one may call for dimples; the other may not. One may produce protein that makes curly hair; the other may be for straight hair. Which one wins?

Those traits that can be observed in you are called **dominant traits**. Traits in your genotype but *not* seen in you are called **recessive traits**. You still carry the genetics for the recessive trait, but the dominant trait is stronger and hides the recessive trait. For instance, if your father has freckles but your mother does not, you probably have freckles because freckles are dominant and will be expressed. Recessive traits are expressed only if you don't carry the dominant trait on either homologous chromosome in your genotype.

Many traits are more complicated than a single gene on a single chromosome. For instance, at least 15 different genes on several chromosomes work together to make eye color; at least 7 contribute to skin color; 2 genes are known to code for hair color; and as many as 64 code for height!

Some traits have **codominance**. An example is blood type. If you have a gene for type A blood, your blood type will be A; and if you have a gene for type B blood, your blood type will be B. What if you have both A and B genes? Both A and B will be expressed because they are codominant. Your blood test will show that you have type AB blood, which has characteristics of both A and B types. If you have neither A nor B genes, you will have type O blood.

When a person receives a blood transfusion, it is very important that her blood and the donor's blood be compatible. Tests are done to make sure the 2 kinds of blood are compatible and will not attack each other in the recipient's bloodstream, resulting in clumping of cells and serious physical damage. The best choice for a blood transfusion is usually from a donor with the same type blood as the recipient: A, B, AB, or O.

Eye shape, long eyelashes, cleft chin, short torso, long toes, earlobes or no earlobes—your chromosomes work together to express the traits that are passed from one generation to another. That unique family trait can show up in every generation if it is dominant, or it can skip a generation or more if it is recessive.

Epigenetics

Recent discoveries hint that DNA inheritance is not the whole story. Think about DNA as the hardware for a computer, which doesn't change through life. Every cell with a nucleus contains the same information. What controls the expression of the DNA? What makes one cell read the same DNA and make itself into a lung cell while another becomes an ear cell? Cells don't necessarily know what to do with the DNA they have. They need interpretation.

Staying with the computer analogy, we could say that scientists think they are uncovering the software portion of your genetics. **Epigenetics**, which means "above genetics," studies the effects of methyl groups (chemical tags) and histones (protein spools) on the DNA code. The histones and methyl groups are inherited from your parents' reproductive cells as part of the material from each nucleus, but they are passed separately from the chromosomes.

Figure 1.7

Jaydon demonstrates his facial dimples.

Methyl groups attach to the DNA and act like light switches, turning on and off the DNA. Many cancers are suspected to be caused by a missing or wrongly placed methyl group that can't turn off a bad gene.

Histones are structures around which chromosomes can wind tightly or loosely. They are like volume control knobs on the DNA. A malfunctioning histone may cause disease because the protein-making function of the cell is too fast or too slow and the control knob that could correct the situation isn't working right or isn't there.

Somehow, the histones and methyl groups attach at different locations on the DNA of each cell, depending upon which kind of cell it is destined to be. Together, they act like software that tells the DNA hardware what to do. Epigenetics could be the reason why heart cells become heart cells and skin cells become skin cells.

The most exciting part of epigenetics is that it is **dynamic**, which means it is changeable. Where the tags attach and how many there are change with phases of life and how someone lives. The presence and position of methyl groups and histones are affected by diet, whether or not a person smokes, how much stress he has, and perhaps many other factors not yet identified. No matter what your chromosomes contain, they will not change; but you *can* change the epigenetics you have by taking responsibility for good health decisions.

Genetic Weaknesses and Strengths

Your genetics are part of your nature and are not chosen by you, but they can affect your health. Some diseases and weaknesses have at least some genetic basis because they run in family lines. Doctors will often ask for your family history when they receive you as a new patient. Mentioning your family's physical and emotional challenges helps them shape their treatment to best address the needs you bring to them.

You won't necessarily get a certain disease just because it runs in your family. Many factors contribute to disease, and you can make decisions that will keep you healthier longer. For instance, if your family tends to get diabetes, you can choose to avoid becoming obese. Obesity greatly increases the risk for diabetes. This is just one example; your family doctor can give you further advice.

Weaknesses and diseases are not the whole story, though. Genetically inherited physical advantages are passed through family lines too. For instance, many people work long hours to develop talents that seem effortless to naturally talented people. To practice and master the difficult techniques needed to play the violin is one thing; to have the ear or the touch to perform beautiful music is quite anoth-

er. Anyone can follow a recipe, but someone had the extra taste discrimination to anticipate flavors beforehand and invent the apple/peanut butter/cheddar cheese sandwich. And aren't you amazed with the timing of a good joke teller or the mental gymnastics someone uses to follow a mathematical proof? Talents spring up in families. Some have an incredible musical ear, artistic ability, mathematic ability, or problem-solving skills. Some have remarkable fine-motor skills and shine at detailed work; others have large-motor skills and excel at athletics. These kinds of rich gifts come to you freely, and you can choose whether to develop them further. "On Your Own" questions 1.2–1.4 give you an opportunity to identify traits passed through family lines. Then you can work on notebook project 1.1 to learn more about a specific person or family and nature versus nurture.

On Your Own

1.2 **Which attribute do all these relatives have in common? Aunt Dorothy knits sweaters. Uncle Chester is a dentist. Cousin Charlie builds models. Aunt Martha decorates cakes at a bakery. Uncle Pete repairs sewing machines.**

1.3 **Why might thin lips and small eyes not show up in every generation?**

1.4 **Identical twins share nearly identical inherited characteristics. How could you come to valid conclusions about nature and nature by studying groups of identical twins?**

Think about this.

Is leadership inherited? One strong case might be American intellectual and Puritan pastor Jonathan Edwards and his wife, Sarah. They were deeply influential as leaders in early America. About 150 years after Jonathan's death, Dr. A. E. Winship researched the descendants of Jonathan and Sarah and their 11 children. He found among them a U.S. vice president, 3 senators, 3 governors, 3 mayors, 13 college presidents, 30 judges, 65 professors, 80 public office holders, 100 lawyers, and 100 missionaries. Sixty of them were preeminent authors or editors, including the British statesman Winston Churchill, whose mother was American. Edwards's family members edited or founded 18 periodicals.

But another view might be that the Edwards children were dedicated Christians known for deep thought, honesty, compassion, and hard work—disciplines that often lead to success. The large number of children also increased their long-term influence.

Project 1.1: Nature versus Nurture

TEMPERAMENT

Personality is a combination of emotions, behavior, and thoughts. We will talk more about personality later. Behind much of your personality is your natural preference, your tendency to react to situations and people in predictable ways. Do you like to be alone or with people? Do you like relationships or projects better? These kinds of predispositions are called **temperament**. You do not learn your temperament from others, and it is not imposed upon you by your experiences. Instead, you are born with automatic responses to situations. You can be very different from your parents in your temperament.

The Fluid-Imbalance Theory

Nearly 400 years before Christ walked the earth, the Greek physician Hippocrates recognized 4 distinct temperaments of people. He suggested that the differences were due to an imbalance in natural fluids in their bodies. He gave names to the personalities based on those fluids. Hippocrates said some people were outgoing, adventuresome, and optimistic but also forgetful. Perhaps they had too much blood.

They were **sanguine** (san'-gwin), based on the word for blood. Other people tended to be moody, contemplative, and artistic. Hippocrates thought that they had too much black bile and called them **melancholic** (mel'-an-col-ic). A third kind of people were diplomatic, quiet, and steady, but they could be lazy. Hippocrates said they had too much slow-moving phlegm. He labeled them **phlegmatic** (fleg-mat'-ic). A fourth group of people were given to confident action and leadership, but they suffered from explosive tempers. They must have had a touch too much yellow bile. They were **choleric** (co-lair'-ic).

The fluid-imbalance theory of human temperament was discarded long ago, but the names for people exhibiting those personalities remain. Certainly you have met people of all these types—some you admire, and some you avoid! It is helpful to know the categories not only to describe others, but most importantly to understand yourself.

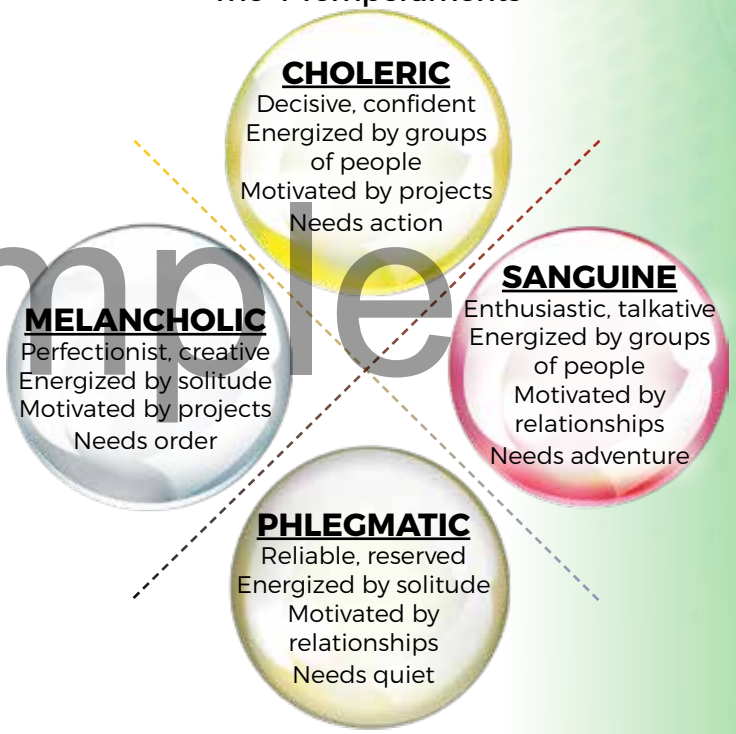
The 4 temperaments can be distinguished by what energizes them and what goals they pursue. Visualize figure 1.8 as a map. To the north and east are the extroverted, outgoing temperaments that are energized by being around groups of people. The extrovert comes home from a party recharged but will be drained by a few hours alone.

To the west and south are the introverted temperaments, which are energized by spending time alone. Social gatherings are pleasant but tiring for the introvert. A sanguine or choleric might say, "I need to talk to people to process being alone so much." A phlegmatic or melancholic might say, "I need some solitude to process all the things I said when I was with that group of people."

What motivates a person? The temperaments on the north and the west are most satisfied by completion of projects. A choleric or a melancholic will tend to act if someone says, "This project needs to be done." The project may come between these people and their closest family and friends if they are not careful.

The temperaments on the east and south act because of deep relationships with people. The fact that a project needs doing is not enough for them. They need someone close to them to say, "Would you do this project for me?" The project will be secondary to their relationship. They would put the project aside if that close friend asked them to stop.

Figure 1.8
The 4 Temperaments



Visualize the temperaments as opposites of each other.

Your Dominant Temperament

Most people have one dominating temperament. Work on notebook project 1.2 to decide which one describes you best.

Project 1.2: A Quick Temperament Test

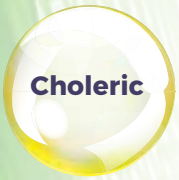
Secondary Temperament

No one has purely one temperament—although some people have a very strong dominant temperament and a much weaker secondary temperament. Other people have 2 nearly equal temperaments. Like mixing paint colors, the result will be somewhere between the originals. This mixing allows for more diversity than the original 4 temperaments. Continuing to blend the paint, imagine the beauty of adding a few drops of a *third* temperament to the mix!

Figure 1.9

Strengths and Weaknesses of the 4 Temperaments

Each temperament has associated strengths and weaknesses.
Can you identify yourself—or anyone else—in this list?



Strengths: Bold, decisive as a leader, confident, persistent, self-disciplined, inclined to set high goals, energetic, enthusiastic, ambitious, rational, competitive

Weaknesses: Insensitive, bossy, quick to judge, proud, arrogant, impatient, quick to disregard instructions and maps, manipulative, not detailed, hot-tempered, revengeful, hard to please, opinionated, harsh, hard-hearted, defensive, apt to charge ahead without thinking of others, dismissive of those less talented

Strengths: Anxious to please people, friendly, fun-loving, careful with outward appearance, conscious of fashion and design, energized by large groups, adventuresome, enthusiastic, joyful, optimistic, high-spirited, energetic, compassionate, talkative, emotional, dynamic, curious, spontaneous, attractive as a leader

Weaknesses: Superficial, frivolous, prone to waste time, careless about finishing work once started, quick to react emotionally, attention-seeking, forgetful, disorganized, restless, eager for excitement, pleasure-seeking, impulsive, impractical, prone to exaggeration, egotistic, quick to spend money, likely to surrender moral convictions to please people

Strengths: Artistic, musical, theatric, excellent in work, idealistic, thoughtful, analytic, creative, sensitive, perfectionist, thorough, precise, faithful, orderly, given to solitude, concerned about justice and vice, inclined to be a servant leader

Weaknesses: Overly analytic, easily depressed, moody, critical of self and others, self-absorbed, unable to take criticism, never satisfied, impractical, unforgiving, given to daydreaming, suspicious, pessimistic, obsessed with the planning stage, not inclined to be a team player, unlikely to initiate relationships

Strengths: Consistent, obedient to rules, reliable, loyal, punctual, good-natured, easygoing, practical, full of common sense, thrifty, efficient, tolerant, good at listening, orderly, scientific, calm under pressure, patient, reserved with opinions, quiet, unclouded by passions, considerate, honest, patient as a leader (especially with children)

Weaknesses: unmotivated, lacking in enthusiasm, resistant to self-improvement, stubborn with a hidden iron will, uncomfortable expressing thoughts, slow to take action, prone to avoid mental or physical exertion, uncomfortable with conflict, overly conciliatory, stingy, prone to hording, content with minimum performance

Credit: Bennett and Bennett (2005), LaHaye (1991), Men's Fraternity (2006), and Laura Chase

Think about this.

"The temperaments reveal our natural tendencies; they do not seal our fate. Our awareness of our tendencies enables us to make decisions about the best possible response in any given situation, rather than always cruising on automatic pilot" (Bennett and Bennett 2005, 12–13).

A person's first and second temperaments will usually be adjacent to each other in figure 1.8. Imagine the melancholic/choleric, who has a precise, artistic bent yet charges ahead with determination. Or the sanguine/phlegmatic, who is fun, enjoys people, and is also steady and reliable. The choleric/sanguine is decisive *and* adventuresome.

Your 2 strongest temperaments will most likely not be opposites of each other because you can't be driven and decisive (choleric) and a good follower (phlegmatic) at the same time. Neither can you be both perfectionist (melancholic) and spontaneous (sanguine). Analyze your strengths and weaknesses in project 1.3.

Project 1.3: Building on Temperament Strengths & Weaknesses

Expression of Temperament Varies with Environment

The expression of your temperament varies with the environment. For instance, let's say your family is full of hard-driving cholerics, and you are also choleric, but less so than the others. You appear melancholic among them because you are more introverted than the majority. But on the soccer field, your choleric nature comes to the surface!

Perhaps you belong to an orchestra consisting mainly of serious, perfectionist melancholics. You are also melancholic, but you are a tiny bit more choleric, enough to be the president of an organization of people who are happy they don't have to lead!

You may be just phlegmatic enough to walk into the middle of a big family dispute and gently speak a thoughtful comment, settling everyone down and bringing a conclusion. You may be just sanguine enough to add sunshine to a gathering of sad friends. Or perhaps your touch of melancholic helps you arrange a table beautifully. Your phlegmatic temperament enables you to babysit for a couple of lively preschoolers. Each temperament is important in human interaction; none is more important than another.

Complete "On Your Own" questions 1.5–1.15 for a review of the 4 temperaments.

On Your Own

1.5 Which 2 temperaments are happiest about a party tonight?

1.6 Which 2 temperaments would rather curl up with a good book than be with people at a party?

1.7. Which temperament, because of self-confidence, probably struggles most with pride?

1.8. Which 2 temperaments can get so involved with projects that they put relationships on the back burner?

1.9 Which temperament, because of perfectionism, has the hardest time taking criticism?

1.10 Which temperament looks at every task and measures how much energy and money it will take to finish the task?

1.11 Which temperament charges into a task without concern for how much work or time is involved and tends not to finish?

1.12 Which temperament has the most patience with children?

On Your Own

1.13 Which temperament is optimistic and tends to see the good side of things?

1.14 Which temperament is pessimistic and tends to imagine the worst?

1.15 Which temperament charges into any group of people and tends to lead it?

OTHER NATURAL INCLINATIONS AND PATTERNS

Of course, you are much more complicated than your genetics and your temperament. No two individuals, including identical twins, behave exactly alike. Practically from birth, you establish certain patterns. Genetics and temperament don't explain why you consistently choose one option over another. Let's look at some of those inclinations.

Dominant Side

Most people have a dominant side of their body; this phenomenon is called **laterality**. Most people are partial either to the right or the left. About one percent of people have almost equal preference for right or left. These people are called **ambidextrous**, which means *two right hands*. This quality might seem like an advantage when that person breaks an arm, but ambidextrous people find it more difficult to distinguish right from left. Some people who seem ambidextrous are really left handed but have learned to get along in a right-handed world by practicing right-hand skills such as cutting with scissors. Many people are mildly lateral. Though not ambidextrous, neither are they strongly lateral. In some sports, it is an advantage to be able to use both hands or both feet equally well. Soccer kickers, baseball switch-hitters, and gymnasts are good examples.

Laterality is most obvious in the choice of hand, foot, and eye.

Which hand do you naturally use to pick up a pencil and write? Which hand do you throw with? That is your **dominant** hand. About 90% of people are right handed.

Which is your dominant foot? You can tell by stepping up quickly to a soccer ball and kicking it. Which foot did you use to kick? If it was your right, then you are right footed. Some right-handed people are left footed.

Which is your dominant eye? You can tell by stretching your arms straight in front of you and forming a small triangle between your hands with your thumbs and forefingers, like in figure 1.10. With both eyes open, look through the triangle to focus on a distant object. Then close and open each eye. Which one were you using to look through the triangle? That's the dominant eye. Some people favor the eye that isn't on their dominant side.

Figure 1.10
Finding Eye Dominance

If the view through the triangle shifts as you close one eye, you're looking through the triangle with your nondominant eye.

Typically, a person is consistently right or left in eye, hand, and foot dominance. If one of these doesn't fit the pattern, the person's laterality is cross-dominant. This may be the cause of apparent clumsiness in some people. Cross-dominant eye and hand preferences interfere with skills involved in sports such as basketball and rifle shooting, which rely on the dominant eye and hand working together.

Record what you find out about yourself in project 1.4.

Project 1.4: My Natural Preferences

Morning People versus Night People

From ancient times, people have arisen with the sun and gone to bed with the darkness. People tend to be **diurnal** (die-urn'-al), which means they are active during the day and asleep during the night. Only rarely is a person **nocturnal**, naturally preferring to sleep during the day and be active at night. Being nocturnal can be a sign of illness. Some people who have to work through the night learn to sleep in daylight, even though this is not their normal or preferred schedule.

The distinction between nocturnal or diurnal tendency lies in when a person *prefers* to get up in the day. Everyone has a daily cycle, a **circadian** (sir-kay'-dee-un) **rhythm**. When do you prefer to get up? When do you go to bed? Artificial lighting makes it possible to get up early or stay up late. Unlike animals, you can decide when to go to sleep and when to get up.

Generally, people are informally classified as either morning people or night people. Morning people wake quickly and are cheerful as soon as they are awake. They like a hearty breakfast and find their most productive working time to be early in the morning, when they are fresh. But after supper they may get grumpy, and they tucker out in the evening.

Night people start slowly in the morning and can be grouchy early in the day. They aren't really hungry until lunch, but by evening they are fully engaged. Their best time for accomplishment is afternoon or evening. Night people have a hard time going to bed because they feel so energetic late in the evening.

Some situations in life may not allow you to wake and sleep on your preferred schedule. Jobs, illnesses, responsibilities, and neighbors who are loud when you want to sleep can make life difficult for a while. Morning people and night people who live in the same household may find that their preferences annoy each other.

No virtue is gained by striking out at others or complaining when you feel grouchy. Sit down together and reason out ways to keep from annoying each other. Perhaps that early bird doesn't need to practice the piano before 7 a.m., and that night owl can turn off the music after 10 p.m. Let the Lord shape your character as you practice self-control and perseverance during the hours you are annoyed!

Describe your circadian rhythm in project 1.4. Then think about the part of the day that is most difficult for you. Early mornings for night people and evenings for morning people are often most stressful. What can you do to avoid conflict with others in your family during that part of the day? Write your idea in project 1.4.

Food Preferences

Human beings can eat a great variety of foods and still stay healthy as long as they consider principles of nutrition. Humans are **omnivores**—they can consume and digest food from both plants and animals.

What do you choose to eat when given lots of options? Does a meal with meat sound wonderful, or does meat disagree with you? Do you eat vegetables only as a requirement to get dessert? Do you eat eggs? Do you drink milk? Would you be satisfied if you had only bread or rice? Do you like the same food regularly or do you like to try something different once in a while?

In project 1.4, write down a typical breakfast, lunch, snack, and dinner for you.

Your Way to Relax

It's important to get some time every day to relax. At the end of a busy day, what do you do to recharge yourself? Do you take a bath? Play a video game? Make a phone call? Read a book? Do a craft? Exercise or lift weights? Play an active outdoor game? Play the piano? Play a board game? Do a puzzle? Talk with the family? Go for a walk? Watch television? Check social media? Record your relaxation techniques in project 1.4.

Activity Level

Finally, look at your physical activity. Do you tend to collapse into a chair and stay there for hours, or

do you resist sitting still? Estimate how many minutes each day you do physical activity intense enough to make you sweat. Estimate how much time you spend each day walking, running, or practicing your favorite sport. (Time spent recovering and sweating from exercise doesn't count!) Record the minutes in project 1.4.

One Last Visit to Genetics

This module has concentrated on looking at characteristics that you developed naturally: your genetics, temperament, and preferences. Much can be explained by your ancestry, but that isn't the whole story.

Racehorses have been carefully bred for speed for hundreds of years, and horse-racing investors carefully check ancestry to determine a colt's value. People are not racehorses. Very important qualities like character and attitude are chosen by each individual; they are not inherited. History shows that some wise and good kings have had spoiled, arrogant, useless sons and daughters. On the other hand, a great leader may come from ordinary parents. This is one reason the founders of our country rejected royal descent as a requirement for leaders. Your destiny is only partially genetic. Most of who you will be is up to you.

Consider a Health Profession

Primary Care Physician

A career as a medical doctor requires the highest level of education and the highest level of responsibility among the health professions. The doctor-patient relationship is personal, private, and protected. Physicians have the opportunity to care for individuals in times of crisis and to bring hope and relief. They can advise those headed for trouble to consider making lifestyle changes. Depending on their specialty area of training, they can often diagnose a physical illness, treat it, and follow the person's progress back to health. Helping to restore another to health is deeply satisfying, so much so that many physicians donate spare time to serve the poor around the world.

This primary care physician, Dr. Sarbah, is caring for a person injured in a hurricane.

How does someone become a physician? The best candidates must be good students and usually must graduate with a 4-year college degree, often earned in a scientific field. Premedical studies in college require classes in biology, general chemistry, organic chemistry, calculus, and physics, along with other classes.

Getting into medical school after college is not automatic. After completing the recommended premedical college coursework, the student must take the Medical College Admission Test (MCAT). MCAT scores, college grades, impressions made in interviews, recommendation letters, and the student's involvement in extracurricular activities (activities outside schoolwork that show leadership, compassion, or initiative), determine whether the medical school will admit the student.

Medical school is a 4-year commitment, and the student earns either an MD (Doctor of Medicine) or DO (Doctor of Osteopathy) degree. After these 4 years, the student must choose a specialty, which narrows and intensifies the study to a specific kind of medicine. Residency training in a hospital takes at least another 3 years. The student can choose from at least 17 types of residencies, such as primary care, different types of surgery, emergency room training, and radiology. Some students choose to specialize in primary care, which means they are the first doctors people see when they have a medical problem or need an annual checkup. Primary care residencies include family medicine, internal medicine, gynecology (medicine of women), and pediatrics (medicine of children). Eleven years after finishing high school, the medical doctor may be ready to go into practice.

Answers to the "On Your Own" Questions

1.1 **Two.** The genome is a record of only 1 of the chromosomes in each pair. Most cells in the body contain 2 genome sets. Remember, you get 1 set from your mother and 1 set from your father. An exception is a reproductive cell, which has only 1 genome set.

1.2 Because all use their hands, **fine-motor skill** is necessary for all these activities.

1.3 **Thin lips and small eyes are recessive traits** (Bradbury 2011). If people with the dominant traits of thick lips and large eyes marry into the family, the recessive traits might not be expressed in the children, at least in the first generation.

1.4 **Because identical twins have almost exactly the same genetics, we can assume any differences between them are a result of nurture.** Studies of identical twins help define which diseases and abilities are genetic and which are not.

1.5 **Choleric** and **Sanguine**

1.6 **Melancholic** and **Phlegmatic**

1.7 **Choleric**

1.8 **Choleric** and **Melancholic**

1.9 **Melancholic**

1.10 **Phlegmatic**

1.11 **Sanguine**

1.12 **Phlegmatic**

1.13 **Sanguine**

1.14 **Melancholic**

1.15 **Choleric**

It's now time for you to review your personal notes in your student notebook. You should also look over your responses to the "On Your Own" questions that you answered as you completed sections of this module.

If you took good notes and understood all of the answers to the "On Your Own" questions, you should be able to complete your Study Guide, which can be found in your student notebook.

Do your best to complete the Study Guide from memory. If you cannot answer some questions, you may go back and look for the answers in your notes. If you don't find the answers, consider taking more detailed notes in the future. Ultimately, if you do not know the answer, look it up in your textbook.

The answers to the Study Guide can be found online at the Book Extras site. Use the answer key only when you are fairly certain you have all of the correct answers already written into your student notebook. This is important because you will be taking a test and be graded on your knowledge. You will not gain knowledge if you simply look up an answer on an answer key!

When you feel that you are well prepared, turn to the test-taking section of your notebook and take the test for this module. Your parent or teacher will grade the exam.