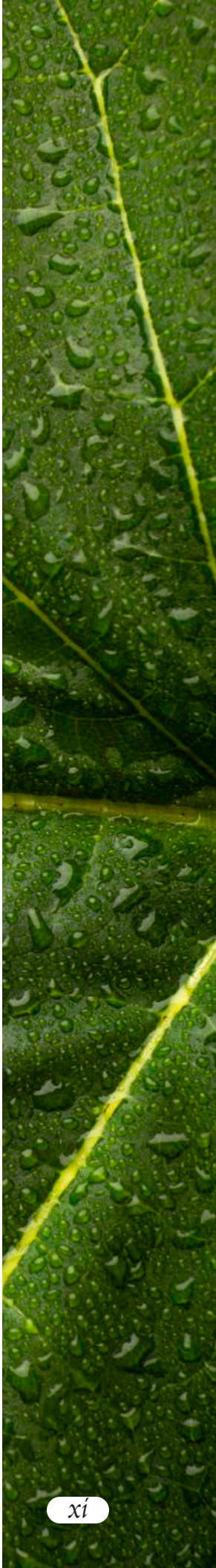


HOW TO USE THIS CURRICULUM

The main goal of elementary and middle-school science is to create joy in God's creation and to prepare for next-level courses. Through reading and activities, students will become familiar with terms and processes that will equip them with skills needed for critical thinking in high school. They will understand the importance of a Christian worldview, observe the outside world through the lens of creation, and gain an understanding of a loving God who cares for us so greatly that He has designed life and the world to make sure all our needs are met and to show us the beauty in which we live.

This curriculum is designed for students in grades 4–8. However, it is easy to adjust expectations and adapt activities for younger or older students or to have siblings learn together. You'll find suggestions for adaptation at the end of this section.

The *Student Reader* contains 32 lessons; each is designed to be completed in about 2–3 hours per week. We recommend splitting each lesson into 4 segments. Of course, this depends on the age and attention span of your students and the number of outside resources you use. If you teach science 4 times a week, plan for about 30–45 minutes each day. You have the freedom to choose what your students should complete in any week, according to your own schedule and plans.

Each chapter contains several components you'll want to explore each week with your students. You'll find a **vocabulary** section with words to define, a **word**

origin section to help students understand the meanings of certain terms, and a **Scripture memory** section. Lessons also include a **Creation Corner** to point your students back to the unique creation designed by God for our care and enjoyment.

The *Lab Manual*

It is imperative that students use the *Lab Manual* with the *Student Reader*. The *Student Reader* contains information, but the *Lab Manual* reviews and reinforces the lesson material and encourages higher-level thinking as your students apply the information learned. The *Lab Manual* contains everything you'll need for recordkeeping; it provides a place for notes, sketches, research, and following the steps of the scientific method. You can easily adapt the *Lab Manual* to the age level and ability of your students.

Sketching: The goal of sketching is recordkeeping. Scientists frequently sketch and document their findings in their studies, and your students will do this throughout their educational journeys. However, if your students would rather find a picture or take a photo and tape or paste it in the *Lab Manual*, that can take the place of sketching. You're free to make a choice for each activity.

Suggested Daily Guide: A planning guide at the beginning of each lesson in the *Lab Manual* breaks down your week into 4–5 days. We recommend 4 shorter segments divided over a week rather than 1 longer session. The more frequently students are exposed to terms, concepts, and ideas, the easier it will be to retain information long-term.

Materials Needed: Students will need to have sketching tools available for almost every lesson. These include a pencil, colored pencils, a charcoal pencil, markers, etc. Students will also do research in almost every lesson. They'll need access to books, a science encyclopedia, and/or the internet (*with parental guidance*).

A complete list of all additional materials needed for the year is provided at the beginning of the *Lab Manual*. In addition, a list of materials is provided in each lesson. Some of the materials are common items you'll have around your house; others will need to be purchased ahead of time from a science supply store or catalog. All experiments are designed to reinforce important lesson concepts and to prepare students for further study in science. It will be beneficial for you to familiarize yourself with the materials before each lesson.

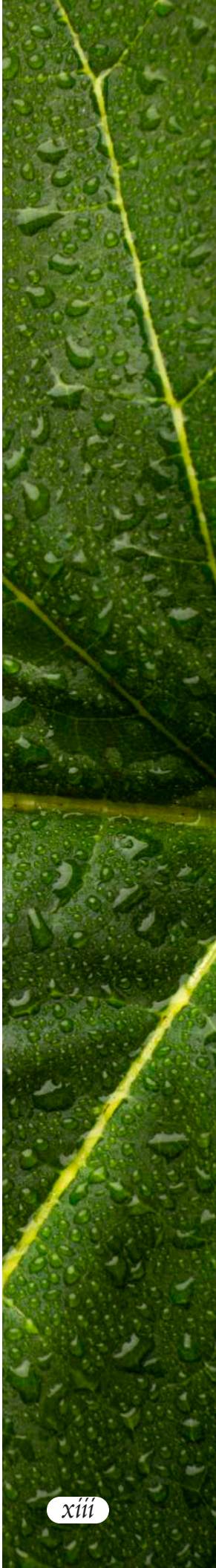
You may notice that all the measurements in this book use the metric system. However, if you live in the U.S., Liberia, or Myanmar, you may only be familiar with the English or Imperial system. If so, this book is a great opportunity to

become familiar with metric measurements! Virtually all scientists use the metric system, and it's important for aspiring scientists to be comfortable working with meters, liters, grams, and degrees Celsius. If your tools at home don't have metric measurements, we've included a conversion table in Appendix A for your convenience.

How to Begin

To begin each new lesson, read the text to your students or have them read it to themselves. For very young students, you might read it on your own and then discuss the information at their level.

- Students should write down information they think is important in the **Student Notes** portion of the *Lab Manual*. Remember that what you think is important might be different from what they think is important; that's completely acceptable at this age.
- Each lesson includes **Scripture Memory** because learning about God's Word is essential to understanding His character and His plan. Scripture memory cards are also included in the back of the book. You can print them to aid in memorization or post them in your school area. They can also be used as flash cards for review throughout the school year.
- The **Define It** section provides a place for students to define the vocabulary words from each lesson.
- The **Write It** section is a guided review of the chapter's key concepts. Students will define words, answer questions, and sketch diagrams. They can compare what they determined was important when they read to the material reviewed in this section and add to their notes if needed.
- The **Apply It** section takes learning to the next level. It includes a variety of activities as well as labs—with an emphasis on following the steps of the scientific method—and a complete, step-by-step guide to writing a lab report (a necessity for high school and college). When students write their conclusions, they can choose which questions to answer; it could be all of the questions provided, some of them, or some of their own. It can be tempting to eliminate these activities to save time; however, we strongly advise using them to prepare for higher-level learning.
- The **Research It** section allows for further study. Students will use books, encyclopedias, and/or the internet (*with parental guidance*) to learn more about a topic. Younger students can write a couple of sentences or sketch a picture about what they learned. Older students can write 2–3 paragraphs about the researched topic.



- The **Review It** section provides a **quiz** on odd-numbered weeks and a **crossword puzzle** on even-numbered weeks. In addition, **semester tests** are included after lessons 16 and 32. You can use these components as tests, as another review, or not at all. Each quiz is worth 10 points, and a grade can be calculated by multiplying the number of correct answers by 10. Semester test grades can be calculated by dividing the number of points earned by the number of points possible, then multiplying that answer by 100.

  Suggested grading scale:

  A = 90–100

  B = 80–89

  C = 70–79

  D = 60–69

  F = 59 and below

- Last, you'll want to allow time for **outside reading**, perusing pictures, and researching topics of interest. We recommend that students keep track of important information in the blank pages in the back of the *Lab Manual*.

The *Lab Manual* will serve as an excellent reminder and record of what your students have accomplished and learned this year in science! It is also a great way to observe growth in their abilities from year to year.

As with the *Student Reader*, teachers may choose to adapt the *Lab Manual* for students of different ages and abilities. Younger students may orally answer the "Write It" sections, while older students may write their answers in complete sentences. Students of all ages will enjoy the "Apply It" experiments; the lab reports can be adapted as needed. A flexible approach to the curriculum will make learning successful for all ages.

Elementary and middle-school science is about discovery, following the model of other scientists, and taking joy in the journey. Have fun with it yourself, and your enthusiasm will carry over to your students!

ABOUT THE AUTHOR

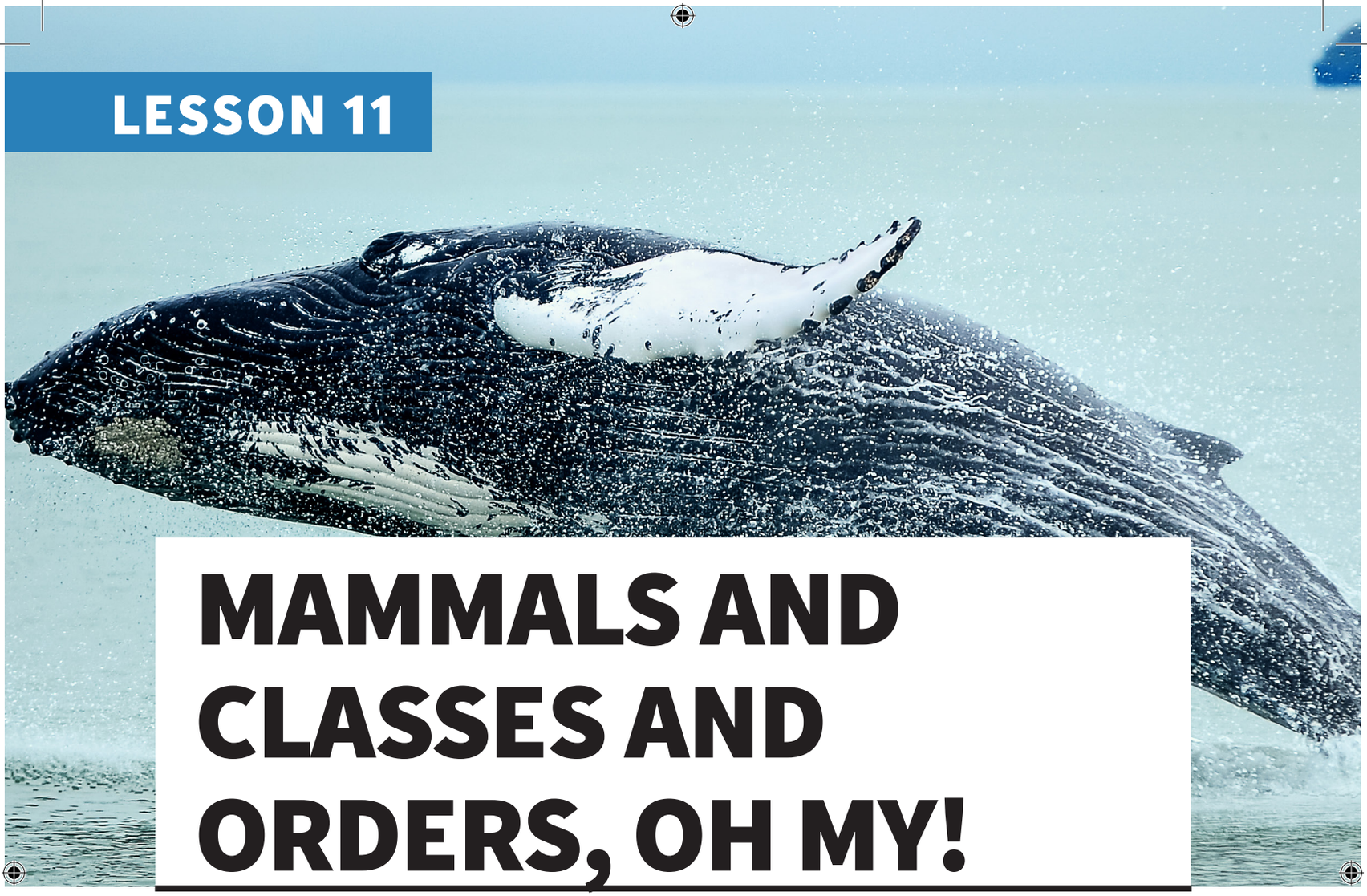
Karri J. Iverson has been a major influence on the lives of many children and families for more than 20 years. She graduated from Western Michigan University *summa cum laude* in elementary education with minors in science/math and English. She has used her diverse education as well as her husband's knowledge and help to homeschool their 5 children.

In 1999 Karri recognized a growing need for homeschooled students to have further instruction in English and science, so she began a local homeschool tutorial. She taught classes in many subjects and managed several teachers as the group grew to meet the needs of local homeschoolers.

Karri has also taught at other homeschool programs and co-ops and has enjoyed teaching Bible studies at her church. She has given direction and guidance to many parents during their homeschooling journeys and has privately tutored several students throughout their high school years. One of her passions is developing curriculum, which she has done for her own children, local homeschooling groups, the local school district's summer and extracurricular camps, and private schools. In addition, she has taught for the Summer Institute for the Gifted and has designed her own science and math curriculum for summer camps.

In addition, Karri trains and encourages teachers and evaluates programs to make sure they meet scientific objectives. She also loves helping students learn about their awesome Creator!

LESSON 11

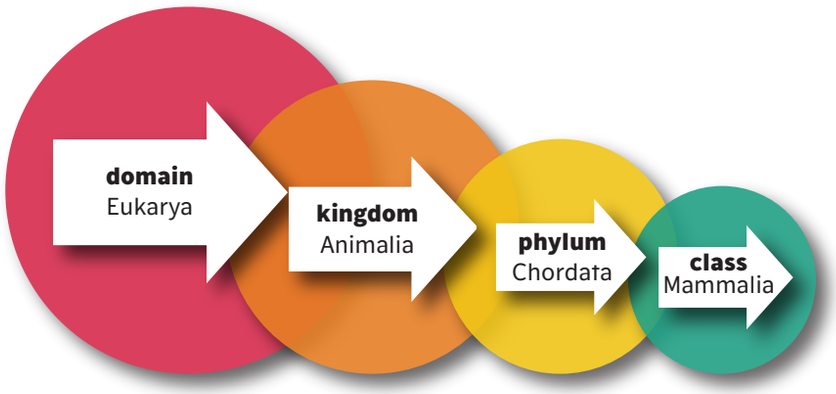


MAMMALS AND CLASSES AND ORDERS, OH MY!

Goal: To differentiate between a few of the animals in the class Mammalia, including aquatic mammals and humans.

Many types of mammals—including lions, tigers, monkeys, and even bears—live in familiar environments, but you may wonder where other mammals, such as the duck-billed platypus, thrive. Some mammals, called **aquatic mammals**, live in the water.

Aquatic mammals live in the oceans and are often mistakenly called fish. These are animals like whales, porpoises, and dolphins whose characteristics make them mammals, although they seem like they could be fish. First, they do not lay eggs as fish do; rather, they give birth to live babies. Second, aquatic mammal mothers feed their babies milk that their bodies produce. These mammals even have hair, though you may never see it. Last, fish



get their oxygen from the water through gills, but aquatic mammals have lungs and must come to the surface for air.

Whales

The whale's incredible size alone makes this mammal interesting. Whales are the largest creatures on earth. The smallest whales are about 2 m long, but the largest whales are almost 30.5 m long! Although several different species of whales exist, there are 2 main types: **toothed whales** and **baleen whales.** Toothed whales, as you might guess, have actual teeth and are able to eat large fish. Baleen whales, on the other hand, have whalebone plates instead of teeth. They open their mouths and take in large amounts of water, fish, and tiny organisms. When they close their mouths, the water filters out, leaving the food behind just like a colander filters out water and leaves the pasta behind! Whales are carnivores that eat other fish. So, you see, although whales are very large, that does not necessarily mean they eat large animals.

Porpoises and Dolphins

Two aquatic mammals that people often confuse with each other are porpoises and dolphins. Dolphins can be recognized most easily by their long, sleek bodies and pointed beaks. Porpoises, on the other hand, have more rounded mouth and nose structures, and their

Dolphins breath air with their lungs, so they need to hold their breath while diving.

VOCABULARY

aquatic mammals
toothed whales
baleen whales
monotreme
marsupial
nocturnal
primate
bipedal
opposable thumbs

WORD ORIGIN

The word *primate* comes from the Latin word *primas*, meaning "of the first rank."

SCRIPTURE MEMORY

Genesis 1:27: "So God created man in His own image, in the image of God He created him; male and female He created them."

bodies tend to be a bit more rounded as well. Marine biologists can get close enough to see another type of difference—their teeth. Dolphins have cone-shaped teeth, and porpoises' teeth look more like a shovel or spade. God created these animals with differences even though they look the same to most of us.

Aquatic mammals fascinate people all over the world. In many coastal areas, people pay money to go out on boats just to observe mammals such as whales, dolphins, and porpoises. Creationists marvel at the intricacies of God's design.

Monotremes and Marsupials

Even though most mammals give birth to live babies, some mammals lay eggs. That might surprise you, but it is true. **Monotremes** are characterized as nonplacental animals because their babies develop outside the mother's body. Remember, monotremes are a *class* of mammals, not a specific animal.

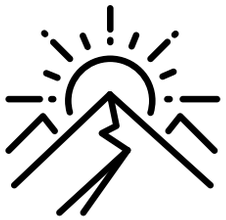
The duck-billed platypus's bill helps it glide smoothly through the water.

The most well-known monotreme is the duck-billed platypus. This creature is probably the most unusual in all of God's creation. It has a bill like a duck, fur like a beaver, and webbed feet, and it lays eggs! It looks even stranger than it sounds. This animal is found in Australia, New Guinea, and Tasmania.

Another type of monotreme is the spiny anteater. It is also called an echidna. The spiny anteater is an egg-laying, insect-eating mammal. Both the platypus and the spiny anteater cause difficulty for materialists. They are such odd combinations of animals that materialists cannot determine how or from what they allegedly evolved.

A spiny anteater is covered with quills to protect it from predators.

The other type of nonplacental mammal is a **marsupial**. Marsupials nourish their young from a yolk sac in the uterus for a few weeks. After this stage, the underdeveloped baby is born. It is far from ready to survive apart from the mother, so God designed the mother with a pouch to carry this new creature. The baby attaches itself to the mother and is constantly nourished by her milk. Eventually, it is developed enough to leave the pouch. Kangaroos, koalas, and opossums are 3 types of marsupials. Most marsupials are **nocturnal**, which means they are primarily active at night.

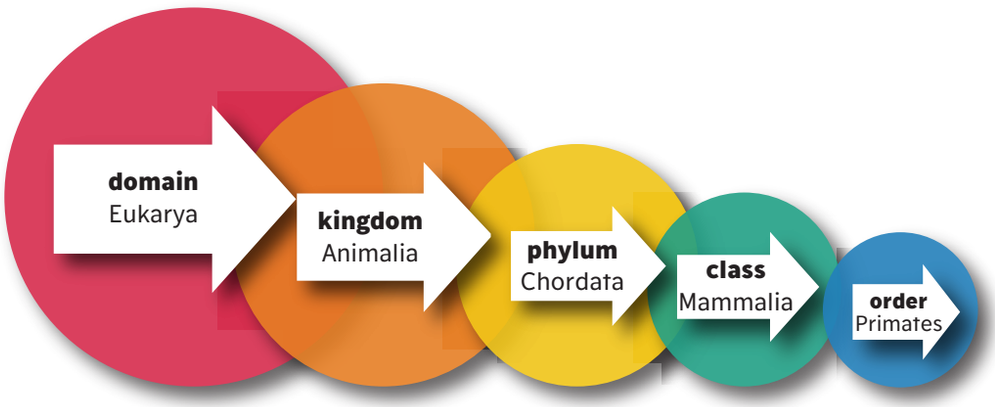


CREATION CORNER

The spiny anteater, also called an echidna, is a unique mammal that lives in Australia and New Guinea. Do you remember that most mammals have hair? God designed this creature with quills over its fur to protect itself. Just like its name suggests, it eats ants, termites, and other invertebrates that live in the soil. An echidna does not have teeth. Instead, it has a sticky, spiny tongue that allows it to scoop up insects as prey. Using that tongue, it chews by smashing its prey against the roof of its mouth. Echidnas are monotremes, which means they are 1 of only 2 types of mammals that lay eggs. A female usually lays 1 egg at a time and then incubates that egg in a pouch in her stomach for about 6–8 weeks. After hatching, a baby echidna, called a puggle, drinks its mother's milk until it's about 7 months old. An echidna can live for up to 50 years!

Primates

That brings us to the order **Primates**. Monkeys, apes, and humans are all in this order. What makes an animal qualify for this category? First, primates are **bipedal**. To figure out what this word means, look at its Latin roots: *bi* means "two," and *pedal* refers to feet. In other words, primates can walk on 2 feet. Most primates, however, also use their arms to help them get around as they swing from branch to branch or climb. This makes humans the only truly bipedal primates.



Primates are very social animals. With some exceptions, they live in large societies. Primates are able to see in a way that other mammals cannot. They can perceive depth, which is the difference between looking at a picture of an object (2-dimensional) and looking at something in real life

Most primates live in social orders, interacting frequently with other primates in their tribe.

(3-dimensional). The major feature of most primates is **opposable thumbs**. This means that one of the fingers (the thumb) can meet with each of the other fingers to form a circle. (Try it out!) This is special to primates. It enables us to pick up things and handle them in ways other animals cannot.

These similarities lead many people to think monkeys and apes are the same animal, but they are not. The easiest way to distinguish a monkey from an ape is to look for a tail; a monkey has a tail, and an ape does not. Another difference is that apes are usually larger than monkeys. Also, an ape's arms are usually longer than its legs; this is not true of a monkey's arms.

Humans Are Special

Humans are also primates, but that doesn't make us like apes and monkeys or mean that humans descended from apes and monkeys. We are alike in some ways, but we also have many differences. The Bible says God created humans in His image—a claim unique to humans. Humans have a soul, the ability to tell right from wrong, and a diverse language system to communicate. Apes and monkeys don't have any of those attributes. Humans are truly special physically, mentally, and spiritually.

What makes humans unique is that we are all created in God's image.