KINGDOMS AND CLASSIFICATION

3-8 Science Unit Study

THE GOOD AND THE BEAUTIFUL

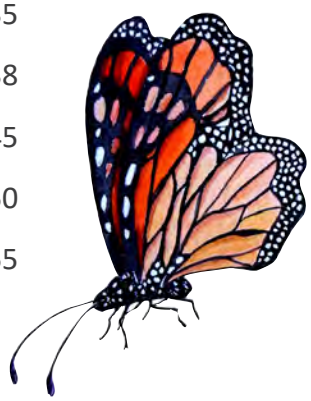
Kingdoms and Classification

CREATED BY THE GOOD AND THE BEAUTIFUL TEAM

Prerequisite Unit

Most of The Good and the Beautiful science units can be used in any order. However, it is very helpful to complete this unit before *Botany* and *Mammals*.

Table of Contents



The Good and the Beautiful

Unit Information

Science Journal

All The Good and the Beautiful science units include activities in a student journal. Each student should have his or her own student journal, and the parent or teacher will direct the student regarding when to complete the activities as directed in the lessons. Science journals can be purchased by going to **goodandbeautiful.com/science** and clicking on the *Kingdoms and Classification* unit link.

Science Wall

All The Good and the Beautiful science units include vocabulary words to be placed on your science wall, which is a wall or tri-fold presentation board in your learning area to which you can attach the vocabulary words and other images. ***Cut out the vocabulary word cards at the beginning of the unit.*** The course will indicate when to place them on the wall.

Lesson Preparation

All The Good and the Beautiful science units include easy-to-follow lesson preparation directions at the beginning of each lesson.

Activities and Experiments

Many of The Good and the Beautiful science lessons involve hands-on activities and experiments. An adult should always closely supervise children as they participate in the activities and experiments to ensure they are following all necessary safety procedures.

Optional Microscope Activities

This unit introduces the use of microscopes. In this unit there are several microscope activities, beginning with Lesson 2. The microscope greatly enhances the lessons, but if you do not have a microscope, this unit can still be completed by watching the microscope activity videos. Note: For help selecting and using your microscope, see "How to Use a Microscope" at **goodandbeautiful.com/sciencevideos.**

Experiment Videos

Go to **goodandbeautiful.com/sciencevideos** and click on the *Kingdoms and Classification* link or use the Good and Beautiful Homeschooling app to see videos of experiments used in this unit. This is a convenient way to watch experiments that may be more complicated. Children often learn best through hands-on experience; therefore, this unit includes a supply list and instructions for all experiments, and you may choose to do as many as you wish.

Unit Videos

Some lessons include videos that were created by The Good and the Beautiful. Have a device available that is capable of playing the videos from **goodandbeautiful.com/sciencevideos** or from the Good and Beautiful Homeschooling app.

Content for Older Children

Some lessons include extra content that is more applicable for older children (grades 7–8). Parents or teachers may choose to skip this content if instructing only younger children.

Content for Younger Children

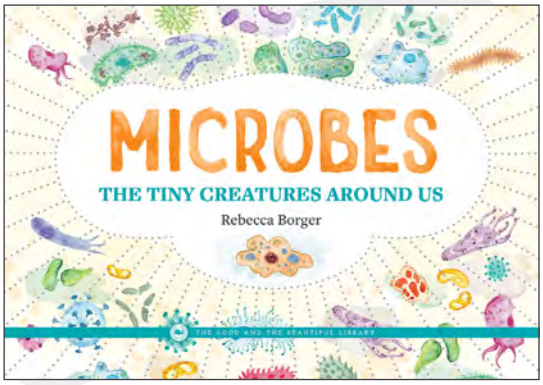
Some lessons include extra content that is more applicable for younger children (grades 3–6). Parents or teachers may choose to skip this content if instructing only older children.

Versions

New discoveries in kingdoms and classification are being made on an ongoing basis. This course is reviewed and revised periodically to keep the information as up-to-date as possible. This version is the second edition of this unit.

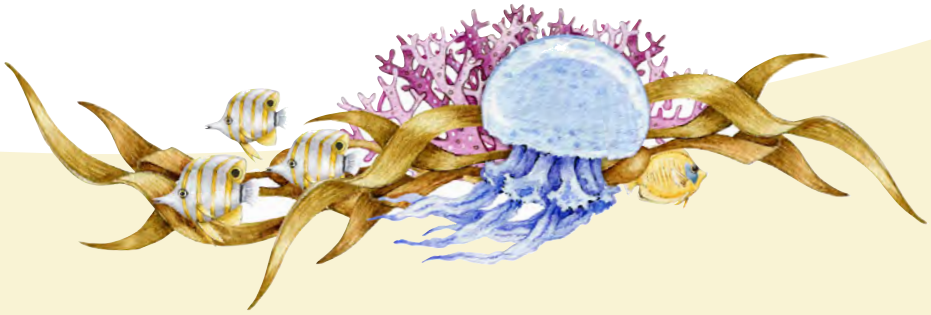
Read-Aloud Book Pack

The books below are optional read-aloud books that complement this unit. These books can be purchased as a book pack by going to **goodandbeautiful.com/science** and clicking on the *Kingdoms and Classification* link.



Microbes: The Tiny Creatures Around Us
by Rebecca Borger

Taxonomy Trivia
by The Good and the Beautiful Team



CORRELATED BOOKS

The Good and the Beautiful Library has several books that correlate well with the *Kingdoms and Classification* unit. It can be a wonderful experience for children to read books on their levels related to the subjects they are learning in science. The library includes both fiction and nonfiction books organized according to reading level. Find these correlated books by going to **goodandbeautiful.com** and clicking on the *Kingdoms and Classification* science unit product page.

GRADES 7–8

Lesson Extensions

How the Extensions Work

Each lesson has an optional lesson extension for children in grades 7–8. Complete the lesson with all the children, and then have the older children complete the self-directed lesson extension. These extensions are located in the *Grades 7–8 Kingdoms and Classification Student Journal*.

Answer Key

The answer key for the lesson extensions can be found by going to **goodandbeautiful.com/science** and clicking on the *Kingdoms and Classification* unit. From there click on the FAQs, Helps, and Extras page.

Flexibility

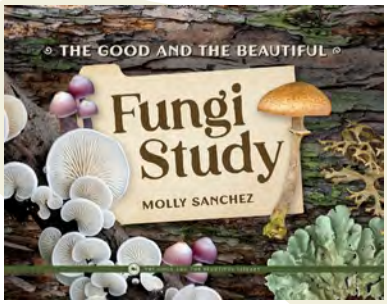
The amount of time it will take to complete each lesson extension will vary for each child. The average time is about 10–15 minutes per extension. Parents/teachers and children may choose to omit parts of the lesson extension if desired. Encourage the children to stretch their capabilities, but also reduce work if needed.

Taking Notes

Some of the grades 7–8 lesson extensions have the children summarize the material read. Teach the children to look for key information and then to summarize the most important points. Students can also add notes with their thoughts and the facts that are most interesting to them.

Optional Grades 7–8 Reading Book

We recommend *The Good and the Beautiful Fungi Study* by Molly Sanchez as extra reading for students in grades 7–8. This book can be purchased by going to **goodandbeautiful.com/science** and clicking on the *Kingdoms and Classification* unit link.



The Good and the Beautiful Fungi Study
by Molly Sanchez

Supplies Needed

This section is divided into supplies needed for **activities** and supplies needed for **experiments**. If you would prefer to watch the experiments instead of perform them, you can watch all the experiments at **goodandbeautiful.com/sciencevideos** or on the Good and Beautiful Homeschooling app. The activities, however, are not filmed.

For Optional Use with Lessons 2, 5, 7

- High-quality compound microscope
- Methylene solution
- Glass slides and coverslips
- Toothpicks
- Clear tape
- Eyedropper
- Paper towels
- We have tested and reviewed microscopes. Our top-recommended microscope is AmScope M150C 40x–1000x All-Metal Optical Glass Lenses Cordless LED Student Compound Microscope (monocular). You do not have to use our recommended microscope.

Lesson 1

- Pencil or pen
- Paper clip

Lesson 2

- 2 pieces of thread, yarn, or rope about one foot long per child
- Agar plates purchased online or 5 paper cups, plastic wrap, 5 rubber bands, ½ cup water, 2 tsp sugar, 2 tsp gelatin
- Disposable gloves

Lesson 3

- Permanent marker
- 7 standard-sized disposable cups
- Tape

Lesson 4

- Agar plates prepared in Lesson 2
- 4 cotton swabs

Lesson 5

- 15–20 assorted office or household supplies, such as a paper clip, rubber band, pencil, sticky note, hair elastic, penny, bobby pin, eraser, staples, etc.
- Cup of water from a stagnant pond or lake (optional)

Lesson 6

- 3 empty disposable water bottles
- 3 balloons
- Marker
- 3 portions of ¼ c water each—two portions warm and one portion cold
- 3 Tbsp active dry yeast
- 1 Tbsp sugar
- Bowl
- Funnel
- Spoon or whisk
- Game pawn, piece of cereal, or coin

Lesson 7

- Shallow pie pan and tall glass filled with ½ inch of water each
- Dry sponge
- Straw
- Thin layer of onion (optional)

Lesson 8

- None

Lesson 9

- Glue
- 1 M&M® (or similar hard-shelled candy) for each child

Lesson 10

- A pipe cleaner for each child
- 10–15 beads for each child

Lesson 11

- None

Vocabulary

Instructions: Cut out the vocabulary cards in this section. Place them on your science wall when prompted to do so in the lessons. Review the vocabulary words several times during this unit and, if desired, at various times throughout the school year.

Organism

any living thing that can move, grow, and reproduce; most need air, food, and water

Microorganism

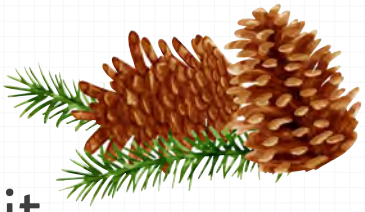
an organism so small it can only be viewed with a microscope

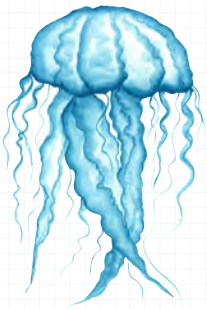
Cell

the small, basic unit of living matter of which all organisms are made

Gymnosperm

a plant without flowers that produces seeds not covered by fruit





Invertebrate

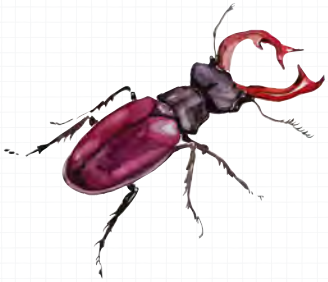
a group of animals without a backbone or spine

Vertebrate

a group of animals with a backbone or spine

Exoskeleton

a skeleton located on the outside of a creature's body



Introduction to Living Things

Objective

Help the children learn about the wondrous diversity of life as they discover the defining characteristics of all living things on Earth.

Preparation:

- ☐ Cut out the "Living Things" cards.
- ☐ Cut out the "Characteristics of Life Icons" cards from each child's student journal.

Activity Supplies:

- Pencil or pen
- Paper clip

☐ Picture Activity

Place the cut-out "Living Things" cards in front of the children.

Read to the children. Point to each picture as you discuss it: Can you find anything this amoeba, mushroom, tree, red stag, and sea coral have in common? What differences do they have? **Pause for response.** It's probably much easier to find the differences, but they do have one main thing in common—they are alive! God has created a world that is teeming with life, most of which we can't even see! **Point to the blob-like gray amoeba.** If you were to collect a drop of water from a pond, there could be many amoebas within it, too small to see with your eye. This yellow sea coral is something else you can find in the water, but unlike the amoeba, it is actually an animal! God created all of the living beings on the planet with their own characteristics and purposes. In this unit you will learn about what is unique about each life form and what ties them all together. **Save the cards to use later in this lesson.**

☐ Science Wall: Vocabulary Words

Place the vocabulary cards ORGANISM and MICROORGANISM on your science wall. Read and discuss the words and their definitions.

☐ Characteristics of Life Game

Place the spinner page and each child's set of cut-out "Characteristics of Life Icons" cards in front of the children. Have each child pick a cut-out "Living Things" picture used in the previous activity to place in front of himself or herself. If there are more than five players, have the children work in teams.

Read to the children: Living things have more in common than you might realize. Some scientists debate over what categorizes something as living vs. nonliving. However, there are eight commonly accepted attributes we will cover in this unit.

We are going to play a game to learn about each one. The goal of the game is to collect all eight characteristics. **Place the "Characteristics of Life Icons" cards near the children. Place the paper clip in the center of the spinner and put the pencil tip through it.** Each of you will take turns spinning the paper clip and collecting the picture of the characteristic you land on. I will read a brief description of each characteristic as it is collected for the first time from the list on this page. If you land on a characteristic that has been read already, you will briefly describe that characteristic. If you have already collected the characteristic you land on, your turn is over. **The first person to collect all eight can be declared the winner, or all players can try to beat a 10-minute timer.**

CHARACTERISTICS:

Living things have DNA. Located within a cell, hereditary DNA is a tiny twisted strand of chemical molecules. It contains the instructions for how an organism looks and functions and is passed down when an organism reproduces. An insect's DNA tells it to grow wings or six legs, or to have the ability to glow at night.

Living things have cells. All living things have either one or many cells—the building blocks of life. Some ***microorganisms***, such as bacteria, fungi, and viruses, are made of one or a few cells. Humans are ***organisms*** with over 30 trillion cells!

Living things reproduce. Reproduction is the process of living things creating new life. A mother and father cat create new life and pass down their DNA to their baby. This DNA tells the kitten's body to grow up into an adult cat.

Living things grow and develop. A living thing grows larger and changes as it matures. Consider a frog. The tadpole grows larger and then develops into a frog.

Living things need energy. In order to stay alive, organisms must consume food for energy. This is done in a variety of ways: some organisms eat other organisms, some produce their own food, and others break down dead material for food. A plant's DNA tells it to convert sunlight into energy so that it can make its own food.

Living things have senses. Although some organisms have very limited senses, all are able to respond to stimuli in an environment. For example, earthworms don't have eyes, but they are able to sense vibrations and light. They can even taste some flavors through the nerves in their skin.

Living things require homeostasis. As you sit during this lesson, your heart is beating a steady rhythm. You have internal balance or *homeostasis*. If a balloon suddenly popped nearby, it might surprise you, and your heart would beat more rapidly. After a time your heart would return to homeostasis and its steady rhythm. The beating of your heart is one example, but other body functions fluctuate and return to balance, such as body temperature, breathing, hormones, and emotions.

Living things can move. At some stage in their lives, all living things move; flowers open to the sun, cheetahs run across the savanna, and sea sponges float about the ocean as polyps.

Living and Nonliving Hunt Activity

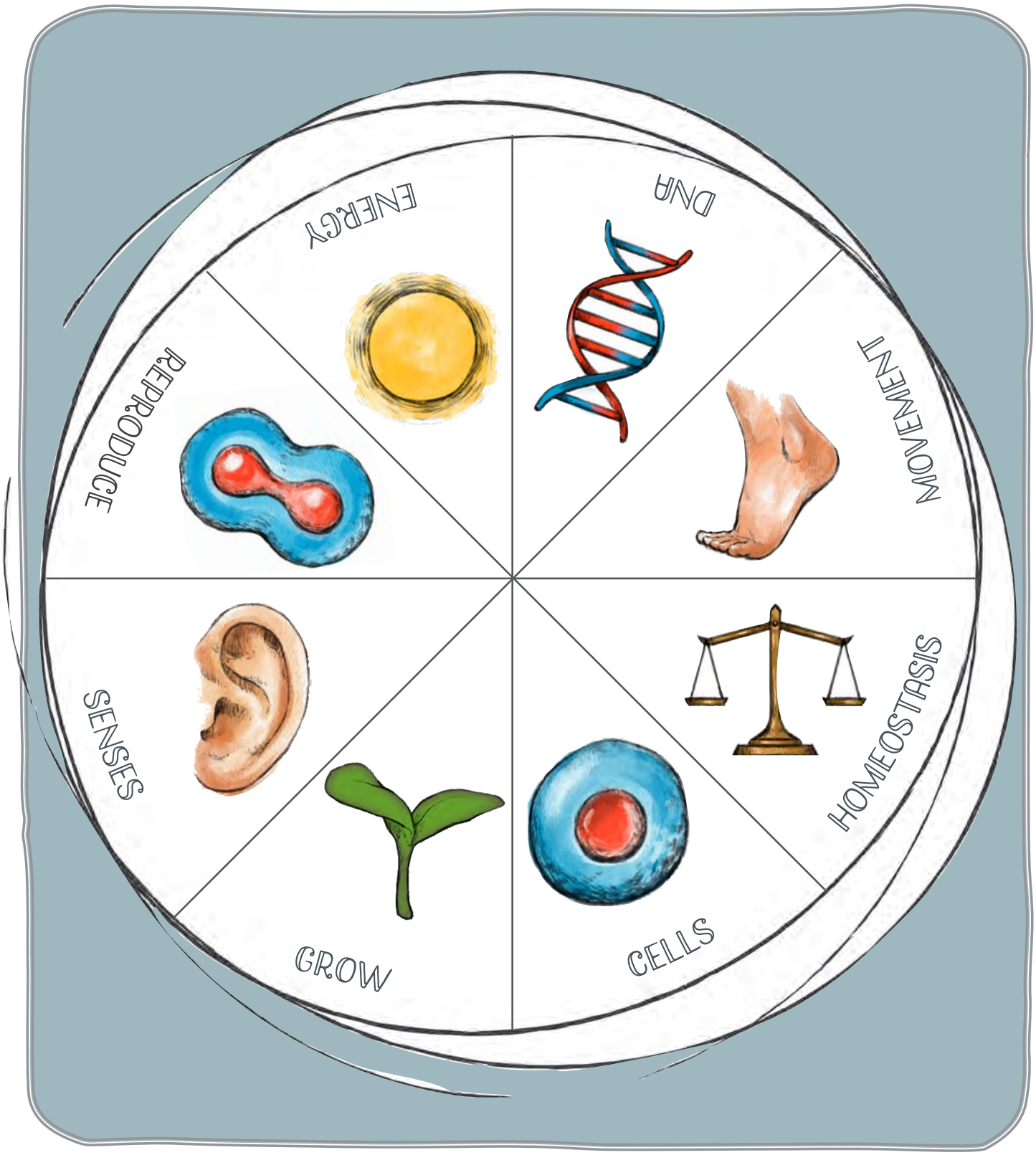
Read to the children: Everything around us is either living or nonliving. To explore this further, we are going to do a scavenger hunt.

Have the children turn to the "Living and Nonliving Hunt" page in Lesson 1 of their student journals. Depending on the season and weather, this activity may be completed outside or inside.

Lesson 1 Extension

Have children grades 7–8 complete the self-directed Lesson 1 extension titled "DNA and Classification" in their student journals.

Spinner



Classification

Objective

Help the children understand and identify the levels of classification and the six kingdoms of life.

Preparation:

- ☐ Cut out the "Tiger Taxonomy" squares.
- ☐ Write one of the following classification levels on each cup with a permanent marker: kingdom, phylum, class, order, family, genus, species.

Activity Supplies:

- Permanent marker
- 7 standard-sized disposable cups
- Tape

☐ Optional Read Aloud

At any point in the lesson, you may read one of the books from the optional Read-Aloud Book Pack. Longer books may be split into more than one reading session. *Taxonomy Trivia* by The Good and the Beautiful Team is suggested with this lesson.

☐ Organization of Living Things

Read to the children: Did you know that new species are discovered every year? A species is a group of animals that all share the same characteristics. Look at the Rice's blue whale in the picture below. Until recently the Rice's blue whale was believed to be one of the species of baleen whales. With further study scientists realized that this whale had differences in its skeleton that made it unique from other whales it had been grouped with. Why do we group animals into species? In this lesson we will discover the answer to that question and see how scientists determine what creatures should be grouped together.

☐ Systems of Organization

Read to the children: Imagine you want to find a certain book at your public library. Would you walk down the aisles and read every single title to find it? No! You would use the library's system of organization to find the book more quickly. Libraries are organized by sections, such as adult, young adult, youth, nonfiction, and fiction. Within these sections books are given a number that tells you the subject of the

book or are labeled with the author's last name and put in alphabetical order. The classification system used by libraries narrows down large categories into smaller ones, like the roots of a tree coming from the thick trunk and spreading out into smaller and smaller underground branches.

Your public library holds thousands of books. But did you know there are about 8.7 million different kinds of living things on the earth that we know of, from flowers blooming in the sun to eagles soaring in the skies? Do you think it is important for them to be organized? Why do you think so?

Carl Linnaeus created a system for classifying living things in the 1700s with only two kingdoms: plants and animals. In his time many new organisms were being discovered, and there was not a system for naming or classifying them. This meant that organisms were given very long names that were difficult to remember, and it was impossible to see how things were related. Thinking back to our library example, it was as if books were being put on shelves in a library randomly. It was difficult to ever find the book, or organism, needed.

Classification Cups Activity

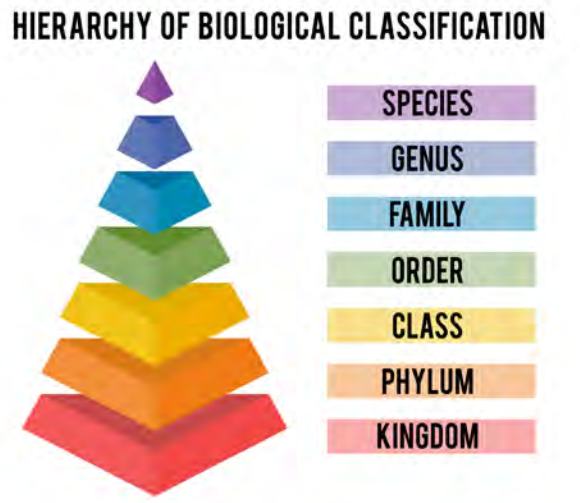
Have the children turn to the "Taxonomy of Life" chart in Lesson 3 of their student journals.

Read to the children: Look at all the different forms of life that God has created! This chart shows the *classification*, or grouping, of just a few organisms based on shared characteristics, similar to Linnaeus' system. Point to each of the six circles labeled "Kingdom." These six kingdoms are the first major grouping of organisms based on their cell and development types. *Note: Some scientists organize creatures into five or seven kingdoms. We will study six kingdoms because that is the system most scientists use.*

Give the children the seven labeled cups. *Kingdom* is the first of seven levels of classification. This level is a large group that includes a variety of creatures. As you move down the levels, they gradually become more specific. *Species* is the last group and includes creatures with the same characteristics that are able to reproduce together. Starting with the cup labeled "Kingdom," see if you can stack the cups in order according to the diagram below. **Have each child take a turn stacking them in the correct order with Kingdom at the bottom and the other levels of taxonomy inside the Kingdom cup.**

Tape a cut-out "Tiger Taxonomy" card to the outside of each correct cup. Have the children place them in a row in the correct order. Read to the children: Look at all the different creatures included on the cup labeled "Kingdom Animalia." Move down the row and look at the animals in each picture on the cups. Each classification level narrows down the creatures included until you reach the specific species. **Have the children take turns stacking the cups in order again. If desired, have them try stacking the cups multiple times while being timed to see if they can get faster! If desired, keep the cups to practice with prior to each lesson or every other lesson.**

Read to the children: Now we will see this classification on the "Taxonomy of Life" chart. Find the "Kingdom Animalia" circle. See if you can follow the groupings down the "Taxonomy of Life" chart to find where tigers fit.



Tiger Taxonomy

Kingdom
Animalia

Phylum
Chordata

Class
Mammalia

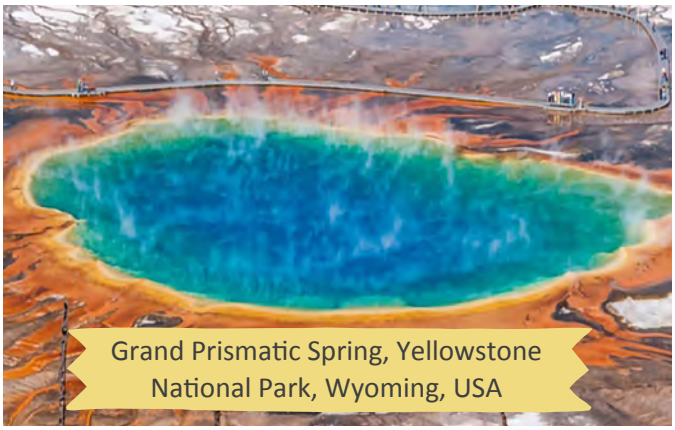
Order
Carnivora

Family
Felidae

Genus
Panthera

Species
tigris

Bacteria and Where They Are Found



Grand Prismatic Spring, Yellowstone National Park, Wyoming, USA

Eifuku Chimneys "Champagne" hydrothermal vents at Eifuku Seamount Volcano, Pacific Ocean

Shore of Great Salt Lake, Utah, USA

Coastline of Antarctica

Escherichia coli

(Image: Anne Fjelbirkeland), CC BY 2.5, via Wikimedia Commons

Methylococcus capsulatus

Alcanivorax borkumensis

Gloeocapsa magma

1

The Eifuku chimneys are hydrothermal vents found deep in the ocean that pump out water that is 103 °C (217 °F). The bacteria living there enjoy the high temperatures.

FEW

2

Located in Yellowstone National Park in the USA, the Grand Prismatic Spring is 71 °C (160 °F). The color of the pool is a result of the bacteria that live in it.

ER

3

The icy cold terrain of Antarctica is generally below 0 °C (32 °F), but the freezing temperature is no hindrance for the bacteria that call it home.

THAN

4

The shore of the Great Salt Lake is so salty that nothing grows except for the bacteria that eat the salt and give the water its purple color.

ONE

5

THIS SPECIES

uses methane gas to produce energy and converts it into carbon dioxide and water.

DIFFERENCE

Eubacteria live everywhere on Earth.

PER

6

THIS SPECIES

is found in human intestines and helps with digestion. Some strains cause disease.

DIFFERENCE

Archaebacteria only live in extreme environments.

CENT

7

THIS SPECIES

is commonly seen as black and green stains on rooftops.

DIFFERENCE

Archaebacteria are simple microorganisms.

8

THIS SPECIES

is often unseen in the ocean until oil is present, then it appears to feed on the oil and reduce the amount in the ocean.

DIFFERENCE

Eubacteria are complex microorganisms.

Marvelous Mushrooms

Bleeding Teeth Fungus

not edible

Found primarily in coniferous forests in the Pacific Northwest, this is one of the most unique mushrooms in the world. Dark red liquid oozes from small holes on its cap.

The Giant Puffball

edible

The name of this mushroom fits its appearance perfectly. Generally the size of a soccer ball, this white orb-like mushroom can grow to be 1.5 meters (5 feet) wide and weigh 23 kilograms (50 pounds)!

Amanita Mushroom

some are poisonous

The traditional storybook mushroom, this red-capped fungus is what many may think of when they picture mushrooms.

Honey Mushroom

edible

The largest organism in the world is a specimen of honey mushroom that is 2,385 acres in area, which is about 1,350 soccer fields! The mushrooms you see above ground are only part of the organism. Underground is a vast network of root-like structures called mycelia. This mushroom is also interesting because bioluminescent bacteria living on its surface cause it to glow!

Marvelous Mushroom Maze

START

Animal Kingdom: Vertebrates

Objective

Help the children understand the characteristics of vertebrates in the Animalia kingdom.

Preparation:

- ☐ Cut out the "Animal Field Journal: Vertebrates" cards from each child's science journal.
- ☐ Write the words "endothermic" and "ectothermic" on two separate slips of paper, one set for each child.

Activity Supplies:

- A pipe cleaner for each child
- 10–15 beads for each child

☐ Complex Creatures

Read to the children: In this unit we have seen a variety of living things, from basic, unicellular bacteria to towering trees. We have gradually learned about the simple to the complex. This wide range of complexity gives our earth diversity and connection. Each species is unique and needed, just like every person.

Humans have the distinction of being the most complex living things on our planet. Unlike protists, we are able to learn and remember. Because we have a backbone and an endoskeleton that holds us up and helps move our muscles, we can run, jump, and dance, whereas a snail moves slowly across the ground. God has created all things to serve a unique purpose. Think of the unique talents that you have. What is something you do that benefits your family or community? **Discuss this question with the children.**

Watch the video titled "Vertebrates: Complex Creatures" at goodandbeautiful.com/sciencevideos or from the Good and Beautiful Homeschooling app. Discuss the following questions:

1. Animals display an astounding variety of abilities—jumping, flying, swimming, changing color, regrowing limbs, etc. If you could have any of these abilities, which would you choose?
2. Why do you think variety is important?

☐ Backbone Beads

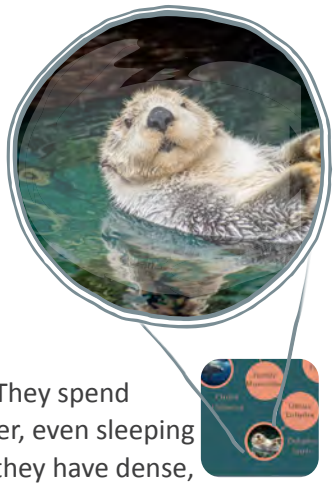
Give each child a pipe cleaner and 10–15 beads.

Read to the children: Stand up and place your hands on your back. Can you feel your backbone? Bend over and move side to side. Your backbone gives your body structure and allows you flexibility. **Have the children place the beads on their pipe cleaner.**

A backbone is made up of two parts. The first is the spinal cord, which is represented by the pipe cleaner. This cord carries nerves that send important messages to and from your brain. It is important and needs to

be protected by the second part of your backbone, the vertebrae bones, which are represented by the beads. Humans have 33 vertebrae stacked on top of each other like the beads on the pipe cleaner. Each bone is connected to muscle that allows it to twist and turn. **Have the children move the pipe cleaner in different directions to show the flexibility of the backbone.**

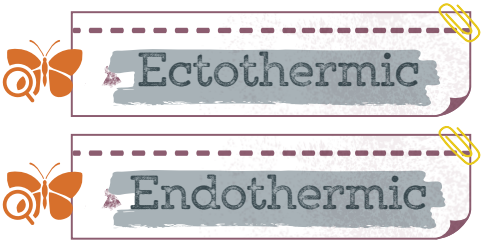
Creature Spotlight: Southern Sea Otter



Read to the children: Off the coast of California, USA, you might spot some of these marine vertebrates swimming, floating, or playing in the Pacific Ocean. They spend most of their time in the water, even sleeping while floating. To stay warm they have dense, waterproof fur that protects their bodies from the cold water. **Have the children turn to the "Taxonomy of Life" chart in Lesson 3 of their student journals and follow the path from Kingdom Animalia to the species *Enhydra lutris*, the scientific name for the sea otter.**

Science Wall: Vocabulary Words

Place the vocabulary cards ECTOTHERMIC and ENDOTHERMIC on your science wall. Read and discuss the words and their definitions.



Vertebrate Diversity

Place one set of the previously written words "ectothermic" and "endothermic" in front of each child.

Read to the children: There are five classes of vertebrates: birds, mammals, reptiles, amphibians, and fish. While they all share the characteristic backbone, each class is unique and is either ***ectothermic*** or ***endothermic***. Sea otters are endothermic because they are able to maintain their body temperature with thick protective fur. As I read about each class of vertebrates below, raise your ectothermic or endothermic card to show how you believe their body regulates heat. **Review the vocabulary cards as needed.**

Birds: Covered in feathers that help maintain their body heat, birds are most distinct for their ability to fly. They are found on every continent of the world and include varieties like the penguin, ostrich, eagle, and hummingbird. [endothermic]

Reptiles: Unlike birds, reptiles rely on their environments for warmth and must live primarily in locations where they have access to sunshine to warm up and shade to cool off. They have scaly skin and leathery eggs and include crocodiles, turtles, snakes, and lizards. [ectothermic]

Mammals: Characterized primarily by the fact that they give birth to live young who feed on the mother's milk, these animals are found throughout the world. It may surprise you to learn that there are only about 5,000 species in this class. Some have fur to help them maintain their body heat, while others have large amounts of fat or even blubber. [endothermic]

Animal Field Journal Key

Animalia
Arthropoda
Insecta
Coleoptera
Lampyridae
Photinus

While many underwater creatures can produce their own light through bioluminescence, these small beetles are one of few on land to do so. On a summer night in warm climates, they will use these lights, created by a chemical reaction, to find a mate.

Invertebrates

Animalia
Cnidaria
Scyphozoa
Semaeostomeae
Cyaneidae
Cyanea

Glowing in the ocean is a creature with over a thousand tentacles that can grow to be up to 37 meters (120 feet) long! It lives in cold waters near the surface and dangles its tentacles below to catch its prey. Like others in its phylum, it has stinging barbs that can kill unsuspecting fish that swim too close.

Invertebrates

Animalia
Mollusca
Gastropoda
Stylommatophora
Helicidae
Helix

A trail of slime follows in its wake as this invertebrate moves through the forest. Commonly called escargot, these small mollusks live in forests and feed on fungi and decaying plants. Snails create their shells in a spiral shape that gradually grows as the snail does.

Invertebrates

Animalia
Porifera
Demospongiae
Haplosclerida
Petrosiidae
Xestospongia

This creature is called home to many animals and looks more like a rock than an animal. It eats by pumping the water around it through its walls and filtering out nutrients. With a width up to 2 meters (6.5 feet) across, these giants are capable of pumping, filtering, and cleaning a lot of water.

Animalia
Echinodermata
Echinoidea
Echinoida
Strongylocentrotidae
Strongylocentrotus

These spiny relatives of sea stars live in rocky, shallow water near the shore. Eating primarily algae and the base of kelp, these tiny creatures can have a big impact on water ecosystems. These invertebrates can eat away the bases of an entire kelp forest, but predators keep their population in check.

Animalia
Annelida
Clitellata
Haplotaxida
Lumbricidae
Lumbricus

Earthworms may be small, but they are one of the major contributors to the health of Earth's soil. As they move underground, they eat buried waste and recycle it into the soil as nutrients for plants and other organisms. There are over 7,000 different species of earthworms and they can be found on every continent except Antarctica.

KINGDOMS AND CLASSIFICATION

Grades 3-6

STUDENT JOURNAL

This journal belongs to:

THE GOOD AND THE BEAUTIFUL

INSTRUCTIONS

This student journal accompanies *The Good and the Beautiful Kingdoms and Classification* science unit. It contains all the worksheets and journal pages that are needed to complete the unit. Each student will need his or her own copy of the science journal.

Have each student take his or her time to create high-quality work as the activities and worksheets are completed. Students may enjoy looking back on their past discoveries when they've finished.

TABLE OF CONTENTS

LIVING AND NONLIVING HUNT

*Can be completed outdoors or indoors (looking for items inside or through a window)

Find at least five of the items listed below and write or draw them in the column under "Item." Observe each item and put an X in each box that applies to the item. More spaces are included if you would like to find more items. In the final box, draw an X if the item is living.

- ◊ rock
- ◊ grass
- ◊ tree
- ◊ cement
- ◊ ant
- ◊ dirt
- ◊ flower
- ◊ bird
- ◊ fence
- ◊ worm
- ◊ window
- ◊ plant
- ◊ house
- ◊ pet
- ◊ book
- ◊ spider

	Item	 Needs Energy	 Grows & Develops	 Has Cells	 Has Senses	 Can Move on Its Own	 DNA	 Reproduces	 Homeostasis	 Living
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

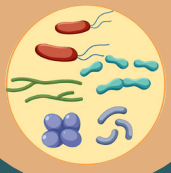
Taxonomy of Life

Kingdom Protista

- Phylum Chlorophyta
- Phylum Plasmodroma
  - Class Sarcodina
    - Order Amoebida
      - Family Amoebidae
        - Genus Amoeba
          - *Amoeba proteus*
- Phylum Phaeophyta

Kingdom Archaebacteria

Kingdom Eubacteria



- Phylum Phaeophyta
  - Class Gamma Proteobacteria
    - Order Enterobacterales
      - Family Enterobacteriaceae
        - Genus Salmonella
          - *Salmonella bongori*

Kingdom Plantae

- Phylum Bryophyta
  - Class Bryopsida
    - Order Dicranales
      - Family Leucobryaceae
        - Genus Leucobryum
          - *Leucobryum glaucum*
- Phylum Anthocerophyta

NONVASCULAR

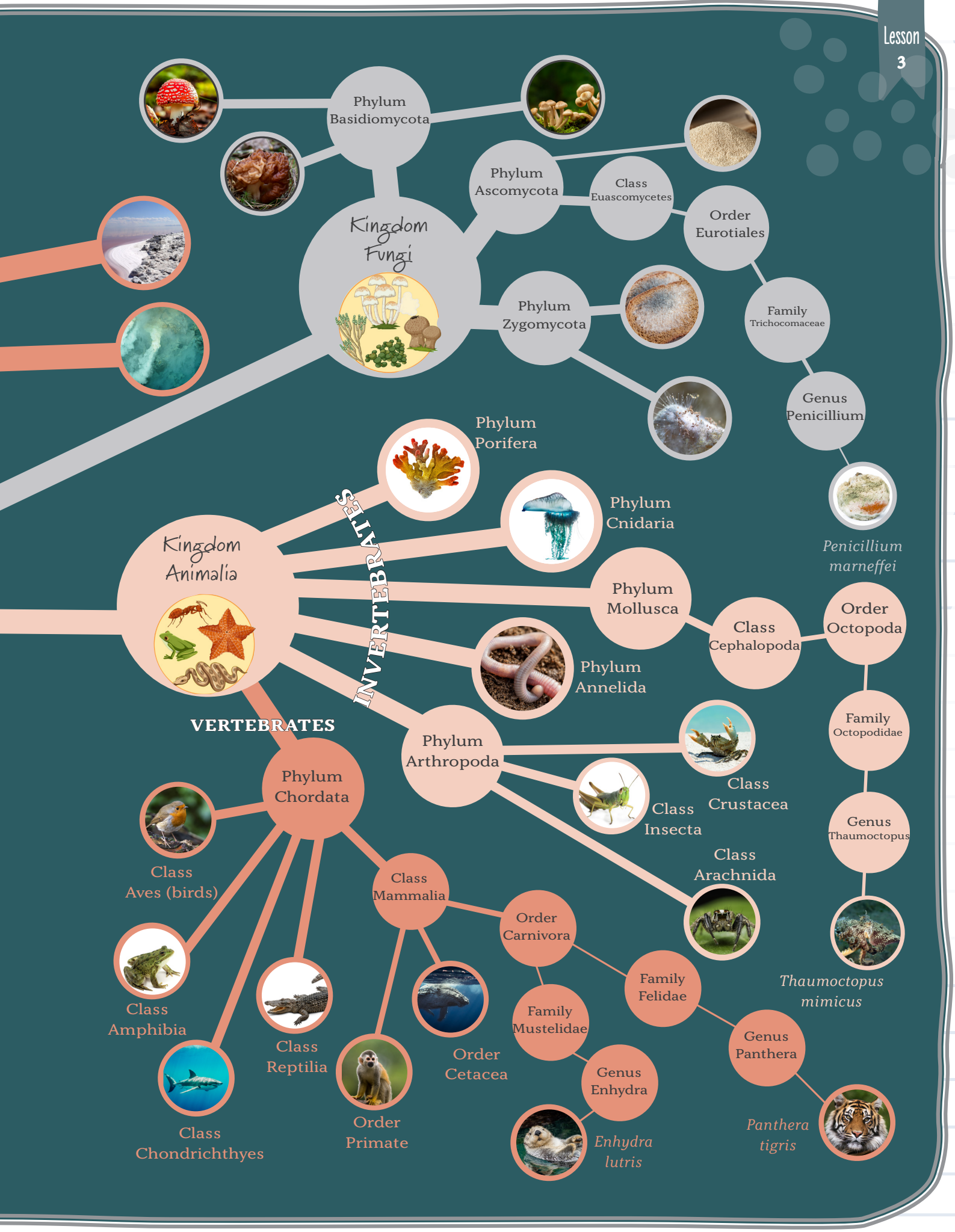
VASCULAR

- Phylum Anthophyta
  - Class Magnoliopsida
    - Order Rosales
      - Class Dicotyledonae

ANGIOSPERMS

- Phylum Coniferophyta
  - Class Cordaitopsida
  - Class Coniferopsida
  - Class Pinopsida
    - Order Pinales
      - Family Taxodiaceae
        - Genus Sequoia
          - *Sequoia sempervirens*

GYMNOSPERMS

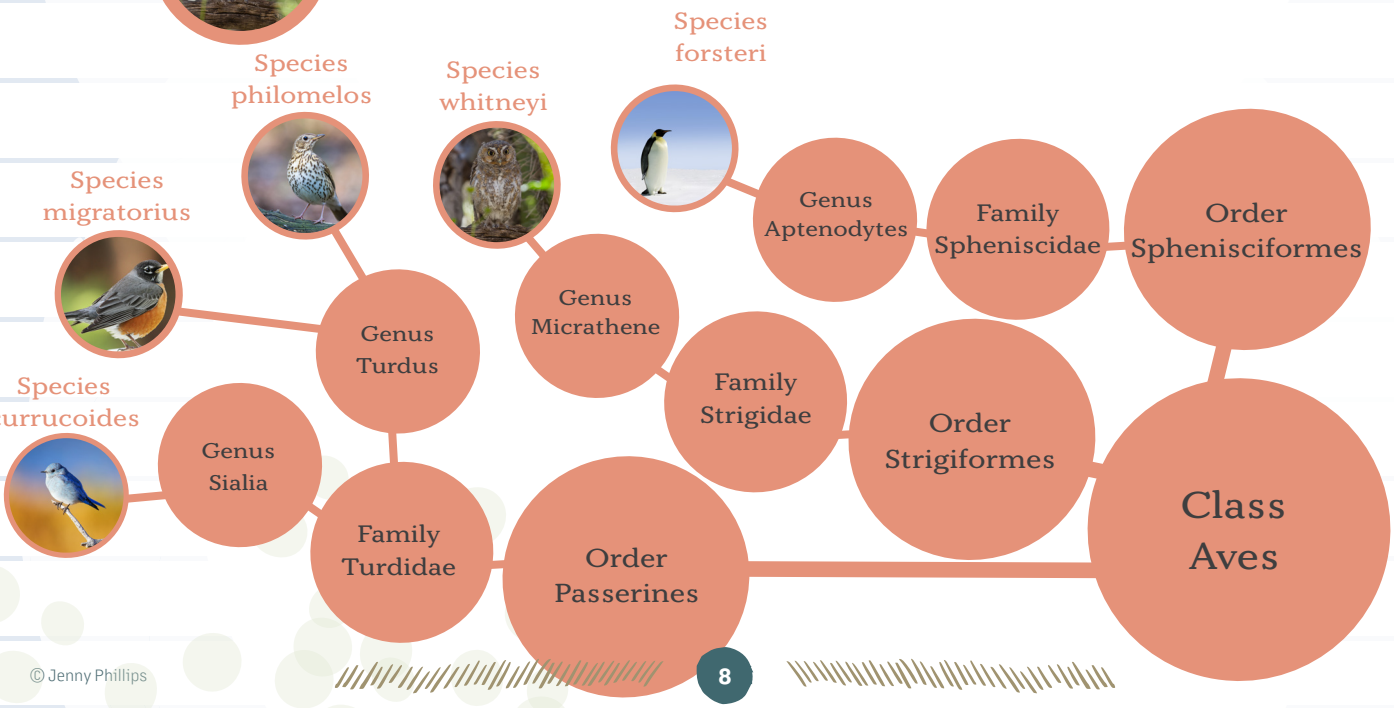

Kingdom Fungi
Phylum Basidiomycota
Phylum Ascomycota
Class Euascomycetes
Order Eurotiales
Family Trichocomaceae
Genus Penicillium
Penicillium marneffei
Phylum Zygomycota
Kingdom Animalia
INVERTEBRATES
Phylum Porifera
Phylum Cnidaria
Phylum Mollusca
Class Cephalopoda
Order Octopoda
Family Octopodidae
Genus Thaumoctopus
Thaumoctopus mimicus
Phylum Annelida
Phylum Arthropoda
Class Crustacea
Class Insecta
Class Arachnida
VERTEBRATES
Phylum Chordata
Class Aves (birds)
Class Amphibia
Class Reptilia
Class Chondrichthyes
Class Mammalia
Order Primate
Order Cetacea
Order Carnivora
Family Mustelidae
Genus Enhydra
Enhydra lutris
Family Felidae
Genus Panthera
Panthera tigris

Lesson 3

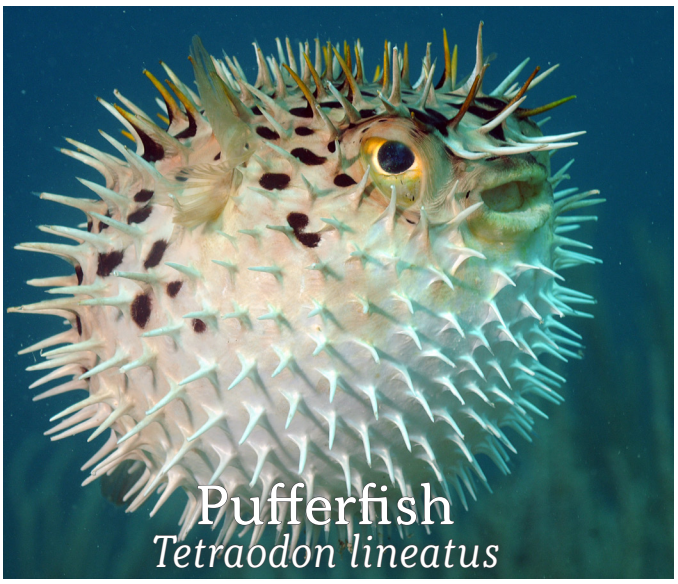
SCIENTIFIC NAME SEARCH

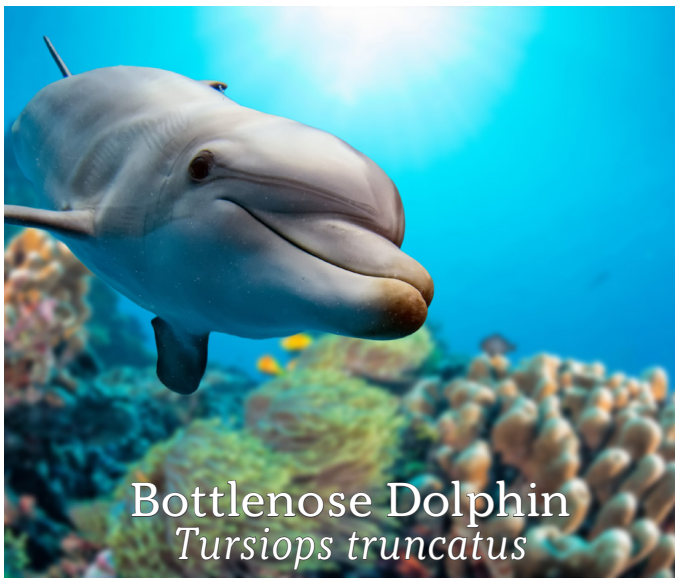
Referencing the chart below, draw lines from each bird's common name to each part of its scientific name.

	COMMON NAME	SCIENTIFIC NAME	
	MOUNTAIN BLUEBIRD	TURDUS	FORSTERI
	EMPEROR PENGUIN	APTENODYTES	CURRUCOIDES
	SONG THRUSH	MICRATHENE	PHILOMELOS
	AMERICAN ROBIN	SIALIA	MIGRATORIUS
	ELF OWL	TURDUS	WHITNEYI



Animal Field Journal: Vertebrates





KINGDOM ANIMALIA

- Read the story by replacing the pictures with the words in the key at the bottom.
- Then review the vocabulary cards ECTOTHERM, ENDOTHERM, VERTEBRATE, and INVERTEBRATE.

 ran to the door. He was so happy to see the animals. The first thing he wanted to see was the  . He loved how most  have fur to keep them warm. Next, he went to see the  with their smooth, scaly skin. His favorite was a  that had skin that could change colors to camouflage, and right next to it was an  that could jump really far!  remembered looking for  at a pond near his house. Flying overhead were  in many different colors. He loved hearing their songs.  sometimes wished that he could fly like a  . As he walked by a large glass tank, he could see  swimming in the water. These  came from rivers, and one was really big!  was sad when it was time to go but glad that he could see so many amazing animals.

Sam	Reptile/s	Mammals	Amphibian/s	Bird/s	Fish
					

KINGDOMS AND CLASSIFICATION

Grades 7-8

STUDENT JOURNAL

This journal belongs to:

THE GOOD AND THE BEAUTIFUL

INSTRUCTIONS

This student journal accompanies *The Good and the Beautiful Kingdoms and Classification* science unit. It contains all the worksheets and journal pages that are needed to complete the unit. Each student will need his or her own copy of the science journal.

The *Kingdoms and Classification* lesson extensions are also found here. These extensions are optional for older students (grades 7–8) to complete on their own. Each extension is accompanied by lined paper so the student can keep his or her work in one place.

Have each student take his or her time to create high-quality work as the activities and worksheets are completed. Students may enjoy looking back on their past discoveries when they've finished.

TABLE OF CONTENTS

EXTENSION

Instructions:

1. Read the information below.
2. With the help of DNA, scientists are better able to classify animals. Write two or three sentences explaining to someone who hasn't studied DNA and classification why it is important to distinguish differences between animals.

DNA and Classification

In the 18th century, scientists began using a system of organism classification developed by Carl Linnaeus. At that time classification was based primarily on the appearance of organisms or their ecological locations. Since that time new developments in science, primarily in DNA, have made it possible to determine even more accurately the relationship between certain organisms.

Changing Classification

All living organisms contain DNA. Scientists can now utilize the process of DNA sequencing to see the relationship between organisms. The more closely related organisms are, the more sequences they have in common. Even more importantly, sequencing helps scientists determine distinctively when a new species has been discovered. Due to these newer developments, classifications of some organisms have changed. An example of changing a classification and the discovery of new classifications is found in cyanobacteria. Previously thought to be blue-green algae, ***cyanobacteria*** are single-celled microscopic organisms found naturally in all types of water. Like plants, they use sunlight to make their food. DNA sequencing allowed biologists to definitively classify this organism more accurately.

DNA Barcode

With an established database of DNA sequences in place, scientists have been able to create what is known as a DNA barcode for each species. Similar to the barcode a grocery clerk scans to add the price of an item to your total automatically, DNA barcodes are a short section of DNA sequence for a given species that allows scientists to quickly identify and determine the taxonomy of a species without evaluating its entire genetic code.

Giraffes

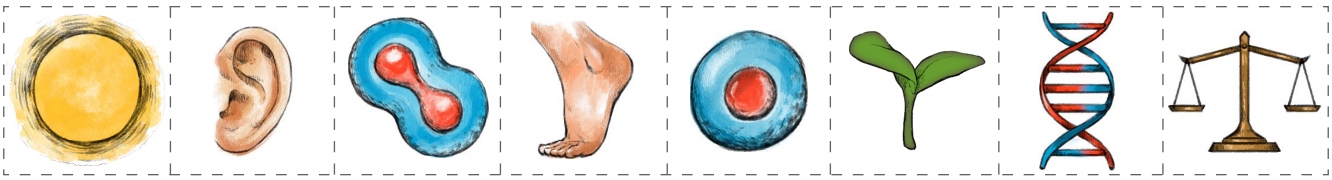
A giraffe is another organism that has been reclassified due to DNA findings. Prior to 2016 all giraffes were believed to be one species. Giraffes had not been extensively studied before this time. In 2016, through DNA analysis, scientists discovered that giraffes actually comprise four very different species.

This discovery was made by taking skin samples from more than 100 giraffes in Africa. DNA was extracted from each sample. After a comparative analysis, scientists were able to classify giraffes into four new groups: *Giraffa giraffa*, *Giraffa tippelskirchi*, *Giraffa reticulata*, and *Giraffa camelopardalis* (commonly named southern, Masai, reticulated, and northern giraffe respectively). This discovery has had a great impact on the preservation of these threatened species. Because these groups are so genetically diverse, they are not able to mate with one another. Conservationists now understand that they must have giraffes with the same DNA barcode together. DNA sequencing is a remarkable tool for correctly classifying living things and seeing the connections between them.

Can you "spot" any differences?

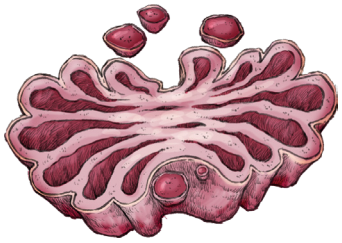
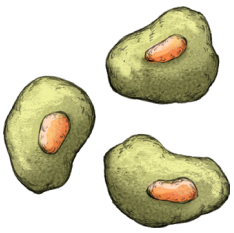
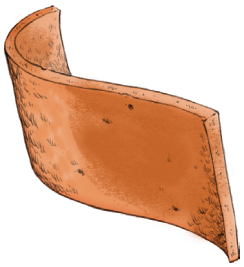
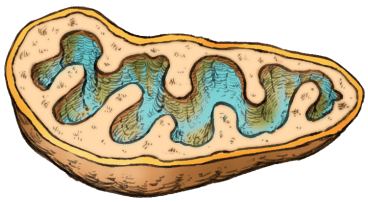
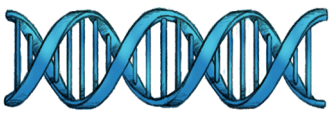
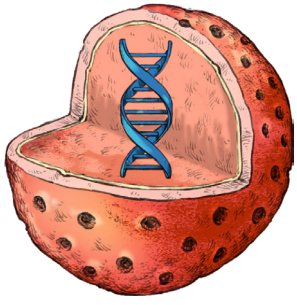
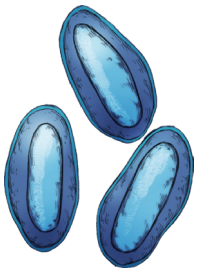
Lesson 1

CHARACTERISTICS OF LIFE ICONS



Lesson 2

PARTS OF A CELL

PROKARYOTE		EUKARYOTE
		
		
		

Lesson 3

Taxonomy of Life

Kingdom Protista

Phylum Chlorophyta

Phylum Plasmodroma

Class Sarcodina

Order Amoebida

Family Amoebidae

Genus Amoeba

Amoeba proteus

Phylum Phaeophyta

Kingdom Archaebacteria

Kingdom Eubacteria

Class Gamma Proteobacteria

Order Enterobacterales

Family Enterobacteriaceae

Genus Salmonella

Salmonella bongori

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Kingdom Plantae

NONVASCULAR

Phylum Bryophyta

Class Bryopsida

Order Dicranales

Family Leucobryaceae

Genus Leucobryum

Leucobryum glaucum

Phylum Anthocerophyta

VASCULAR

Phylum Anthophyta

ANGIOSPERMS

Class Magnoliopsida

Class Dicotyledonae

Order Rosales

Phylum Coniferophyta

GYMNOSPERMS

Class Cordaitopsida

Class Coniferopsida

Class Pinopsida

Order Pinales

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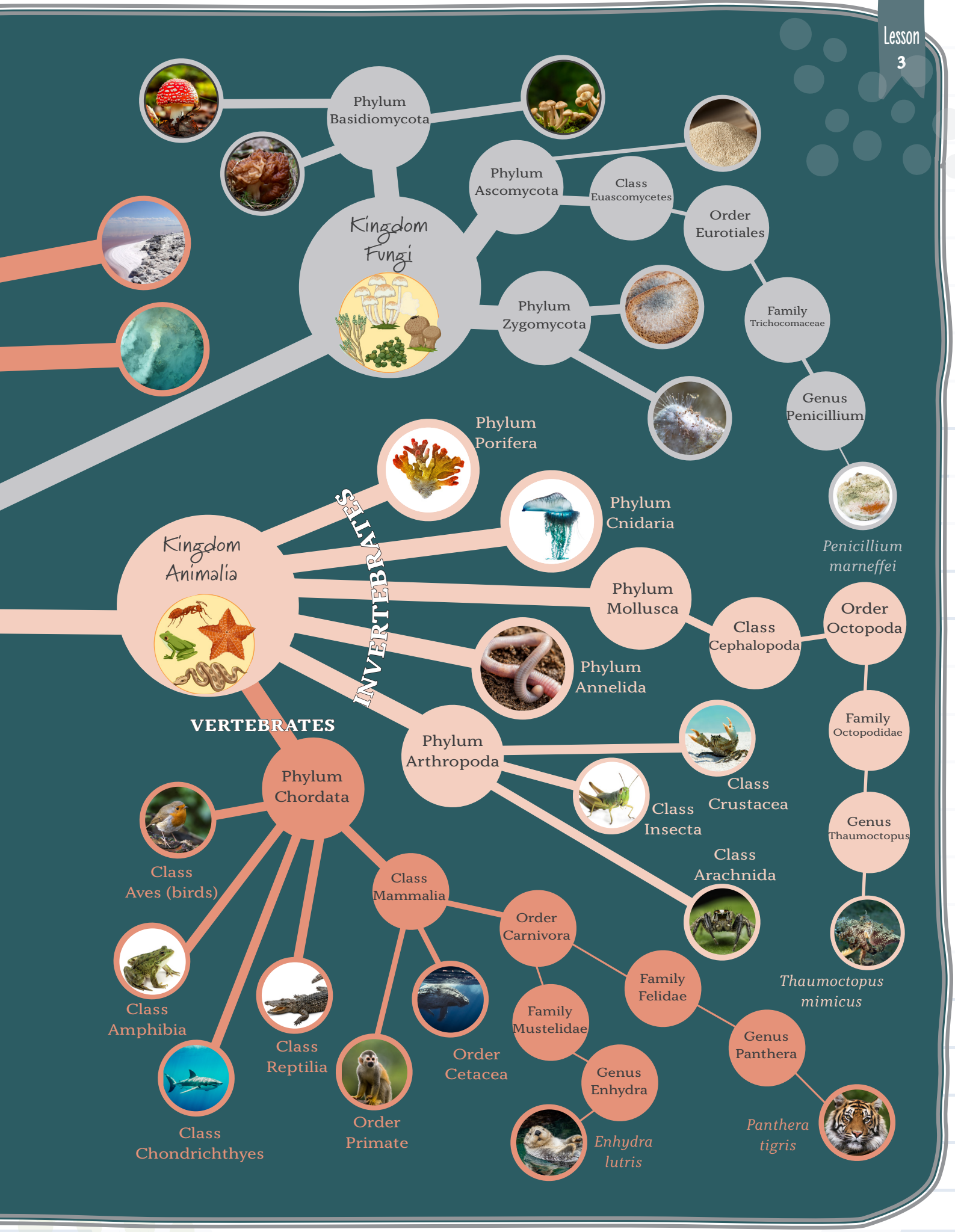
Genus Sequoia

Sequoia sempervirens


Kingdom Fungi
Phylum Basidiomycota
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Order Eurotiales
Family Trichocomaceae
Genus Penicillium
Penicillium marneffei
Phylum Zygomycota
Kingdom Animalia
INVERTEBRATES
Phylum Porifera
Phylum Cnidaria
Phylum Mollusca
Class Cephalopoda
Order Octopoda
Family Octopodidae
Genus Thaumoctopus
Thaumoctopus mimicus
Phylum Annelida
Phylum Arthropoda
Class Crustacea
Class Insecta
Class Arachnida
VERTEBRATES
Phylum Chordata
Class Aves (birds)
Class Amphibia
Class Reptilia
Class Chondrichthyes
Class Mammalia
Order Primate
Order Cetacea
Order Carnivora
Family Mustelidae
Genus Enhydra
Enhydra lutris
Family Felidae
Genus Panthera
Panthera tigris

EXTENSION

Instructions:

1. Read the information below.
2. Imagine you are a taxonomist who studies amphibians. Create an hourly schedule for your day starting at 8:00 AM and ending at 5:00 PM.

A Day in the Life of a Taxonomist

What do you think the day of a taxonomist would be like? Do you think they sit in a museum looking at specimens under a microscope? Perhaps they spend a lot of time writing about what they have found. Actually, in a given day they may do all of these things or one of these things. Each day is different but filled with study and discovery!

The purpose of taxonomists is to organize and classify the world around them. Most will choose a specific area to focus on, such as fish or parasites. Much of the life on Earth has been organized, but sometimes corrections to groupings need to be made and new species are found and need to be classified. The first step for a taxonomist is to find organisms to study.

To begin his or her day, a taxonomist may go out in the field to collect organisms. For example, parasite taxonomists gather small mammals, from which they can collect parasites. As with other scientists, specimens are collected during a field expedition where taxonomists spend days, or even weeks, in a specific area, collecting what they can to bring back to a laboratory for storage.

Once study material has been collected, either from the field or from storage, taxonomists work to identify the organisms. Taxonomists must be like detectives and ask questions like "How is this organism different than other similar organisms?" "How does this organism live?" "Where did it come from?" and "Does its DNA match an existing species?" To find the answers to these questions, taxonomists will look at the organism's appearance, anatomy, DNA, and cells (under a microscope) and will consider where it came from. With all this information, they can identify the species as one already classified or give the new species a name and classify it.

At this point they will continue to evaluate the organism and will describe it in writing and by drawing pictures of its external and internal features. When the mystery of the organism is solved, they will write their findings in a scientific paper and publish the paper in magazines or research journals.

There are many reasons these publications are useful. For example, fishermen will often contact taxonomists to determine the correct species of their catch for legal paperwork and market worth. Developers putting in a new shopping center might contact a taxonomist to determine the species of a resident animal before they can begin building. And conservationists need to know specific species to track their numbers and determine changes in population. To identify a species correctly, there must be documentation on that species—documentation that comes through published findings of taxonomists around the world.

New Species

FIND

To find new species, taxonomists go out in the field and collect unfamiliar organisms. Sometimes new species are found by scientists in other fields or even by common citizens.

IDENTIFY

Once found, an organism must be identified. This is done through DNA analysis, microscopic examination, and the study of the organism's overall appearance. If the organism is unique, as in the case of a new species, it is given a name.

DESCRIBE

Taxonomists describe the creature by drawing its internal and external structures and writing down its characteristics and unique features.

PUBLISH

All the information about the new species is compiled into a scientific paper and published to benefit the entire scientific community.

Agar Plate Bacteria Collection Recording Sheet

DATE COLLECTED: _____

Bacteria Collected From: #

My Prediction

My Results

Date:

Bacteria Collected From: #

My Prediction

My Results

Date:

Bacteria Collected From: #

My Prediction

My Results

Date:

Bacteria Collected From: #

My Prediction

My Results

Date:

Control: #

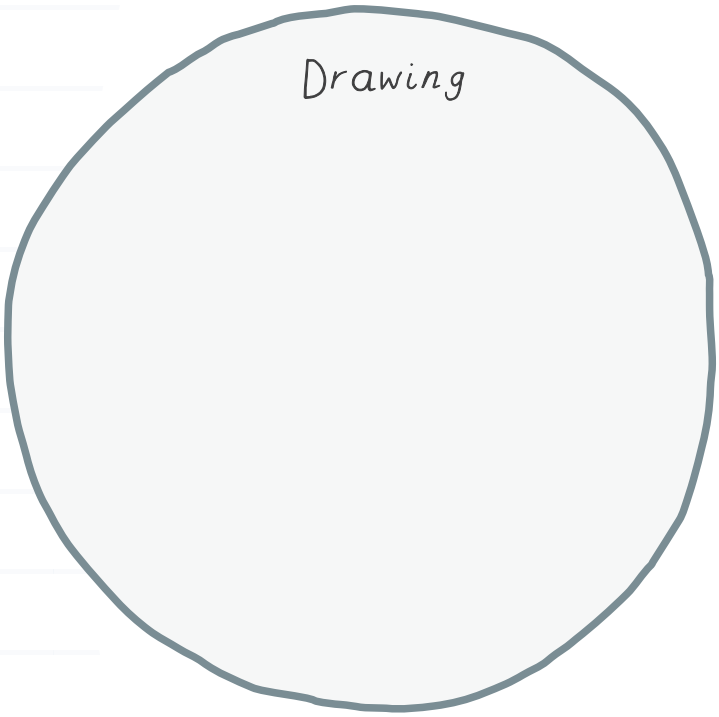
My Prediction

My Results

Date:

PROTIST MICROSCOPE LAB

Drawing



Date _____

Specimen Observed

_____

Notes _____

_____

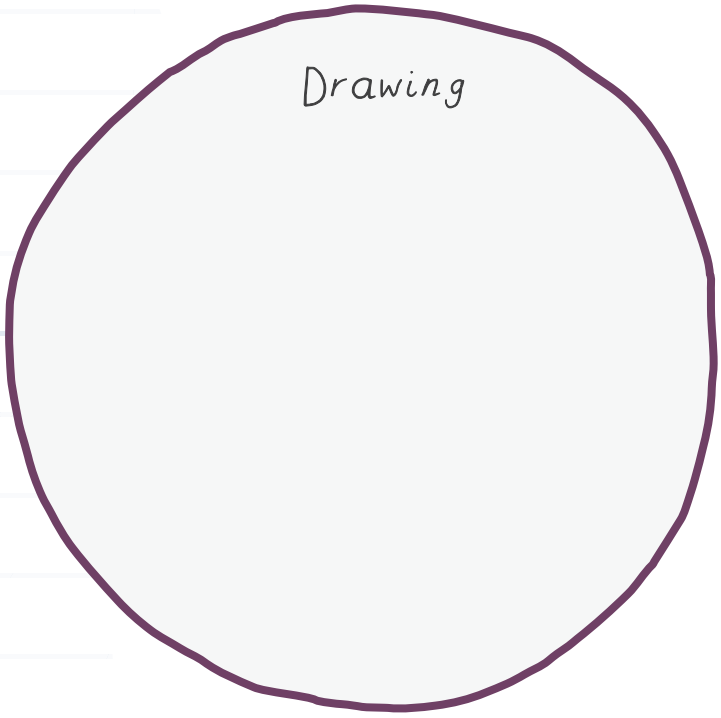
_____

_____

_____

_____

Drawing



Date _____

Specimen Observed

_____

Notes _____

_____

_____

_____

_____

_____

EXTENSION

Instructions:

1. Read the information below.
2. Think about a natural environment near your home, whether it is a pond, mountain, lake, ocean, or field. List three organisms living in that environment and one way that they are all connected. What keystone species could exist in this environment?

Biodiversity

You have learned about a large variety of different organisms on our planet, and there are still more to come! Why do you think there are so many different things living on our planet? Do we need thousands of different species of plants? Yes, every species on our planet is important and plays a different role in an interconnected web. The vast diversity of living things is known as ***biodiversity,*** and it enables the success of all life on our planet.

Consider the park in your neighborhood. The butterflies that fly by need plants to lay their eggs on and flowers to drink nectar from. The trees need nutrients in the soil that come as mushrooms and other decomposers break down organic waste. And the kids playing on the swings need the trees and other plants to produce oxygen for them to breathe. While all species and the overall diversity of life are important, there are some creatures that are critical to the survival of ecosystems. These are known as ***keystone species***.

Read about the examples of these to the right. If any of these species were to become extinct, then other species would not be able to survive. Can you think of another example of a keystone species?

Like keystone species, we play an important role in preserving the ecosystems around us. Genesis 1:26 states "let them have dominion . . . over all the earth." The creations of the earth are for the benefit of man and have blessed us with food, shelter, and enjoyment. Consider the plant species that you rely on each day, the wood used to build your home, the vegetables and fruits you eat, the trees that give you air to breathe. Biodiversity is a blessing.

What can we do to ensure that biodiversity continues into the future? We need to reduce our consumption and promote growth. Scientists are working to create better techniques for producing food. Hydroponics is one example. It is the production of plants without the use of soil. We can reduce the amount of food we purchase that goes to waste or produce our own food with gardens outside and in. Many in the timber industry are working to stop clear-cutting (cutting entire sections of a forest) and instead cut selectively and replace what they cut. With these and other measures, we can preserve the beautiful diversity of our planet.

Keystone Species

SAGUARO

Standing tall in the desert, this giant cactus provides nesting spots for birds; food for bees, bats, and birds; and water for mammals and insects.

ARBUSCULAR FUNGI

These microorganisms decompose matter in the soil to recycle the nutrients into a form usable by plants. Connected to roughly 80% of land plant roots, they pass along the nutrients to promote growth.

WILD RED RASPBERRY

This is a critical food source in arctic climates for animals ranging from bees to bears.

TROPICAL FIG TREE

Over 1,200 bird and mammal species feed on the fruit of this amazing tree year-round. It is one of the few trees to produce some fruit all year, and therefore it might be the only food source in lean times.

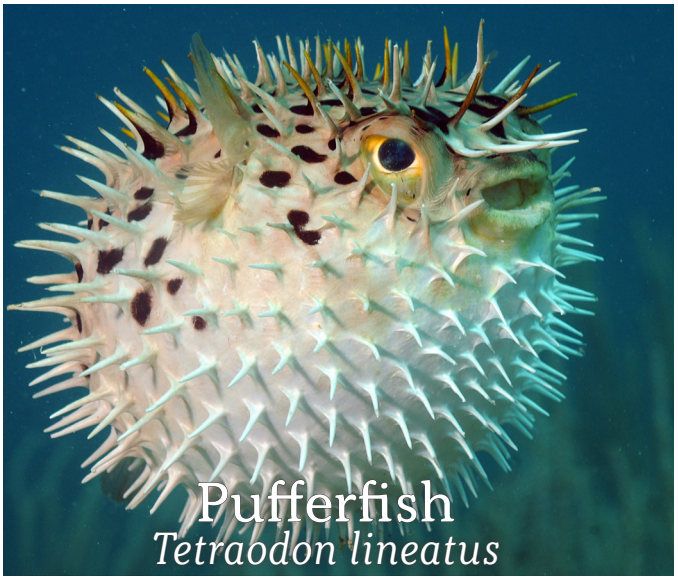
MILKWEED

As the only food source of monarch caterpillars, milkweed provides the food for a creature responsible for the pollination of many wildflowers.

RED MANGROVES

These unique trees grow their roots in the water and become a safe haven for fish and crustaceans. Larger creatures also use the roots for sheltering their nests.

Animal Field Journal: Vertebrates



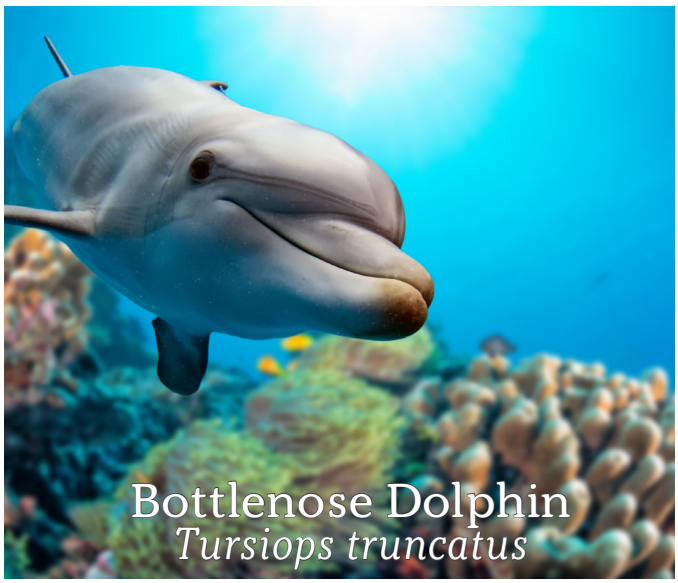
Pufferfish
Tetraodon lineatus

Poison Dart Frog
Oophaga pumilio

Chameleon
Chamaeleo chamaeleon

Ruby-Throated Hummingbird
Archilochus colubris

Dusky Leaf Monkey
Trachypithecus obscurus



Bottlenose Dolphin
Tursiops truncatus

EXTENSION

Instructions:

1. Read the information below.
2. Today you get to create the fastest animal in the world. Draw a picture of your animal and be sure to include the factors that make animals fast. Write a description of your animal in 1-2 sentences and include how fast you think your animal would go.

The Science of Speed

When you think of the fastest animal on Earth, what comes to mind? You most likely thought of a cheetah, a magnificent running machine. The cheetah is the fastest land animal, but there are many creatures able to move at speeds far faster than this savanna sprinter. In fact, in our list of fastest animals to the right, the cheetah comes in at the very bottom, beneath a horsefly! Read through the list to see what other creatures are built for speed.

Most of the top speeds are achieved by flying creatures, especially birds. Why do you think greater speeds can be achieved in the air? This is due in part to the lessened resistance. The cheetah must push itself across the ground, and the black marlin pushes through the resistance of the water. Air offers less resistance and sometimes even an advantage in the form of wind currents. The top two fastest creatures achieve their greatest speeds when they are diving and gravity is assisting them.

To reduce resistance further, these creatures have streamlined or aerodynamic bodies. If you were to push two boxes through water, one a square and the other a triangle, the triangle would be easier to push. The triangle's tip makes a wedge through the water that reduces resistance. This is the reason a race car has a triangular shape. Consider a cheetah. Its long slender body creates less resistance than the bulky body of an elephant. The black marlin is shaped like a knife cutting through the water, with fins on the top and bottom to reduce drag.

Force is an important factor in speed. Cheetahs have powerfully muscled legs that work together like a spring to squeeze and expand, creating more momentum. They are able to reach their top speed in a matter of seconds in order to capture fast-moving prey. Muscular wings flap with powerful strokes to propel birds forward. Most of the creatures on our list are vertebrates because powerful muscles must attach to bone. When you combine body shape and strength, you are left with an animal built for great speeds. All animals have attributes that contribute to their success in an environment, and God gave these animals characteristics that led to speed.

Fastest Animals

PEREGRINE FALCON

Exceptionally fast flyers, these creatures are rated the fastest animals on Earth based on their diving speeds reaching 300 km (186 mi) per hour! They shoot from the sky to capture unsuspecting prey.

GOLDEN EAGLE

Just shy of the fastest animal, golden eagles can glide through the air at 193 km (120 mi) per hour. This is faster than most cars! When diving they can reach speeds of 241 km (150 mi) per hour.

MEXICAN FREE-TAILED BAT

The fastest mammals are bats smaller than your hand. They are able to reach flying speeds of 160 km (99 mi) per hour. They live in colonies millions strong in Mexico and Texas.

HORSEFLY

The fastest flying insect, these tiny creatures are able to fly at speeds of 145 km (90 mi) per hour! When it comes to speed, its size is an advantage. Its quickly beating wings can move its tiny body faster than a cheetah!

BLACK MARLIN

As the fastest fish, this creature comes in just above the cheetah and is able to reach average top speeds of 130 km (80 mi) per hour! Its needle-like nose slices through the water, which glides over its streamlined body.

CHEETAH

The fastest land animals, cheetahs are built for speed. Their average sprinting speed is around 120 km (75 mi) per hour for shorwt distances, but the fastest recorded cheetah reached 160 km (99 mi) per hour!

Animal Field Journal

Animalia
Arthropoda
Insecta
Coleoptera
Lampyridae
Photinus

While many underwater creatures can produce their own light through bioluminescence, these small beetles are one of few on land to do so. On summer nights in warm climates, they will use these lights, created by a chemical reaction, to find a mate.

GLUE CARD HERE

Invertebrates

Animalia
Porifera
Demospongiae
Haplosclerida
Petrosiidae
Xestospongia

This creature is called home to many animals and looks more like a rock than an animal. It eats by pumping the water around it through its walls and filtering out nutrients. With a width up to 2 meters (6.5 feet) across, these giants are capable of pumping, filtering, and cleaning a lot of water.

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Animalia
Cnidaria
Scyphozoa
Semaeostomeae
Cyaneidae
Cyanea

Glowing in the ocean is a creature with over a thousand tentacles that can grow to 37 meters (120 feet) long! It lives in cold waters near the surface and dangles its tentacles below to catch its prey. Like others in its phylum, it has stinging barbs that can kill unsuspecting fish that swim too close.

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Invertebrates

Animalia
Echinodermata
Echinoidea
Echinoida
Strongylocentrotidae
Strongylocentrotus

These spiny relatives of sea stars live in rocky, shallow water near the shore. Eating primarily algae and the base of kelp, these tiny creatures can have a big impact on water ecosystems. These invertebrates can eat away the bases of an entire kelp forest, but predators keep their population in check.

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