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

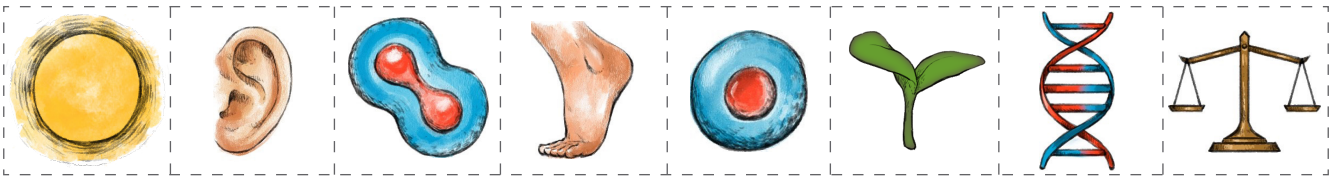
A giraffe is another organism that has been reclassified due to DNA findings. Prior to 2016 all giraffes were believed to be one species. Giraffes had not been extensively studied before this time. In 2016, through DNA analysis, scientists discovered that giraffes actually comprise four very different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

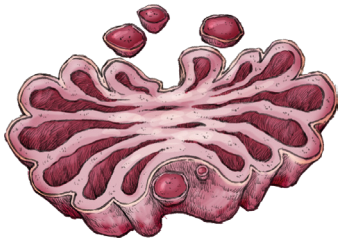
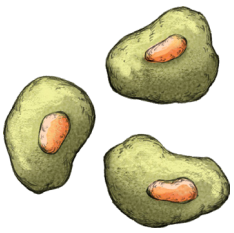
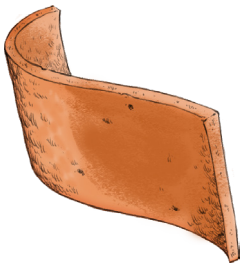
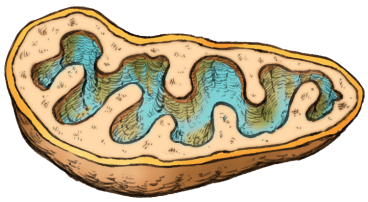
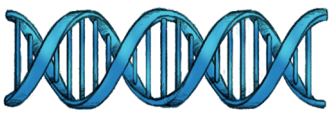
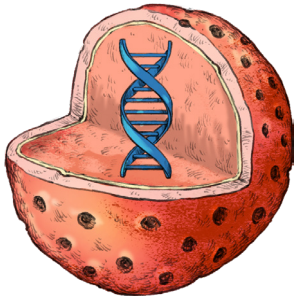
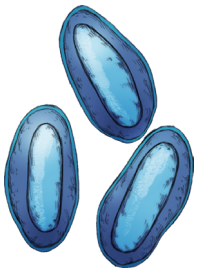
Lesson 1

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

Phylum Phaeophyta

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

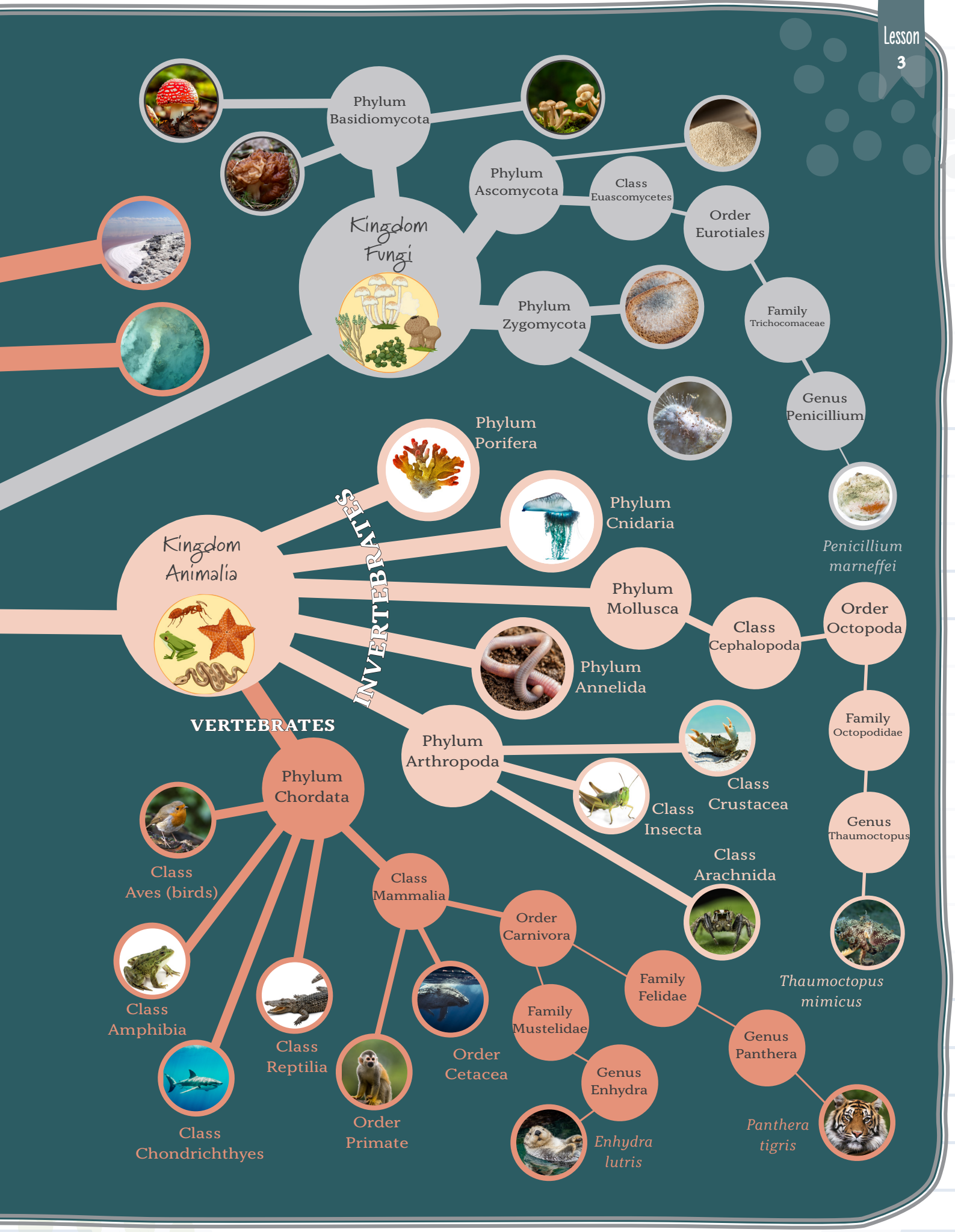
Class Pinopsida

Order Pinales

Family Taxodiaceae

Genus Sequoia

Sequoia sempervirens


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

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: #

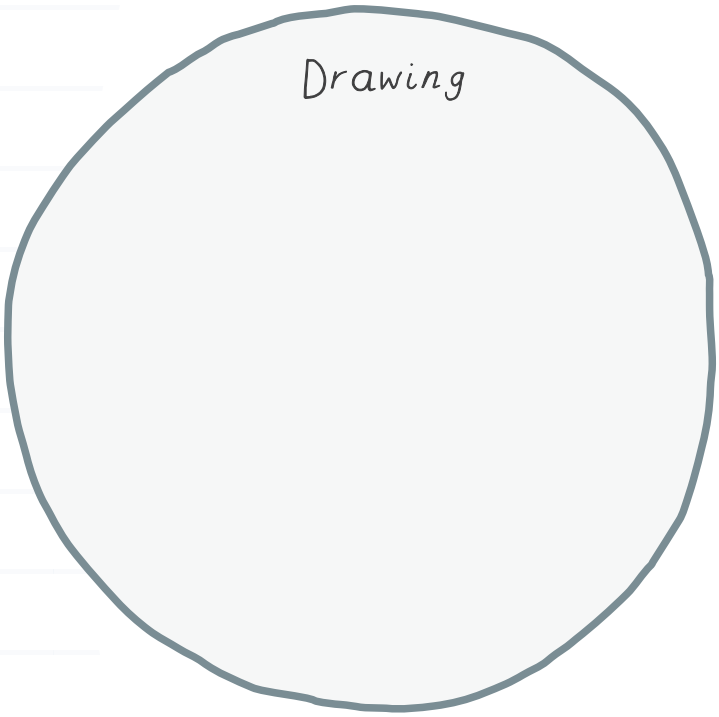
My Prediction

My Results

Date:

PROTIST MICROSCOPE LAB

Drawing



Date _____

Specimen Observed

_____

Notes _____

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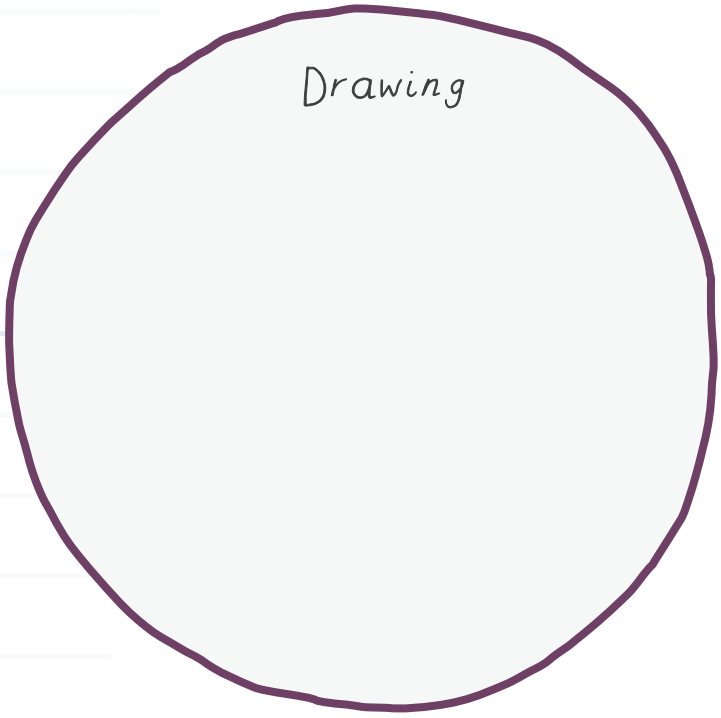
Drawing



Date _____

Specimen Observed

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Notes _____

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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.

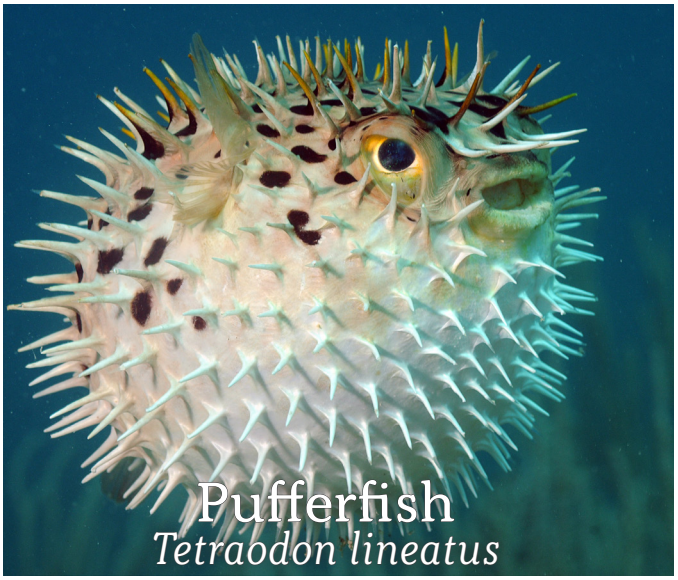
MILKWEED

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



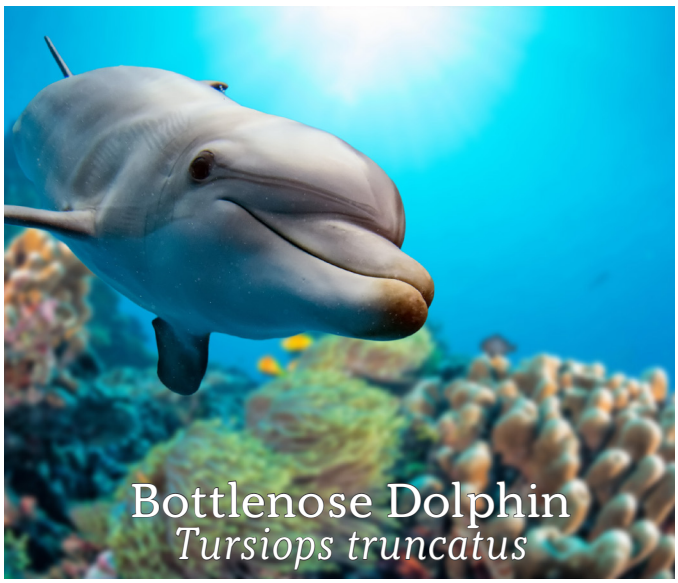
Pufferfish
Tetraodon lineatus

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.

GLUE CARD HERE

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.

GLUE CARD HERE

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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