

Science- Grade 4

Unit 1

Title: Motion

Unit Overview

In this unit, students learn about forces, energy, and collisions by studying the physics of car crashes. They examine a jet taking off and landing and make observations and predictions about how forces cause objects, such as jets and cars, to start or stop moving. They investigate roller coasters to learn about energy and how it can change forms. By making observations and analyzing data, they learn about different types of energy and examine the cause-and-effect relationships between forces that are applied to objects and changes in energy. They determine which traits enable some animals to run so much faster than a human. They learn about how speed is measured and make connections between an object's speed and the forces it experiences. Finally, students examine what happens when two objects moving with great speed—such as a bat and a ball, or two cars—collide with each other. They make predictions about the energy transformations that occur during a collision and connect energy transformations to the forces that are exerted on the colliding objects. Students apply the core ideas of this concept by identifying the properties of a race car that help it achieve a high speed and predicting how its energy will change if it collides with a wall. At the conclusion of the unit, students will understand the importance of the relationships between energy, force, and motion to our world.

PA Academic Standards Science:

- 3.2.4.B1 Explain how an object's change in motion can be observed and measured.
- 3.2.4.B2 Identify types of energy and their ability to be stored and changed from one form to another.
- 3.2.4.B6 Give examples of how energy can be transformed from one form to another.

NGSS Disciplinary Core Ideas:

- PS3.A The faster a given object is moving, the more energy it possesses. Energy can be moved from place to place by moving objects or through sound, light, or electric currents
- PS3.B Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. Light also transfers energy from place to place. Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.
- PS3.C When objects collide, the contact forces transfer energy so as to change the objects' motions.

Core Standards Literacy

- RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
- W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
- W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Content:

- Starting and Stopping
 - Force & Motions

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- Energy and Motion
 - Forms of energy
- Speed
 - Distance over time
 - Relationship between speed and kinetic energy
- Energy and Collisions
 - Energy change
 - Mass and speed

Skills:

- Analyze data to explain and model different causes of changes in an object's motion.
- Draw evidence from literary or informational texts to explain how speed is related to energy and model the cause-and-effect relationship between the force acting on an object and the object's motion
- Investigate the forms of energy in a system or for an object and apply logical reasoning to predict the types of energy.
- Explain how energy is conserved
- Describe how an object's change in position occurs at different rates.
- Model data to show patterns in the speed of objects and use those patterns to predict future motion.
- Cite evidence to explain how speed is related to the amount of kinetic energy of an object.
- Construct an explanation based on evidence and logical reasoning that the speed of an object depends on the energy of the object and how energy is conserved in a collision..
- Analyze and interpret data to describe how the speeds of objects and masses of objects affect the amount of damage in collisions between objects.
- Predict the outcomes of collisions based on patterns in energy transfer and change between the interacting objects.
- Use mathematical and computational thinking to organize data to reveal patterns in the mass, speed, and energy of objects using standard units.

Inquiry Questions: *(include factual, conceptual, debatable)*

- **Factual:**
What are some examples of exerting force with a push? What are some examples of exerting force with a pull? What are some things that affect the force that can be exerted on an object? What are some examples of energy or work? When does a roller coaster have the most energy? When does it have the least? What happens to a roller coaster's energy when it stops? What happens to objects when they collide with another object?
- **Conceptual:**
How do forces act on a starting and stopping object? How can you use patterns to make assumptions about forces? What is the relationship between mass energy and work? How do moving objects get energy? Where does the energy to move objects come from? How could you measure the speed of something moving fast?
- **Debatable:**
Is it possible to have a world without force?

Resources:

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"Unit 1: Car Crashes" *Discovery Education Grade 4 Science Techbook*, Discovery Education,
<https://app.discoveryeducation.com/learn/techbook/units/b9bb588e-b591-47b7-9f5e-d67ac3874836>.

"Waves of Sound ." *Mystery Science*, Mystery.org,<https://mysteryscience.com/waves/>.

Unit 2

Title: Energy Resources

Unit Overview

In this unit, students are presented with the movement of water flowing in a waterfall and are asked to consider the energy involved in this movement. Students consider how energy is used to power remote-controlled cars and other devices and observe that energy can be transferred from place to place in the form of sound, light, heat, and electricity. Building on this, students obtain information to describe that the energy used to move cars can be derived from fuels extracted from natural resources in a variety of ways. Students use what they have learned about nonrenewable and renewable energy resources to evaluate the impact that energy use has on the environment. Finally, to summarize their learning, students return to harnessing the power of water and research the benefits and drawbacks of dams and propose solutions to address the environmental harm caused by human use of energy. Students will grasp the importance of energy and learn what we can do to create and conserve it for the future.

PA Academic Standards Science:

- 3.4.4.E3 Identify types of energy and the importance of energy conservation.
- 3.2.4.B1 Explain how an object's change in motion can be observed and measured.

NGSS Disciplinary Core Ideas:

- ESS3.A Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.
- PS3.A The faster a given object is moving, the more energy it possesses. Energy can be moved from place to place by moving objects or through sound, light, or electric currents.
- PS3.B Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. Light also transfers energy from place to place. Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.
- PS3.C When objects collide, the contact forces transfer energy so as to change the objects' motions.

Core Standards Literacy

- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.
- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.

Content:

- Devices and Energy
 - Forms of energy
 - Energy input and output

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- Transfer of energy
 - Conservation of energy
 - Energy Chains
- Fuels
 - Renewable vs. Nonrenewable fuels
 - Nuclear energy
 - Using fuels wisely
- Renewable Energy Sources
 - Solar energy
 - Wind energy
 - Common sources and how they meet energy needs
- Energy and the Environment
 - Environment impact of fossil fuels
 - Big City Environmental Concerns
 - Effects of deforestation
 - Negative Impacts of Renewable Energy

Skills:

- Construct explanations based on observations and evidence that energy is transferred from place to place by sound, light, heat, and electricity.
- Develop models that describe patterns in the formation of different types of fossil fuels from natural resources and that predict the properties and uses of different types of fossil fuels.
- Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
- Construct explanations for the use of solar radiation, wind, and falling water in the generation of electricity.
- Develop models based on observations and evidence that energy is transferred from place to place by light, heat, and electricity
- Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans
- Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

Inquiry Questions: *(include factual, conceptual, debatable)*

- **Factual:**
Where does energy in the form of electricity and fuel come from? How does water produce energy? Is water a renewable or nonrenewable energy resource? Does using water as an energy resource produce pollution? How does an engine cause wheels on a vehicle to move? How do solar-powered devices like calculators work?
- **Conceptual:**
How do we use natural resources, as an energy resource? How is electricity used to power electronic devices? What kinds of energy transfer occur when light from the sun is used to power an object? How are fossil fuels formed and used? What are the different ways we can use renewable energy to generate electricity? How can you reduce the impact of energy production on the environment?
- **Debatable:**
What can be done to ensure we have enough energy to power our future?

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Resources:

"Unit 2: Energy Resources." *Discovery Education Grade 4 Science Techbook*, Discovery Education, <https://app.discoveryeducation.com/learn/techbook/units/3a4a05a1-58ec-47ae-a504-325bd4c254c1>.

"Energizing Everything ." *Mystery Science*, Mystery.org, <https://mysteryscience.com/energy/>.

Unit 3

Title: Earth's Changing Surface

Unit Overview

In this unit, students examine the mechanisms that cause changes in the Earth's surface over time. Students are first presented with an image of a sandcastle being washed away. They use this as a model for how rocks can be broken down by weathering. Then, students examine the cause and effect relationships between processes such as erosion and deposition and the formation of landforms such as canyons, valleys, and deltas. Students examine how maps and images can be used to model the relationships between landforms and even show structures under the ocean. Finally, students take a deep dive into exploring the distribution of volcanoes on Earth, the nature of volcanic eruptions, and the impacts of eruptions on humans. Students summarize their learning for this unit by examining maps and making predictions about the future based on the forces that have shaped geography over time. Students will be able to comprehend how the changing Earth impacts humans and how much or how little is in our control.

PA Academic Standards Science:

- 3.3.4.A1 Describe basic landforms. Identify the layers of the earth. Recognize that the surface of the earth changes due to slow processes and rapid processes.
- 3.3.4.A2 Identify basic properties and uses of Earth's materials including rocks, soils, water, and gases of the atmosphere.
- 3.3.4.A4 Recognize Earth's different water resources, including both fresh and saltwater. Describe phase changes in the forms of water on Earth.
- 3.3.4.A5 Describe basic weather elements. Identify weather patterns over time.
- 3.3.4.A6 Identify basic landforms using models and simple maps. Identify simple changes in the earth system as air, water, soil and rock interact Explain how basic weather elements are measured.

NGSS Disciplinary Core Ideas:

- ESS1.C Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed.
- ESS2.A Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.
- ESS2.B The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth.
- ESS3.B A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts.

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Core Standards Literacy

- RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

Content:

- Breaking Down and Moving Rocks
 - Types of weathering
 - Chemical and Mechanical weathering
 - Erosion
 - Deposition
- Changing Landscapes
 - Impact of water, ice, wind
 - Canyons, Valleys, Deltas
 - Wind erosion
 - Patterns and rock formations over time
- Mapping Landforms
 - Land and water features
 - Satellite imagery
 - Rivers and Watershed
 - Mapping Elevation
- Volcanoes
 - Location of volcanoes
 - How volcanoes form
 - Types of volcanoes
 - Studying and predicting volcanoes

Skills:

- Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.
- Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
- Analyze and interpret data from maps to describe patterns of Earth's features.
- Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
- Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Inquiry Questions: *(include factual, conceptual, debatable)*

- **Factual:**

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How do wind, water, and weather erode Earth's surface? How are canyons formed? What are examples of chemical weathering? What are examples of mechanical weathering? What happens to Earth's surface as a glacier moves across it? How are caves formed? What factors affect how quickly landscapes change?

- **Conceptual:**

How are landscape changes recorded by layers of rocks and fossils? How can people protect themselves and the environment from the impact of changing landscapes? How is weathering different from weather? What does weathering have to do with the formation of landscapes?

- **Debatable**

To what extent is it possible to counter the effects of weathering, erosion and deposition?

Resources:

"Unit 3: Earth's Changing Surface." *Discovery Education Grade 4 Science Techbook*, Discovery Education, <https://app.discoveryeducation.com/learn/techbook/units/99dee058-58cc-4360-8e6a-1218a4a43be3>

DK Find Out! Earth. (n.d.). Retrieved June 1, 2022, from <https://www.dkfindout.com/us/earth/>

"The Birth of Rocks." *Mystery Science*, Mystery.org, <https://mysteryscience.com/rocks/>.

Unit 4

Title: Earthquake Waves in Action

Unit Overview

In this unit, students explore earthquake waves and analyze the causes and impacts of earthquakes. They apply this knowledge to design bridge structures that can withstand the forces of an earthquake. They begin by observing a video of an earthquake that took place in Japan. They continue their observations by analyzing data to describe patterns of Earth's features to explain the causes and impacts of earthquakes. Then, they analyze a water droplet image to develop a model of waves to describe the movement of objects as a result of earthquakes. Using what they have learned about the causes and impacts of earthquakes, they generate and compare solutions that can mitigate the impact of earthquakes. Finally, students summarize their learning by designing a bridge that can withstand earthquake forces. They consider the design criteria and constraints of specific bridges and propose methods to test their designs. Students will learn how we use scientific tools, technology, and engineering to understand, plan and prepare for the impact of natural disasters.

PA Academic Standards Science:

3.4.4.A1 Understand that tools, materials, and skills are used to make things and carry out tasks.

3.4.4.A2 Understand that systems have parts and components that work together.

3.4.4.A3 Describe how various relationships exist between technology and other fields.

3.4.4.B1 Describe how technology affects humans in various ways.

3.4.4.B2 Explain how the use of technology affects the environment in good and bad ways.

3.4.4.B3 Explain why new technologies are developed and old ones are improved in terms of needs and wants.

3.4.4.B4 Describe how the history of civilization is linked closely to technological development.

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- 3.4.4.C1 Understand that there is no perfect design.
- 3.4.4.C2 Describe the engineering design process: Define a problem. Generate ideas. Select a solution and test it. Make the item. Evaluate the item. Communicate the solution with others. Present the results
- 3.4.4.C3 Explain how asking questions and making observations help a person understand how things work and can be repaired.
- 3.4.4.D3 Investigate and assess the influence of a specific technology or system on the individual, family, community, and environment.

NGSS Disciplinary Core Ideas:

- ESS2.B The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth.
- ESS3.B A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts.
- PS4.A Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks)
- ETS1.A Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.
- ETS1.B Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.
- ETS1.C Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.

Core Standards Literacy

- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.
- RI.4.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

Content:

- Earthquake Causes & Impacts
 - Fault lines
 - Tectonic Plates
 - Continents and sea floor
 - Predicting Earthquakes
- Earthquake Waves
 - How waves travel
 - Seismic waves
 - Amplitude and wavelength determine impact
 - Analyze and interpret wave data

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- Reducing Earthquake Impact
 - Earthquake preparation
 - Earthquake safety tips
 - Earthquake resistant
 - Major hazards

Skills:

- Construct explanations based on patterns in plate tectonics for the occurrence of earthquakes that are and are not related to volcanic activity.
- Analyze and interpret longitudinal and latitudinal data to locate earthquakes and to develop a model of the pattern of earthquake distribution on Earth.
- Analyze and interpret data from patterns in rock formations to support an explanation for the occurrence of earthquakes in Earth's history.
- Analyze and interpret data using logical reasoning to predict which plate boundaries are likely to experience strong earthquakes and which plate boundaries are likely to remain stable.
- Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
- Develop models of waves that describe patterns in terms of amplitude and wavelength and that describe how waves cause objects to move.
- Construct an explanation of how amplitude and wavelength affect the movement of seismic waves through Earth.
- Generate and compare multiple tsunami warning and evacuation systems based on how well they reduce the impact of natural Earth processes on humans.
- Obtain and combine information to generate and compare multiple earthquake preparedness plans based on how well they reduce the impact of natural Earth processes on humans.
- Plan and carry out fair tests of earthquake-proof houses to identify aspects that can be improved.

Inquiry Questions: *(include factual, conceptual, debatable)*

- **Factual:**
How does energy travel during an earthquake? How are people and the landscape impacted by earthquakes? What happens during an earthquake? What causes earthquakes? What are some impacts of earthquakes? Where do earthquakes happen? What are fault lines? What are waves? How can we describe earthquakes? What is a seismometer? How can you tell the strength of the earthquake? Where do most tsunamis occur?
- **Conceptual:**
What patterns do you observe in the occurrence of earthquakes? How can you make predictions about how earthquakes happen? How do patterns in data sets help us understand patterns in Earth's features? If you were an engineer, what would be your biggest concern about a city during an earthquake? What lessons have engineers learned over time about the technologies that minimize damage during an earthquake? What challenges do engineers face in preparing a busy city for an earthquake?
- **Debatable:**
Why is it important to use scientific tools, technology, and engineering to understand and prepare for the impact of natural disasters?

Resources:

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“Unit 4: Earthquakes.” *Discovery Education Grade 4 Science Techbook*, Discovery Education, <https://app.discoveryeducation.com/learn/techbook/units/426d6edf-b5b4-4d06-ac8d-344fb7c60d58>.

“The Birth of Rocks.” *Mystery Science*, Mystery.org, <https://mysteryscience.com/rocks/>.

Unit 5

Title: Senses, Survival and Animal Communication

Unit Overview

In this unit, students investigate how sensory interactions with the environment can help animals survive. They begin their investigation by considering how bats use their senses to help them navigate by describing how organisms use internal and external structures to survive in the environment. Using models, they describe how these structures allow organisms to receive and process different types of information through their senses. They then observe that one sensory modality—vision—is particularly useful because light reflecting from objects can enter the eye and transmit information. They realize that humans have taken advantage of light’s information-carrying capacity to use patterns of light to transmit information and communicate. Last, students extend the transfer of information to sound by researching how bats use patterns of sound to transmit and receive information. Students will learn that animals, like all living things, require their senses to communicate and survive.

PA Academic Standards Science:

- 3.1.4.A1 Classify plants and animals according to the physical characteristics that they share.
- 3.1.4.A2 Describe the different resources that plants and animals need to live.
- 3.1.4.A3 Identify differences in the life cycles of plants and animals.
- 3.1.4.A5 Describe common functions living things share to help them function in a specific environment.
- 3.1.4.A8 Construct and interpret models and diagrams of various animal and plant life cycles.
- 3.1.4.B1 Describe features that are observable in both parents and their offspring.
- 3.2.4.B3 Understand that objects that emit light often emit heat.
- 3.2.4.B5 Demonstrate how vibrating objects make sound and sound can make things vibrate. Demonstrate how light can be reflected, refracted, or absorbed by an object.
- 3.1.4.B2 Recognize that reproduction is necessary for the continuation of life.
- 3.1.4.B5 Identify observable patterns in the physical characteristics of plants or groups of animals.
- 3.1.4.C1 Identify different characteristics of plants and animals that help some populations survive and reproduce in greater numbers. Describe how environmental changes can cause extinction in plants and animals.
- 3.1.4.C2 Describe plant and animal adaptations that are important to survival.
- 3.1.4.C3 Compare fossils to one another and to currently living organisms according to their anatomical similarities and differences.

NGSS Disciplinary Core Ideas:

- LS1.A Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

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LS1.D Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.

PS3.A The faster a given object is moving, the more energy it possesses. Energy can be moved from place to place by moving objects or through sound, light, or electric currents.

PS3.B Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. Light also transfers energy from place to place. Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.

PS4.B An object can be seen when light reflected from its surface enters the eyes.

PS4.C Digitized information can be transmitted over long distances without significant degradation.

High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa.

Core Standards Literacy

RI.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.

W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

Content:

- Adaptations and Survival
 - Plant and animal adaptations
 - How body systems adapt to meet the needs of living things
 - How human activities affect survival
- Senses
 - Using senses
 - Nervous system
 - Processing sensory information
 - How organisms grow, reproduce and respond to the environment
- Light and Sight
 - Light energy
 - Reflection and refraction
 - The connection between light and sight
 - Optical illusions
- Communication and information transfer
 - Digital vs analog
 - Communication systems
 - Fiber Optics
 - Cell phone

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- Transporting sound through waves

Skills:

- Develop a model of the relationships among an organism's survival, habitat, adaptations, and body systems and argue from evidence that plants and animals have internal and external structures and behaviors that function to support survival, growth, behavior, and reproduction.
- Argue from evidence that multiple adaptations or organs within systems work together to ensure survival in specific habitats.
- Develop models that describe how organisms respond to changes in their habitats at different rates over time.
- Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
- Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
- Generate and compare multiple solutions that use patterns to transfer information.
- Develop a model of a communication system that consists of many parts that work together to transfer information from one place to another.
- Argue from evidence that light and sound transfer energy across distances.
- Design, test, and evaluate models of information-transfer systems that can encode, transmit, and receive information

Inquiry Questions: (include factual, conceptual, debatable)

- **Factual:**
How do different types of animals and plants adapt to survive cold winters? What needs to happen for you to see an object in low-light areas?
- **Conceptual:**
How do the internal and external structures of animals help them sense and interpret their environment? What kinds of adaptations are needed to survive in extreme environments? What causes animals to respond differently in their environments? How do animals sense and process information? How do different animal senses compare? How do senses help animals survive, grow, and reproduce? What role does light play in how we see? In addition to sight, what are other ways an animal uses light for survival? How do humans encode information and transmit it across the world? How do humans use light and other electromagnetic radiation to send and receive information?
- **Debatable:**
Can a single form of communication be created for all organisms?

Resources:

"Unit 5: Senses and Survival." *Discovery Education Grade 4 Science Techbook*, Discovery Education, <https://app.discoveryeducation.com/learn/techbook/units/831aa5af-4220-4939-9ae4-83bd865fc82a>.

"Human Machine." *Mystery Science*, Mystery.org, <https://mysteryscience.com/body/>.