8th Grade Science Unit:  
It’s All Relative  
Unit Snapshot

**Topic: Forces and Motion**

<table>
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<tr>
<th>Grade Level: 8</th>
<th>Lesson Duration: 9 days</th>
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**Summary**

The following activities allow students to explore, explain, and elaborate on the qualities of motion in relation to reference points through on-line simulation, modeling, and a stop-animation project.

**CLEAR LEARNING TARGETS**

“I can”…statements

_____ describe motion in relation to reference points.

**Activity Highlights and Suggested Timeframe**

| Day 1 | **Engagement:** Teachers will use the [www.explorelearning.com GIZMO simulation: Measuring Motion](http://www.explorelearning.com) to formatively assess students’ prior knowledge related to motion, reference points, and speed. |
| Day 2 | **Exploration:** Students will complete a filmstrip animation activity to explore motion as it relates to the use of reference points. |
| Day 3 | **Explanation:** Students will explain how reference points can be used to detect motion by modeling motion in the On The Bus activity. |
| Day 4-7 | **Elaboration:** A Walter and Gromit Video will introduce students to stop-animation photography. Students will then develop their own stop-animation photo project using clay or small toys. |
| Day 8 and on-going | **Evaluation:** Formative and summative assessments are used to assess student knowledge and growth to gain evidence of student learning or progress throughout the unit, and to become aware of students misconceptions related to motion and reference points. A teacher-created short cycle assessment can be administered at the end of the unit to assess all clear learning targets (Day 7). |
| Day 9 | **Extension/Intervention:** Based on the results of the short-cycle assessment, facilitate extension and/or intervention activities. |
NEW LEARNING STANDARDS:
8.PS.2 Forces have magnitude and direction.

- The motion of an object is always measured with respect to a reference point

SCIENTIFIC INQUIRY and APPLICATION PRACTICES:
During the years of grades K-12, all students must use the following scientific inquiry and application practices with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas:

- Asking questions (for science) and defining problems (for engineering) that guide scientific investigations
- Developing descriptions, models, explanations and predictions.
- Planning and carrying out investigations
- Constructing explanations (for science) and designing solutions (for engineering) that conclude scientific investigations
- Using appropriate mathematics, tools, and techniques to gather data/information, and analyze and interpret data
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating scientific procedures and explanations

*These practices are a combination of ODE Science Inquiry and Application and Frame-work for K-12 Science Education Scientific and Engineering Practices

COMMON CORE STATE STANDARDS for LITERACY in SCIENCE:
CCSS.ELA-Literacy.SL.8.1b Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
CCSS.ELA-Literacy.SL.8.1c Pose questions that connect the ideas of several speakers and respond to others’ questions and comments with relevant evidence, observations, and ideas.
CCSS.ELA-Literacy.SL.8.2 Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
CCSS.ELA-Literacy.SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

STUDENT KNOWLEDGE:

Prior Concepts
K-2: Forces are introduced as pushes and pulls that can change the motion of objects. Forces are required to change the motion of an object. Greater force on a given object results in greater change of motion.
Grades 3-5: The amount of change in movement of an object is based on the mass* of the object and the amount of force exerted.
Grades 6-7: An object’s motion can be described by its speed and the direction in which it is moving. An object’s position and speed can be measured and graphed as a function of time.

*While mass is the scientifically correct term to use in this context, the NAEP 2009 Science Framework (page 27) recommends using the more familiar term “weight” in the elementary grades with the distinction between mass and weight being introduced at the middle school level. In Ohio, students will not be assessed on the differences between mass and weight until Grade 6.

Future Application of Concepts
High School: Newton’s second law will be developed quantitatively and situations will be explored mathematically.
**MATERIALS:**

<table>
<thead>
<tr>
<th>Engage</th>
<th>Computer/Internet/Projector</th>
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<tbody>
<tr>
<td>Explore</td>
<td>- Filmstrip Animation Handouts</td>
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<td></td>
<td>- Scissors</td>
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<td></td>
<td>- Glue</td>
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<td>Explain</td>
<td>- On the Bus entrance tickets</td>
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<td>- On the Bus worksheets (1 per student)</td>
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<td>- On the Bus assembled manipulatives</td>
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<tr>
<td>Elaborate</td>
<td>- Computer/Projector/Internet</td>
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<td></td>
<td>- Clay or action figures/small toys</td>
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<td>- Digital camera (phone or iPad with connector cord allowing upload to computer)</td>
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<td></td>
<td>- computer with presentation software such as PowerPoint</td>
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<td></td>
<td>- <strong>Storyboards</strong> (1/group of 5 students)</td>
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**ADVANCED PREPARATION**

- Copy worksheets for distribution
- Preview the [www.explorelearning.com GIZMO on-line simulation](#): Measuring Motion
- Explore phase requires uploading photos to a computer
- Create your own reference point animation (see example screen shot) to demonstrate what excellent work would resemble
- Have plain trifold boards or similar backdrops available for student use during photo shoots
- Cut and assemble **On the Bus** manipulatives
- Save student examples for future years

**SAFETY**

- All CCS Lab Safety Rules apply

**ENGAGE**

(1 day)

(What will draw students into the learning? How will you determine what your students already know about the topic? What can be done at this point to identify and address misconceptions? Where can connections are made to the real world?)

**Objective:** Students discover how they detect motion.

What is the teacher doing?

**www.explorelearning.com GIZMO:**

**Measuring Motion (Day 1)**

- See Teacher Page
- Ask students probing questions.
- Project the Measuring Motion GIZMO on the screen or SMARTBoard.
- Facilitate as students manipulate the GIZMO while the teacher asks probing questions.
- OPTIONAL: Allow students to create their own example of using reference points to detect motion at their seats.
- If needed show the [www.unitedstreaming videoclip: Reference Points [3:49]]

What are the students doing?

**GIZMO: Measuring Motion (Day 1)**

1. Students participate in class discussion and the on-line simulation tasks.
**EXPLORE**

(1 Day)

**Objective:** Students will investigate detecting motion using reference points through a hands-on experience using stop animation.

<table>
<thead>
<tr>
<th>What is the teacher doing?</th>
<th>What are the students doing?</th>
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<tbody>
<tr>
<td><strong>Filmstrip Animation (Day 2)</strong></td>
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<tr>
<td>- Distribute the Filmstrip Animation sheets.</td>
<td>1. Complete the Filmstrip Animation by cutting and gluing the pictures in an order that shows motion.</td>
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<tr>
<td>- Facilitate as students are cutting and pasting.</td>
<td>2. Answer questions based on the finished filmstrip.</td>
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**EXPLORE**

(1 Day)

**Objective:** Students learn that motion is relative and can only be defined in respect to a point of reference.

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<tr>
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<th>What are the students doing?</th>
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<tr>
<td><strong>On The Bus</strong> (Day 3)</td>
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<tr>
<td>- Distribute entrance tickets or display the questions for students. -“Think about what happens when you are at a stoplight and the light in your lane turns green, while the light in the lane next to you stays red. -What happens to your car? How do you know? -Where is the car that was next to you? How do you know?</td>
<td>1. Students answer teacher-led questions.</td>
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<tr>
<td>- Have several students share their responses. Were they able to recognize that even though the car next to them was stationary, it appeared to be moving backwards?</td>
<td>2. Students work with a partner and complete the On the Bus activity.</td>
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<tr>
<td>- Have students sit with a partner.</td>
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<tr>
<td>- Distribute the On the Bus worksheets (1/student)</td>
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<td>- Distribute the assembled manipulatives (1/pair)</td>
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<td>- Complete Scenario 1 with the class. Teacher models the use of the manipulatives and “thinks-aloud”</td>
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<tr>
<td>- Students work in pairs to use the manipulatives, discuss the scenarios, and independently complete the worksheet.</td>
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</table>
**Objective:** Students apply their knowledge of motion and references points to create a stop-animation.

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<tr>
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<tbody>
<tr>
<td><strong>Photo Animation Project (Day 4)</strong></td>
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</table>
| - Play Wallace and Gromit video (or Strange Folk): [http://www.youtube.com/watch?v=CJDhmlMQT60](http://www.youtube.com/watch?v=CJDhmlMQT60)  
- Ask students, “How do we know Gromit (or gnome) is moving? (Accept any answer that says he changes position in respect to another object)  
- Distribute [Wallace & Gromit Questionnaire](http://www.yourwebsite.com/questionnaire) 1/student  
- Assist as students complete questionnaire. Assess their knowledge of depiction of motion in an animation. Have them relate the activity to real world.  
- Ask probing questions like, “How is the motion in this video different than the motion on a reality show?” (One is filmed live; the other is animation) and “If I were watching a highlight film of a football game, how would I | 1. Observe Claymation.  
2. Complete questionnaire.  
3. Discuss relative motion |

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**ELABORATE**

(4 Days)

(How will the new knowledge be reinforced, transferred to new and unique situations, or integrated with related concepts?)

- Engage the class in a “wonderfest” of relative motion by posing thought provoking questions. Some to consider are….
  - What does “down” really mean?
  - Are the people in China standing upside down?
  - Is there a “down” or “up” in space?
  - When you are riding in a car, why do the objects outside your window appear to be moving faster than those far away?
  - Would a slug think that an ant is a speed demon?

Optional: Invite students to create “Wonderfest” questions for homework/extra credit. Display on a bulletin board or Learning Center for research.

3. Participate in a teacher-led class discussion.
know my team is about to score a touchdown?" (close to goal line/post/end zone).
- Invite students to share their drawings of the scenes.
- Facilitate class discussion about perceived motion.

(Days 5-7)
- See Teacher Page
- Group students for differentiation
- Distribute materials for students to plan and complete their animations.
- Students submit storyboard
- Facilitate as students create their backgrounds and plan their animations.
- It is important to take the photographs of each scene with a camera that is stationary. Consider setting up a tripod/camera at a station for you or a responsible student to take the photos.
- Put photos into PowerPoint and show as a slideshow to see the animation.

4. Illustrate relative motion
5. Write about relative motion
6. Present depictions of motion.

(Days 5-7)
1. Students create a film strip storyboard of each frame in their animation.
2. Construct each stop-animation scene and take a picture of each scene.
3. Complete worksheet as class animations are presented.

### EVALUATE
(On-going)

(What opportunities will students have to express their thinking? When will students reflect on what they have learned? How will you measure learning as it occurs? What evidence of student learning will you be looking for and/or collecting?)

### Objectives:
The objective of the assessments is to focus on and assess student knowledge and growth to gain evidence of student learning or progress throughout the lesson, and to become aware of students misconceptions related to motion and reference points.

<table>
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<tr>
<th>Formative</th>
<th>Summative</th>
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<tbody>
<tr>
<td><strong>How will you measure learning as it occurs?</strong></td>
<td><strong>What evidence of learning will demonstrate to you that a student has met the learning objectives?</strong></td>
</tr>
<tr>
<td>- Consider developing a teacher-created formative assessment.</td>
<td>- Filmstrip Animation and On the Bus activities will assess student knowledge throughout the unit.</td>
</tr>
<tr>
<td>1. Measuring Motion GIZMO will formatively assess students’ prior knowledge.</td>
<td>2. Stop Animation project will assess students’ ability to use reference points to detect motion.</td>
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<tr>
<td>2. Teacher observation and questioning during group work will yield data for intervention/extension.</td>
<td>3. Teacher-created short cycle assessment will assess all clear learning targets (Day 8).</td>
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### EXTENSION/INTERVENTION

**EXTENSION**
1. Students compose, and film an instructional video that depicts a moving object from various points of reference.

**INTERVENTION**
1. [www.unitedstreaming.com](http://www.unitedstreaming.com) videoclips
2. Detecting Motion (Lessons on CiMS)
| COMMON MISCONCEPTIONS | • Reference points change as the position of an object changes  
• Motion can only be described from one reference point  
• Only non-moving objects can be reference points  

Strategies to address misconceptions:  
Misconceptions can be addressed through the use of Discovery Ed video clips, and other types of video media to show motion from various perspectives. |
|---|
| DIFFERENTIATION | Lower-Level:  
• Teacher should have a small baggie ready with an assortment of miniature toys that can be used to demonstrate reference point to students. (small car, people, dog, etc.) Students then can manipulate the objects to show their understanding. (eg: “The man sees the car moving forward (backward) away from him.” “The dog is not moving from the man’s viewpoint because it is keeping pace with him.”)  
• Increase use of teacher think-aloud strategy.  
• Provide relevant graphic organizers for students to record their understanding.  

Higher-Level:  
• Require more than one moving object in the Claymation video.  
• Have students research to find at least two additional video clips that show relative motion and have them make and record voiceovers that can be used to teach future students about relative motion.  

Strategies for meeting the needs of all learners including gifted students, English Language Learners (ELL) and students with disabilities can be found at the following sites:  
ELL Learners:  
Gifted Learners:  
Students with Disabilities:  
| ADDITIONAL RESOURCES | Discovery Ed:  
www.unitedstreaming.com  
• The Future of Motion Capture [0:55]  
• Reference Points [3:49]  

Movies/Film:  
Motion
How do you decide if an object is moving? You are probably sitting in a chair as you read this. Are you moving? Your eyes blink and your chest moves up and down. But you would probably say that you are not moving. An object is in motion if the distance from another object is changing. Because your distance to your chair is not changing, you conclude you are not in motion.

Reference Point
To decide if you are moving, you use your chair as a reference point. A reference point is a place or object used for comparison to determine if something is in motion. An object is in motion if it changes position relative to a reference point.

Objects that we call stationary- such as a tree, a flagpole, or a building- make good reference points. From the point of view of a train passenger, those 3 objects are not in motion. If the passenger is moving relative to a tree, he can conclude the train is in motion.

Once you have selected your reference point, you can indicate change of position by using a plus (+) or minus (-) sign. The signs stand for any pair of opposing directions from the reference point, such as to the right or left, up and down, away from and toward, or in front of or behind. If you make the passenger on the train your reference point, then three seats in front of him could be shown as +3. A distance of -5 would mean 5 seats behind him.

Relative motion
Are you moving as you read this? The answer depends on your reference point. When your chair is your reference point, you are not moving. But if you choose another reference point, you may be moving. Suppose you choose the sun as a reference point instead of the chair. If you compare yourself to the sun, you are moving quite rapidly. This is because you and the chair are on Earth, which moves around the sun about 30 kilometers every second. So, you, the chair, the classroom and everything else on Earth move that quickly as well. Going that fast, you could travel from New York City to L.A. in about 2 minutes. Relative to the sun, you are in motion. But, because you are moving with the Earth, you do not seem to be moving.

Distance and Displacement
When you move, the distance between you and a reference point changes. Distance is the length of a path between two points. Suppose you trace the route you take to school each morning. From your starting point at home, you walk one block, turn left, and continue for another block. Then you turn right and walk two more blocks. At the intersection, you turn left and walk 3 more blocks to your end point at school.

How many blocks did you walk in all? The lengths of the segments of your walk are 1 block, 1 block, 2 blocks, and 3 blocks. Therefore, your walk from home to school is a total of 7 blocks.

Displacement is the length and direction that an object has moved from its starting point. Distance is the total length of the actual path between two points. Displacement is the length and direction of a straight line between starting and ending points. According to these 2 directions, you walked a distance of 7 blocks, but your displacement was 5 blocks northeast.

As you learn about motion, you will find other measurements that also have a magnitude (size) and a direction. A quantity that consists of both magnitude and direction is called a vector. Displacement is a vector but distance is not. Other examples of vectors include velocity, acceleration and force. You will learn about vectors later on in this unit. Vectors are shown graphically by using an arrow. The length of an arrow represents the vector's magnitude (size). The direction of the arrow indicates the direction of the vector.

**excerpted from Focus on Physical Science, pages 339-341.**
ENGAGE: TEACHER PAGE

- Begin by showing students a stationary object (i.e. bottle of water) and ask –

1. Is the object in motion relative to you and your classmates? Yes
2. Is the object in motion at all? Yes
3. Does the object’s motion depend on where I look at it from? Yes – if we were on the moon, the bottle would be moving due to Earth’s rotation and revolution around the Sun.
4. If the object is moving so fast through space why doesn’t it appear to be moving to us? We detect motion based on the objects in our frame of reference – what we can see at that time in relation to the moving object.

www.explorelearning.com

GIZMO on-line simulation: Measuring Motion

This activity is intended to be teacher-led in order to formatively assess students’ prior knowledge related to motion, reference points, and speed. Therefore, the explorelearning student exploration worksheets are not needed.

Project the Measuring Motion GIZMO Simulation on the board. Consider choosing students to manipulate the GIZMO as you lead the class through various tasks and questioning.

**Vocabulary:** reference point, motion, speed

**How to use the GIZMO:**
Tell the students: “You have been sent on an African safari by *International Geography* magazine. Your assignment is to find the fastest land animals in the world. Your only tool is a video camera.”

The safari is shown in the *Measuring Motion* Gizmo™.

- On the Safari Adventure tab, wait for an animal to pass by. Press the record button ( ). Press stop ( ) when the animal has passed by.

- Select the Playback tab. Practice using some of the different buttons on this tab:
  - Use the Play ( ) button to replay the simulation.
  - Click Rewind ( ) to go back to the beginning.
  - Click Advance frame ( ) to move forward exactly one second at a time.
  - Drag some arrows ( ) onto the recording to mark the positions of the animals at different times. (The arrows are on the left side of the Gizmo.)
  - Use the Time slider to go to a specific time.
**Teacher-led Questions:**

1. Describe the motion of the animal?
   - *Students should describe direction, relative speed, etc.*

2. How did you know that the animal was moving?
   - *Students should describe the animals position based on the reference points in the picture or the projection screen (near the first tree, right side of the screen, passed in front of the cameraman, etc.)*

3. How can we use the trees to estimate the speed of the animal?
   - *This question is a lead into the next task.*

☐ **Estimating Speed:** Click **Rewind** (▶️). Use **Advance frame** (⏩) to advance the recording one second. Mark the animal's position with an **arrow** (-pointer) and repeat. If we use the trees as a reference point, estimate the distance the animal traveled in one second.

☐ **Note:** The trees in the background are **5 meters apart**

**Teacher-led Questions:**

1. About how far did the animal travel in 1 second?
   - *Answers will vary depending on the animal. Example: It took the Rhino 5.4 seconds to move from tree 1 to tree 5…*(trees are 5 meters apart = 25 meters).

   \[ \text{Speed} = \frac{\text{Distance}}{\text{Time}}. \]
   \[ 25 \text{ meters} \div 5.4 \text{ seconds} \]
   \[ \text{Speed is 4.6m/s} \]

2. Allow students to try a few more animals.

3. Optional: Try this in the classroom by allowing students to create and develop their own example of using reference points to detect motion at their desk. (i.e. pencil rolls from one side of the desk to the other – reference point are student books sitting on the table).

If needed, show the [www.unitedstreaming.com](http://www.unitedstreaming.com) video: Reference Points [3:49]
FILMSTRIP ANIMATION

Name: __________________
Date: ________________

Goal: Be able to use reference points to put pictures in order based on their motion.

Directions: Cut out the filmstrip sections and glue together to make one long filmstrip. Cut out and glue the pictures in the correct order on the filmstrip to show continuous change in motion.

Questions:
1. Describe what is happening in the filmstrip? ____________________________________
   _______________________________________________________________________
   _______________________________________________________________________

2. If this filmstrip was shown as a movie, what objects in this movie would be in motion? 
   _______________________________________________________________________

3. If this filmstrip was shown as a movie, what things in this movie would not be in motion? 
   _______________________________________________________________________

4. What do we call these non-moving objects used for comparison, to detect motion? 
   _______________________________________________________________________

5. You are sitting in a car that is stopped, and then out of the corner of your eye you see a tree on the side of the road begin to move forward...The tree isn't actually moving, so in terms of motion, what is happening? 
   _______________________________________________________________________

6. Motion is relative to a reference point. Can an object be in motion and not in motion at the same time? Explain.
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Filmstrip Animation

Directions: Cut out the following animation frames and paste them in the proper order on the film strip worksheet.
Filmstrip Animation

Attach top of Filmstrip 2 Here

Attach top of Filmstrip 3 Here
**FILMSTRIP ANIMATION – ANSWER KEY**

**Goal:** Be able to use reference points to put pictures in order based on their motion.

**Directions:** Cut out the filmstrip sections and glue together to make one long filmstrip. Cut out and glue the pictures in the correct order on the filmstrip to show continuous change in motion.

**Questions:**

1. Describe what is happening in the filmstrip?
   
   The scientist is either moving from left to right to right to left (will vary depending on the students order) and the bunny is doing a flip.

2. If this filmstrip was shown as a movie, what objects in this movie would be in motion?
   
   The Scientist and the bunny

3. If this filmstrip was shown as a movie, what things in this movie would not be in motion?
   
   The Computers and Stands

4. What do we call these non-moving objects used for comparison, to detect motion?
   
   Reference Points

5. You are sitting in a car that is stopped, and then out of the corner of your eye you see a tree on the side of the road begin to move forward...The tree isn’t actually moving, so in terms of motion, what is happening?
   
   I am moving backwards

6. Motion is relative to a reference point. Can an object be in motion and not in motion at the same time? Explain.

   Yes. We are moving 67,000mph due to the Earth’s orbit around the Sun, yet it can appear that we are not moving if we are in a stationary position. It is based on our perspective and frame of reference.
Think about what happens when you are at a stoplight and the light in your lane turns green, while the light in the lane next to you stays red.

What happens to your car? How do you know?

Where is the car that was next to you? How do you know?
Describing Motion Using a Reference Point

Motion is defined as an object’s change in position over time when compared with a reference point. You can manipulate objects to model motion scenarios and answer questions about motion.

Scenario 1
Justin was sitting in the school bus, which was parked in front of the school. Another bus pulled up beside him and stopped to wait for a pedestrian to cross in front of it. His friend, Elijah, was on the other bus. After the walker crossed, Elijah’s bus pulled out. To Elijah, how does it appear that Justin’s bus is moving?

Task
Card A represents the stationary object. Is this Justin’s or Elijah’s bus? Card B represents the object in motion. Is this Justin’s or Elijah’s bus? Hold Card A still while slowly moving Card B forward. Follow the sight line from Card B to Card A. It points from the viewer to the other object. Does it point forward or backward?

Question: To Elijah, how does it appear that Justin’s bus is moving?
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Columbus City Schools
Curriculum Leadership and Development
Science Department June 2013
1. You are riding our bicycle down the street. You pass the mailman pulling mail from the corner mailbox. To the mailman how do you appear to move?

   A. forward
   B. backward
   C. You do not appear to be moving
   D. In the same direction as the mailman

2. As you are riding in our car down the road, how do the light poles appear to move?

   A. forward
   B. backward
   C. They are stationary and do not move
   D. In the same direction as you

3. While sitting on the 50 yard line at the football game, you watch the quarterback of your team break loose to run 43 yards and score a touchdown. List two things you could use as reference points to describe the quarterback’s motion.

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4. Shaun’s mother walks with him to the bus stop every morning. When the bus pulls up, Shaun gets on as his mother waves goodbye. As the bus pulls out, Shaun sees her still waving. To Shaun, how does his mother appear to move?

   A. forward
   B. backward
   C. She is standing still and doesn’t appear to move
   D. In the same direction as Shaun
Card B

Sight Line

Card A
Wallace & Gromit Questionnaire

A reference point is the object or place on an object to which we compare another object’s motion.

Motion is the change of an object’s position in comparison to a reference point.

1. In the Wallace and Gromit clip, how do we know that Wallace is eating a sandwich?

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2. Pick one of the scenes from this clip and draw the reference point in each frame below.
What objects will you compare to the reference point to show motion? Add those objects to the two frames showing that they moved.

3. Explain in words why the observer infers that the object has moved.

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Reference Point Photo Animation Project – Teacher Page

Summary of Task: Students will create a 5 scene picture animation using reference points to help show the motion of objects in the scene. Students will create a background, scene, and characters as well as a 5 frame sequence of actions for the objects/characters in the scene.

This activity is designed to be student-centered. As students examine the motion of objects using reference points, it is recommended that they work in small groups. Encourage students to keep the perceived actions of the objects in each frame of the animation as simple as possible in order to see an obvious change in position. Students should only have 1-2 objects in motion during the animation. Also, allow students to bring in their own materials if they choose.

1. Divide the class into groups of 3-4 students. Ensure that each group contains at least one proficient artist and one student who has a basic understanding of reference point.
2. Consider designating roles and duties. Artist – draws storyboard; Tech – uploads images and creates PowerPoint; Cameraman – takes snapshots; Sculptor – makes clay forms/moves objects
3. Explain the directions and parameters for the activity.
4. Students will begin by discussing what the scene will look like. Students will determine which objects will remain stationary (reference points) and which object(s) will be in motion. It is recommended that no more than 2 objects should be in motion. A storyboard template is provided and should be used as a roughdraft.
5. Students will draw a background on a piece of poster board (cut in ½). Students should include 3 or more reference points on their background.
6. Students will create a 5 frame animation showing the actions of no more than 2 objects.
7. Set up digital camera stations so students can take their 5 pictures when ready. Tripods with digital cameras should be set up with a table in front so students can set their poster board backgrounds and props on the table. Optional: Include green, tan, white, and/or black “ground” table coverings.
8. When students have practiced their animation several times, they will go over to the digital camera station(s) and photograph each frame of their animation. Students should include a picture of their animation title and group member names before they take the pictures so you know which pictures belong to each group. Hint: Make sure that the camera stays in place and is not moved in any way.
9. Students should write 1-2 paragraphs explaining the actions occurring in the scene. Students should identify the reference points as well as the objects in motion.

Example:
10. Upload the images to PowerPoint (iMovie or MovieMaker) as separate slides.

11. Set up the slideshow to run automatically advancing slides every 0.25 sec. (You will need to type this in as the drop down is graduated in full seconds only.)

12. Share the animations with the class by showing the slides in slideshow mode.

**Extension & Interdisciplinary Connections**

1. As an interdisciplinary connection to English, have students create a story to go along with the actions occurring in the animation. Be sure to include imagery and sequencing.
2. As an interdisciplinary connection to English, have students create comic strip captions to go along with their picture animation.
3. As an extension, have students act out their own animation. Photograph or videotape their actions.
PHOTO ANIMATION PROJECT

Write a paragraph describing the events of your animation.

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Motion and Reference Points Questions: Circle the correct answer.

1. A crossing guard is to the right of a stop sign. A school bus is to the left of the stop sign. A flower bed is directly in front of the stop sign. What is the reference point used to describe positions in the paragraph above?

   a. the flower bed     b. the school bus     c. the stop sign     d. the crossing guard

2. The post office is 4 blocks south and 6 blocks east of the school. What directions are used to describe the position of the post office?

   a. east and south     b. the school     c. 4 blocks     d. 6 blocks

3. You are moving all the time because the Earth is moving. Relative to the sun, you are moving 67,000mph. Why don’t you feel like you are moving this fast?

   a. You may feel like you are not moving because your reference point is the Earth.
   b. You feel like you are moving, but the speed of the Earth compensates for a large part of the 67,000 mph.
   c. You are not moving unless your legs or some vehicle enables you to move.
   d. Since the Earth is moving in a circle, it will equalize any sense of movement you might feel.
# Class Animations

As you watch each animation, list the objects in motion, and 2 reference points you used to detect the motion.

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<tr>
<th>GROUP #</th>
<th>Objects in Motion</th>
<th>2 Reference Points used to detect motion</th>
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