# Balancing Forces

Unit storyline

Students are challenged to figure out how a floating train works in order to explain it to the citizens of Faraday. People in Faraday are excited to hear that a new train service will be built for their city, but concerned when they hear that it will be a floating train. Students develop models of how the train rises, floats, and then falls back to the track, and then write an explanation of how the train works.

Featured activity:
Observing Forces in Chain Reactions (Lesson 3.3)

In Lesson 3.3 of *Balancing Forces*, students compare different types of forces by designing and then analyzing a chain reaction involving touching forces, magnetic force, and gravity. Students identify and record information about the forces involved.
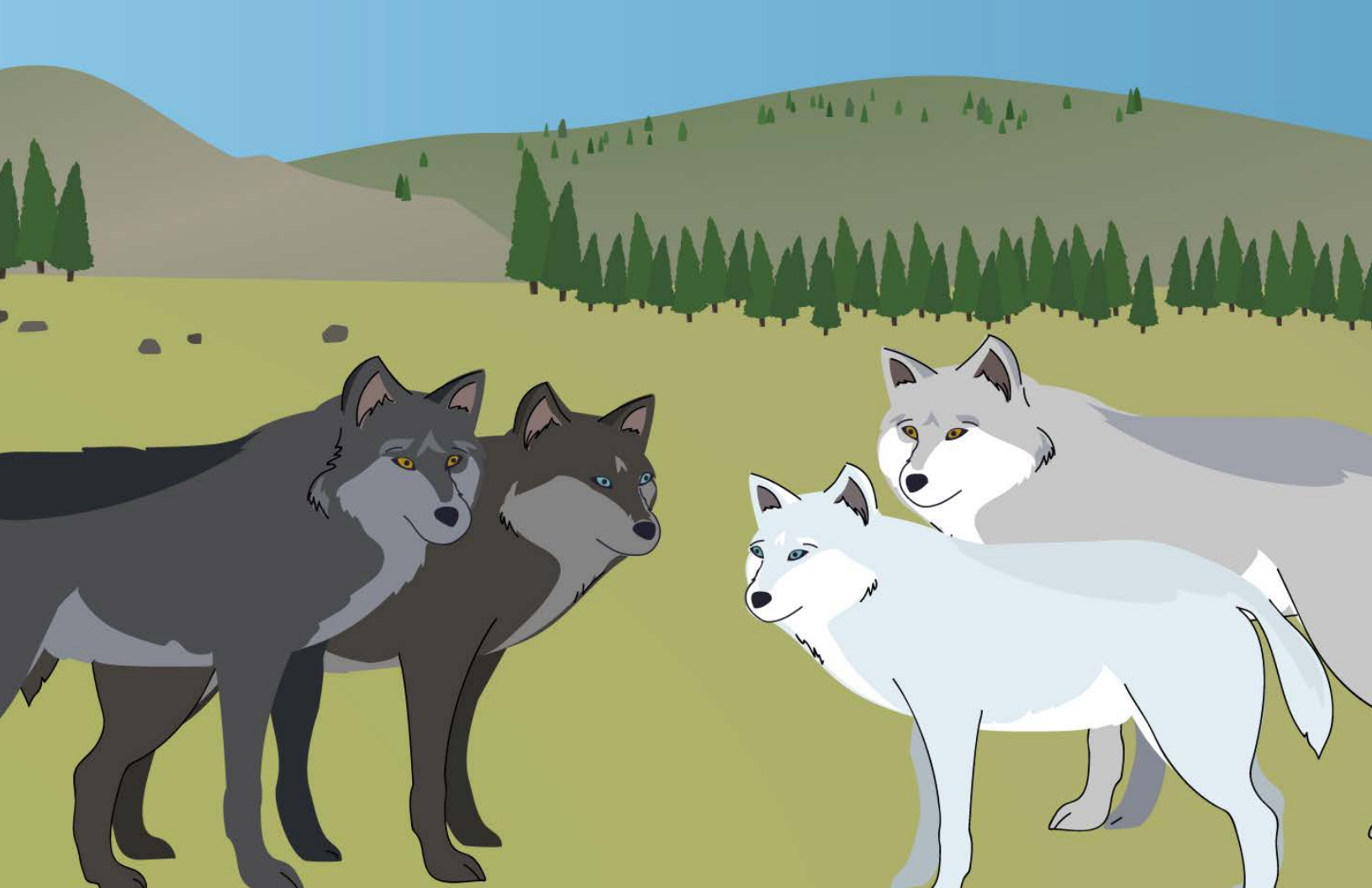
Inheritance and Traits

Unit storyline

Students play the roles of wildlife biologists working in Graystone National Park. They study two wolf packs and are challenged to figure out why Wolf 44, an adopted wolf, has certain traits. Students observe variation between and within different species, investigate inherited traits and those that result from the environment, and explain how Wolf 44 acquired certain traits.

Featured activity:
Exploring Inheritance (Lesson 2.4)

In Lesson 2.4 of *Inheritance and Traits*, students investigate how traits are passed down from parents to offspring by building clay creature offspring. Students work in pairs to make clay creature offspring with specific traits based on instructions that were randomly inherited from two parent creatures. In the discussion following the activity, students compare creatures and observe that, although the offspring inherited instructions from the same parents, here is variation in traits among siblings.

Environments and Survival

Unit storyline

In their roles as biomimicry engineers, students figure out how the traits of grove snails affect their survival in different environments. They apply that understanding as they explore other organisms, their traits, and the likelihood of survival in different environments. Students then design effective solutions to the problem of invasive plant removal using the structural traits of giraffes as inspiration.

Featured activity:
Making Test Versions of Robot Necks (Lessons 4.2–4.3)

In Lessons 4.2 and 4.3 of the *Environments and Survival* unit, students work on their design challenge of building a robot inspired by the necks and mouths of giraffes that will help get rid of invasive plants. The robot neck should help the robot reach plants at different heights, the neck should help them reach a lot of plants quickly, and the teeth should grab and break plants down into small pieces. First, they examine the materials available for making test versions of robot neck to make a plan for their designs. Then, they make their test versions and test them to see if they meet the design criteria.

Weather and Climate

Unit storyline

In their roles as meteorologists, students gather evidence and analyze weather patterns so they can advise the Wildlife Protection Organization on selecting one of three islands for an orangutan reserve, the one with hot and rainy weather that is most like the orangutans' natural habitat on Borneo and Sumatra. They then look for location-based patterns in weather as they figure out if it's possible to predict and/or design solutions that can prevent damage from hurricanes and other natural hazards.

Featured activity:
Building and Testing Hurricane-Proof Structures (Lesson 4.3)

In Lesson 4.3, students design and build structures that can withstand simulated hurricane winds and rain. Students use simple materials to build fortified structures that are meant to withstand a hurricane. After testing each pair's structure with blowing air and poured water, the class discusses what made some designs more effective than others.