

## Parental Genes

### Purpose

Students will recognize that in some organisms all genes come from a single parent, while in those that have sexes, typically half of the genes come from each parent.

### Materials

*For the teacher:* chalk, chalkboard

*For each student:* copy of Black Line Master (BLM) *Butterfly Genetics*, penny, pencil, colored pencils

### Activity

#### A. Pre-Activity Discussion

1. Ask students to describe what a *gene* is. Explain that a gene is a segment of DNA that specifies a trait, such as hair color or hair texture.
2. Explain that there are variations of genes called alleles (e.g., the alleles for the hair texture gene might be curly, straight, or wavy).
3. Explain that in most multicellular organisms, one allele for a particular gene comes from the mother and one comes from the father.
4. Further explain this using Mendel's pea plants as an example.
5. Tell students that the gene for pea seed color has a yellow and a green allele.
6. Write "YY," "Yy," and "yy" on the chalkboard. Tell students that these are the genotypes of three pea seeds and that Y is the allele for yellow color while y is the allele for green color.
7. Ask students what color they think the pea seeds are.
8. Explain that alleles may be *recessive* or *dominant*, such that the effects of a dominant allele will be seen if there is at least one copy of the allele present but the effects of a recessive allele may only be seen if both copies are the recessive allele.
9. Tell students that yellow (Y) is dominant to green (y). Ask students again what color they would expect the pea seeds to be. [YY, Yy = yellow, yy = green]

#### B. Butterfly Genetics

1. Distribute copies of the BLM *Butterfly Genetics*, pennies, and colored pencils to students.

(continued)

connecting  
across the  
curriculum



#### Mathematics

Have students visit [www.explorescience.com](http://www.explorescience.com) and complete the mouse genetics tutorial concerning probability and statistics, found under Life Sciences.

EXTENDING  
THE  
ACTIVITY



Have students take their offspring butterflies, switch partners, and repeat for several generations. Have students observe how the population of butterflies changes through time.

Standards Links  
8.4.3, 8.4.7, 8.7.3

## Activity (continued)

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2. Have students follow the directions and complete the BLM.
3. Have students compare their butterflies and, as a class, discuss the following questions:
  - Did the offspring butterfly look exactly like the parent butterflies? Why or why not? [The offspring butterfly is unlikely to look exactly like the parent butterflies because it will likely have slightly different alleles.]
  - Do all organisms have two copies of their genes? [No, many organisms, such as bacteria and yeast, have only a single copy of their genes.]
  - In organisms with two copies of their genes, such as humans, where do the copies come from? [One copy comes from each parent. During sexual reproduction, each parent donates half of the genetic material to each offspring.]
  - In organisms that have only one copy of their genes, such as yeast or bacteria, where do their genes come from? [All of a *haploid* organism's genes come from its single parent.]


## Classroom Assessment


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### Basic Concepts and Processes

As students work on the BLM and after students have completed the activity, ask questions such as the following:

 Where do the two copies of the butterfly's genes come from?

 How do you know?

 Can you tell me what the coin tosses represented?

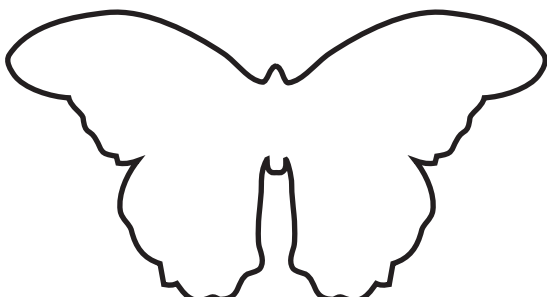
 Could you predict what your butterfly would look like before you did the coin toss?

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Trait	Allele 1	Allele 2	Dominance
Antennae	Short – A	long – a	Short (A) is dominant
Eye Spot	Eye Spot – E	No Eye Spot – e	Eye Spot (E) is dominant
Wing Color	Green – G	Blue – g	Green (G) is dominant
Wing Tip Color	Yellow – Y	Pink – y	Yellow (Y) is dominant
Stripes	Stripes – S	No Stripes – s	Stripes (S) are dominant
Tongue	Long – L	Short – l	Long (L) is dominant
Body Color	Brown – B	Green – b	Brown (B) is dominant
Body Texture	Fuzzy – F	Smooth – f	Fuzzy (F) is dominant

1. Using the table, flip a coin to determine the copies of each gene your parent butterfly has: heads = allele 1, tails = allele 2. You will need to flip the coin twice for each trait (since the butterfly has two copies of each gene). Record your results below and color your butterfly to reflect its genes.

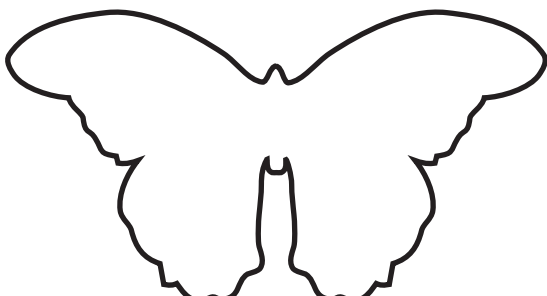
Trait	Copy 1	Copy 2
Antennae		
Eye Spot		
Wing Color		
Wing Tip Color		
Stripes		
Tongue		
Body Color		
Body Texture		



Parent Butterfly

2. Now that you have a parent butterfly, find a partner with whom to mate your butterfly. You will each produce an offspring butterfly using the genes from your parent butterflies. Each of you should flip a coin to determine which copy of each gene your parent butterfly will contribute to the offspring butterfly: heads = copy 1, tails = copy 2. Record your results below under “Parent A” and your partner’s results under “Parent B.” Color your butterfly to reflect its genes.

Trait	Parent A	Parent B
Antennae		
Eye Spot		
Wing Color		
Wing Tip Color		
Stripes		
Tongue		
Body Color		
Body Texture		



Offspring Butterfly