

Aliens Again!

Overview

In this exercise, students use the work they have done in an earlier exercise to look at the details of the genotypes and phenotypes of the aliens. This work should reinforce the terminology and symbols they have seen before. As they explore the traits of two generations of the aliens, they will begin to see how these traits are passed from parents to their offspring. However, they will also see some inconsistencies (traits that are present in the offspring that do not appear in the parents) that will be addressed in later exercises.

Textbook References

McDougal Littell

Unit C Chapter 4, pp. 101-107, Living Things Inherit Traits in Patterns

Prentice Hall

Chapter 14, Section 3 pp. 530-535, Mendel's Work

Materials

*Materials to be supplied by the teacher or the students are marked with an asterisk.

Materials for the whole class

- 1 transparency of *Omah and Opah* worksheet
- 1 transparency of *Alien Traits I* worksheet
- 1 transparency of *Alien Traits II* worksheet

Materials for individual students

- 1 *Omah and Opah* worksheet
- 1 *Alien Traits I* worksheet
- 1 *Alien Traits II* worksheet
- *1 pencil (there may be some erasing to do)

Procedure

Students can get confused quite easily when they first encounter genetics symbols. We suggest that teachers move slowly through the first three examples (*Alien Traits I* worksheet), proceeding one step at a time, filling in the transparency as students fill in their individual worksheets. Remind students that the offspring always get two genes for each trait, one from each parent. The *Alien Traits II* worksheet can be filled in by the students on their own, but the teacher should monitor the class closely to help students who may still be confused.

1. “After studying the plants we have some understanding of how traits are passed on from parents to their offspring. We will try to apply this information to our aliens.”

2. Tell the class that we will go through each trait one at a time.
3. “Let’s start with Antlers.” Hand out an *Alien Traits I* worksheet to each student.
 - a. List the antler phenotypes in the Possible Phenotypes column in the chart on the transparency and have the students copy your work on their worksheets. [Large/branched; short/not branched; medium/not branched. See the sample filled-in worksheet below.]
 - b. “How many phenotypes are there for antlers? [3] What must be true of this trait?” (Remind students of the alien plant examples, Root Type and Flower Color.) “This trait is an example of Incomplete Dominance.”
 - c. “Since we are looking at antlers, we will use *A* as the symbol. Let’s use A^B for large/branched and A^S for short/not branched.” Fill in the blanks above the Antlers table on the transparency as in the sample below and have the students do the same.
 - d. “What genotype would represent large/branched? So what would we write in the chart?” [$A^B A^B$] Fill in the appropriate space in the transparency.
 - e. “What genotype would represent small/not branched? So what would we write in the chart?” [$A^S A^S$] Fill in the appropriate space in the transparency.
 - f. “And finally, what genotype would represent medium/not branched? Remember, this is an incomplete dominance trait.” [$A^B A^S$] Fill in the appropriate space in the transparency.
 - g. Hand out the *Omah and Opah* worksheet. “On this worksheet, for each of the five aliens, fill in the possible genotypes for the Antlers trait. For example, Omah has large/branched antlers. Her genotype for the Antlers trait would be $A^B A^B$. Now do the other four.” After the students have worked on this a bit, fill in the corresponding spaces in the transparency.
4. “Next let’s look at the mouth.”
 - a. List the mouth phenotypes in the Possible Phenotypes column in the chart on the transparency and have the students copy your work on their *Alien Traits I* worksheets. [Large and small.]
 - b. “This trait has two possible phenotypes, and it is a simple dominant/recessive trait. Let’s use M for large mouth and m for small mouth.” Fill in the blanks above the Mouth table on the transparency as in the sample below and have the students do the same.

- c. "What genotypes would represent large mouth?" [Both MM and Mm.]
- d. "What genotype would represent small mouth?" [mm.]
- e. "On the family worksheet, for each of the five aliens, fill in the possible genotypes for the Mouth trait. For example, Omah has a large mouth. What could her genotype be?" [MM or Mm.] "Now do the other four." After the students have worked on this a bit, fill in the corresponding spaces in the transparency. Point out that Omah, Opah, Harold, and Wilbur all have large mouths, so their genotypes could be either MM or Mm. Maude has a small mouth, so her genotype must be mm.

5. "Next let's look at the ears."

- a. Since the Ears trait is dominant/recessive, follow the same procedure as in step 4 above, using P for pointed ears and p for rounded ears. (In case they have forgotten, point out that when they looked at all the aliens in the **Meet the Aliens** exercise, some of them had rounded ears.) If your students seem to understand this process well, just give them the symbols, P and p, and have them work on their own. However, it has been our experience that they may need you to walk them through the process again.
 - b. On the family worksheet, all five aliens have pointed ears, so all five could have genotypes of PP or Pp. No one has rounded ears, so no one has the genotype pp.
6. This completes the *Alien Traits I* worksheet. It is important that all students have filled this out correctly, so with the completed transparency on the overhead, go through it one last time.
7. Hand out the *Alien Traits II* worksheet. If your students are ready for the challenge, have them fill out this worksheet on their own. Provide them with the 'official' symbols and phenotypes that follow, and then set them to work. If you feel that they are still a bit shaky, lead them through another one or two.
- a. Head Shape (H): narrow = H^N; wide = H^W. (This is an incomplete dominance trait.)
 - b. Nose (N): small = N; large = n. (*Careful! Small is the dominant characteristic, so it gets the upper case N!*) Harold is the only alien with the recessive trait, a large nose = nn. All the others have the dominant trait, a small nose = either NN or Nn.
 - c. Eyes (E): large = E; small = e. All the aliens have large eyes, the dominant characteristic, so all can be either EE or Ee. No one has small eyes, so no

one is ee.

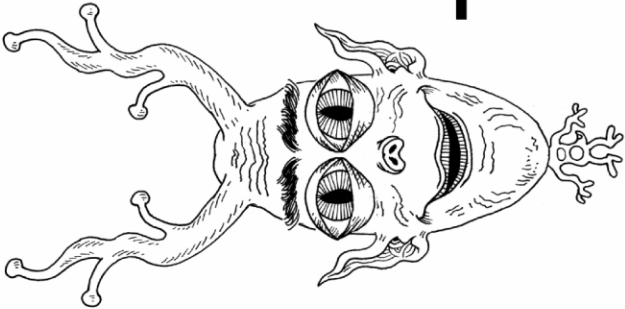
- d. Eyebrows (X and Y): *“We are still not sure exactly how this trait works, but we do know that aliens with large eyebrows have the genotype XX and aliens with small eyebrows have the genotype XY.”* Help the students fill in their charts for this one. Omah and Maude, females with large eyebrows, should be XX, and Opah, Harold, and Wilbur, males with small eyebrows, should be XY.
9. At this point, the students will have a chart completely filled in. In some cases they will know the exact genotype and in other cases they will have it narrowed down to two possibilities.
10. *“Let’s look at the Mouth trait one more time. Remember that each parent gives one of its genes to each child. Based on this information, can we determine anything else about the genotypes of the family members?”* [Since Maude is mm, she must have been given one m gene from each of her parents. Both Omah and Opah must be Mm. We are still not sure if Harold and Wilbur are MM or Mm.]
11. Repeat Step 10 for the nose trait. [Again, since Harold has the recessive trait, he must be nn, and he must have received an n gene from each parent. Omah and Opah must be Nn.]
12. Ask the students to explain the following in their notebooks: *“Remember when we spoke about some traits following the rule, ‘traits are passed from parents to children?’ What is an explanation for traits that do not seem to follow this rule?”*

Omah and Opah

Name _____

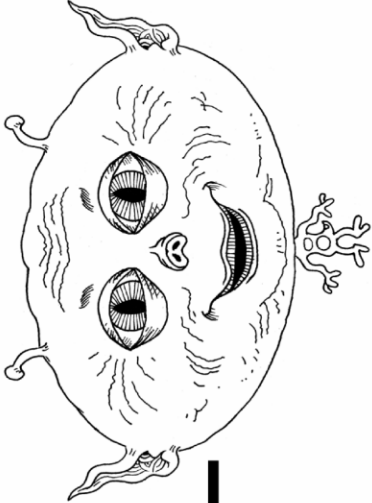
Date _____

Omah
392 Earth-years old



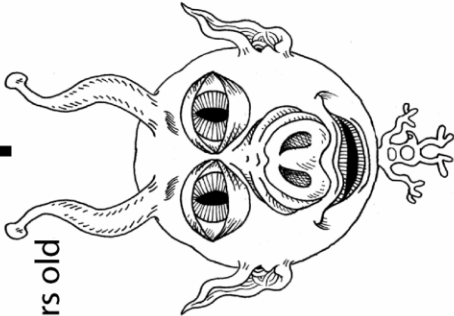
Trait	Genotype
A = antlers	
M = mouth	
P = ears	
H = head	
N = nose	
E = eyes	
X, Y = eyebrows	

Opah
389 Earth-years old



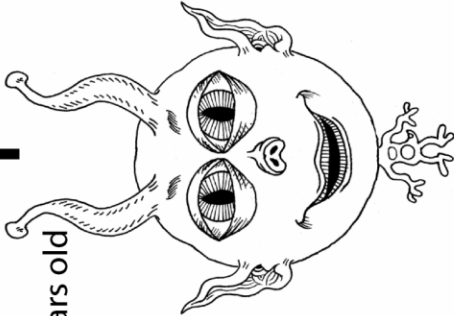
Trait	Genotype
A = antlers	
M = mouth	
P = ears	
H = head	
N = nose	
E = eyes	
X, Y = eyebrows	

Harold
228 Earth-years old



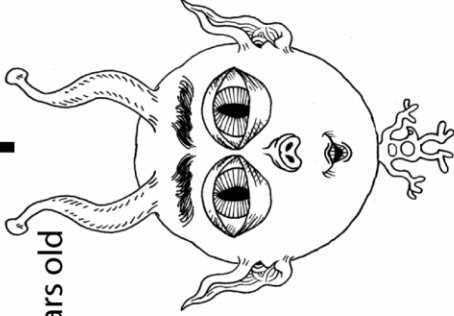
Trait	Genotype
A = antlers	
M = mouth	
P = ears	
H = head	
N = nose	
E = eyes	
X, Y = eyebrows	

Wilbur
224 Earth-years old



Trait	Genotype
A = antlers	
M = mouth	
P = ears	
H = head	
N = nose	
E = eyes	
X, Y = eyebrows	

Mauve
222 Earth-years old



Trait	Genotype
A = antlers	
M = mouth	
P = ears	
H = head	
N = nose	
E = eyes	
X, Y = eyebrows	

ALIEN TRAITS I

Name _____

Date _____

Trait: Antlers

Trait (symbol): _____ (_____)

Symbols: (_____)

Trait (symbol): _____ (_____)

Possible Phenotypes	Possible Genotypes

Trait: Mouth

Dominant trait (symbol): _____ (_____)

Symbols: (_____)

Recessive trait (symbol): _____ (_____)

Possible Phenotypes	Possible Genotypes

Trait: Ear shape

Dominant trait (symbol): _____ (_____)

Symbols: (_____)

Recessive trait (symbol): _____ (_____)

Possible Phenotypes	Possible Genotypes

ALIEN TRAITS II

Name _____

Date _____

Trait: Head shape

Trait (symbol): _____(_____)

Symbols: (_____)

Trait (symbol): _____(_____)

Possible Phenotypes	Possible Genotypes

Trait: Nose

Dominant trait (symbol): _____(_____)

Symbols: (_____)

Recessive trait (symbol): _____(_____)

Possible Phenotypes	Possible Genotypes

Trait: Eyes

Dominant trait (symbol): _____(_____)

Symbols: (_____)

Recessive trait (symbol): _____(_____)

Possible Phenotypes	Possible Genotypes

Trait: Eyebrows

Trait (symbol): _____(_____)

Symbols: (_____)

Trait (symbol): _____(_____)

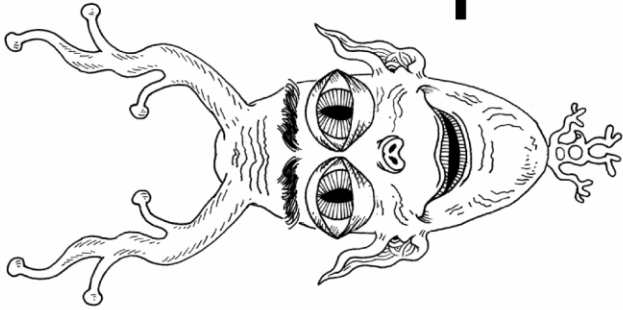
Possible Phenotypes	Possible Genotypes

Omah and Opah

Name _____

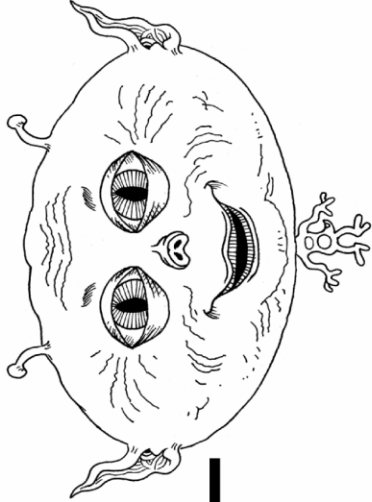
Date _____

Omah
392 Earth-years old



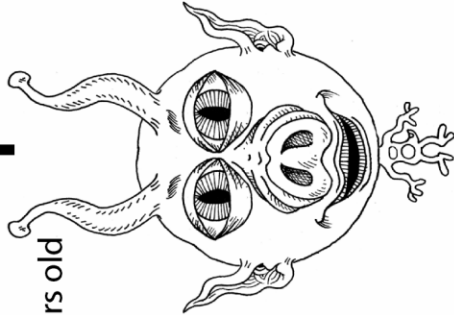
Trait	Genotype
A = antlers	A ^B A ^B
M = mouth	MM or Mm
P = ears	PP or Pp
H = head	H ^N H ^N
N = nose	NN or Nn
E = eyes	EE or Ee
X, Y = eyebrows	XX

Opah
389 Earth-years old



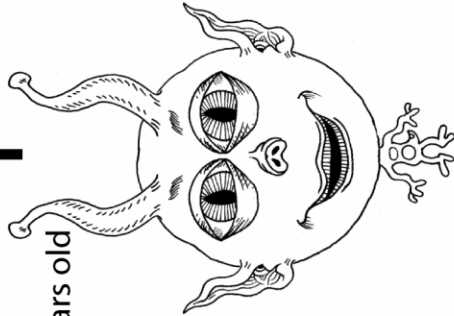
Trait	Genotype
A = antlers	A ^S A ^S
M = mouth	MM or Mm
P = ears	PP or Pp
H = head	H ^W H ^W
N = nose	NN or Nn
E = eyes	EE or Ee
X, Y = eyebrows	XY

Harold
228 Earth-years old



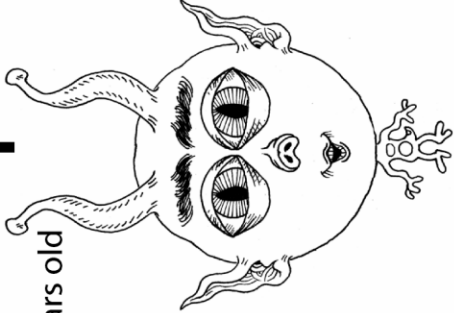
Trait	Genotype
A = antlers	A ^B A ^S
M = mouth	MM or Mm
P = ears	PP or Pp
H = head	H ^N H ^W
N = nose	nn
E = eyes	EE or Ee
X, Y = eyebrows	XY

Wilbur
224 Earth-years old



Trait	Genotype
A = antlers	A ^B A ^S
M = mouth	MM or Mm
P = ears	PP or Pp
H = head	H ^N H ^W
N = nose	NN or Nn
E = eyes	EE or Ee
X, Y = eyebrows	XY

Maude
222 Earth-years old



Trait	Genotype
A = antlers	A ^B A ^S
M = mouth	mm
P = ears	PP or Pp
H = head	H ^N H ^W
N = nose	NN or Nn
E = eyes	EE or Ee
X, Y = eyebrows	XX

ALIEN TRAITS I

Name _____

Date _____

Trait: Antlers

Trait (symbol): large, branched (A^B)

Symbols: (A^B, A^S)

Trait (symbol): short, not branched (A^S)

Possible Phenotypes	Possible Genotypes
large, branched	$A^B A^B$
short, not branched	$A^S A^S$
medium, not branched	$A^B A^S$

Trait: Mouth

Dominant trait (symbol): large (M)

Symbols: (M, m)

Recessive trait (symbol): small (m)

Possible Phenotypes	Possible Genotypes
large	MM or Mm
small	mm

Trait: Ear shape

Dominant trait (symbol): pointed (P)

Symbols: (P, p)

Recessive trait (symbol): rounded (p)

Possible Phenotypes	Possible Genotypes
pointed	PP or Pp
rounded	pp

ALIEN TRAITS II

Name _____

Date _____

Trait: Head shape

Trait (symbol): narrow (H^N)

Symbols: (H^N, H^W)

Trait (symbol): wide (H^W)

Possible Phenotypes	Possible Genotypes
narrow	$H^N H^N$
wide	$H^W H^W$
round	$H^N H^W$

Trait: Nose

Dominant trait (symbol): small (N)

Symbols: (N, n) Recessive trait (symbol): large (n)

Possible Phenotypes	Possible Genotypes
small	NN or Nn
large	nn

Trait: Eyes

Dominant trait (symbol): large (E)

Symbols: (E, e) Recessive trait (symbol): small (e)

Possible Phenotypes	Possible Genotypes
large	EE or Ee
small	ee

Trait: Eyebrows

Trait (symbol): large (X)

Symbols: (X, Y)

Trait (symbol): small (Y)

Possible Phenotypes	Possible Genotypes
large	XX
small	XY