

Aliens One Last Time

Overview

Students will now look at the third generation of aliens and, working backwards, try to figure out which child came from which set of parents. These ‘puzzles’ should help to solidify all of the previous work students have done with genotypes and phenotypes.

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 small groups

- 1 scissors
- 1 glue stick

Materials for individual students

- 1 completed *Omah and Opah* worksheet (from the **Aliens Again!** exercise)
- 1 *Henrietta and Harold* worksheet
- 1 *Maude and Millard* worksheet
- 1 3rd *Generation Cards* cut-out worksheet
- 1 pencil

Procedure

1. “Let’s look back at our alien family one last time. At the same time genetic testing was performed on Wilbur and Wilma, the other aliens in the second generation were also tested.” Hand out the *Henrietta and Harold* and *Maude and Millard* worksheets and explain how to cut and place them so that each student can see the pedigree of Opah, Omah, and their offspring. Explain the basic rules of how pedigrees work. For example, a horizontal line that connects 2 people indicates that they are the parents (Opah and Omah). A vertical line that drops down from a horizontal line points to the offspring of those parents (the vertical line from Opah and Omah points to Harold, Wilbur, and Maude). If there are two or more siblings, their vertical lines will be connected by a horizontal line (Harold, Wilbur, and Maude).
2. As they place Harold and Maude over their counterparts on the *Omah and Opah* worksheet where they had written possible genotypes, give students a chance to compare and make observations. For example, they may have written a genotype with two dominant alleles, while the genetic testing revealed a heterozygous

genotype.

3. Hand out a 3rd *Generation Cards* worksheet to each student and instruct them to cut out each alien.
4. Explain that our challenge is to try to determine which child is from which set of parents. Give students a chance to work through this. It may be frustrating at times because there are lots of ways to attack this problem. With the information provided, the parents of only 4 of the 5 children can be determined unequivocally.
5. Have the class share what they have come up with. As they share their results, have them give their reasoning.
6. Explain to the students that we, as a class, will look at each trait in turn in an attempt to solve this puzzle.

7. *“Let’s start with ears. Which child has different ears from all the others?”*
[Suzy]

“What must her genotype be?” [pp]

“Which set of parents could produce a pp offspring?” [Only Henrietta and Harold]

“Why?” [Henrietta and Harold each carry the recessive allele. Maude and Millard are both homozygous dominant and could not have a child with pp.]

8. *“Now let’s look at antlers. Determine the genotypes of the 4 remaining children. How can this information help us determine parents?”*

“Let’s look at the parents. What type of children could Henrietta and Harold produce?” [Only children with small and medium antlers]

“Let’s look at the parents. What type of children could Maude and Millard produce?” [Only children with medium and large antlers]

“From this information which children can we place and why?”

[Bruce has small antlers, so he must be from Henrietta and Harold. Maude and Millard can’t have small-antlered children.]

[Oscar has large antlers, so he must be from Maude and Millard. Henrietta and Harold can’t have large-antlered children.]

9. *“We still need to decide on Chuck and Larry. Let’s look at the mouths. What genotypes are possible for Larry and Chuck?”* [Larry must be mm. Chuck could be either MM or Mn.]

“Let’s look at the parents. Which children could they produce? Both sets of

parents could produce both types of mouths. Therefore, this trait does not help us.”

10. *“Let’s look at eyes. What are the genotype possibilities for Larry and Chuck?”*
[Larry must be ee. Chuck could be either EE or Ee.]

“Let’s look at the parents. Which children could they produce?”

[Henrietta and Harold can only produce children with Ee, large eyes, even though Henrietta has small eyes. Maude and Millard can produce children with either large or small eyes.]

“How does this information help?” [Larry can only be the child of Maude and Millard because Henrietta and Harold can not have children with small eyes.]

11. *“All we have left is Chuck.”* Ask students to work through the rest of the traits and see if they can place Chuck in the correct family. It turns out that there is not enough information to determine where Chuck belongs. But don’t tell students this yet. Allowing them to struggle with this puzzle by looking at head shape and eyebrows is important. It will tax their reasoning and critical thinking skills. Circulate around the room and have students explain their thinking.
12. Inform students that to place Chuck we need a little more information. Ask each student to answer this question: *“How would knowing the genotype of Chuck’s ears help determine who his parents are?”* [If he were homozygous, it would not help because both sets of parents can produce offspring with PP. If he were heterozygous, Pp, then he would have to be the child of Harold and Henrietta. Only they can have children with Pp genotypes.]
13. Inform the students that Chuck is Pp. Therefore, who are his parents? [Harold and Henrietta]

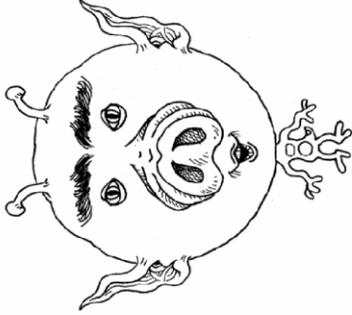
Reflection/Discussion

Now that students can see three generations in the pedigree, ask them to pick a trait that “skips a generation.” For example, the large and small antlers only appear in the first and third generations. Ask students to write an explanation of how this could happen in their notebooks. Have students seen any such traits in their own families?

Henrietta and Harold

Henrietta

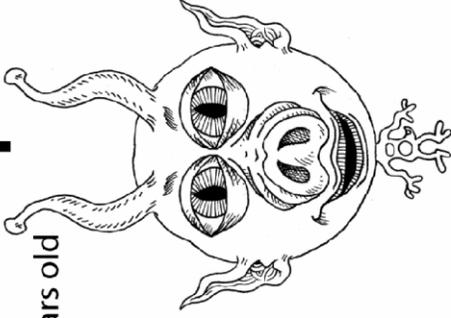
226 Earth-years old



Trait	Genotype
A = antlers	A ^S A ^S
M = mouth	mm
P = ears	Pp
H = head	H ^N H ^W
N = nose	nn
E = eyes	ee
X, Y = eyebrows	XX

Harold

228 Earth-years old



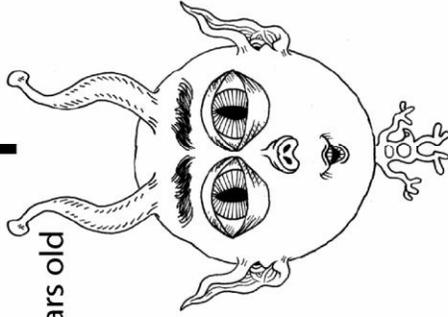
Trait	Genotype
A = antlers	A ^B A ^S
M = mouth	Mm
P = ears	Pp
H = head	H ^N H ^W
N = nose	nn
E = eyes	EE
X, Y = eyebrows	XY

cut out

Maude and Millard

Maude

222 Earth-years old

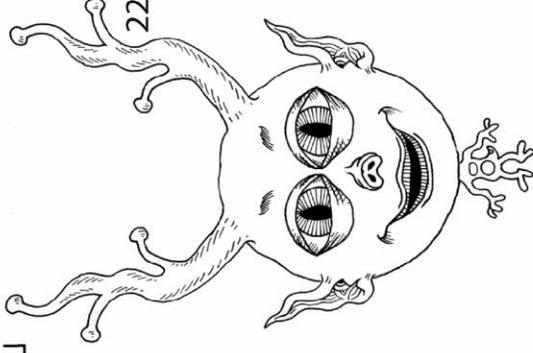


Trait	Genotype
A = antlers	$A^B A^S$
M = mouth	mm
P = ears	PP
H = head	$H^N H^W$
N = nose	Nn
E = eyes	Ee
X, Y = eyebrows	XX

cut out

Millard

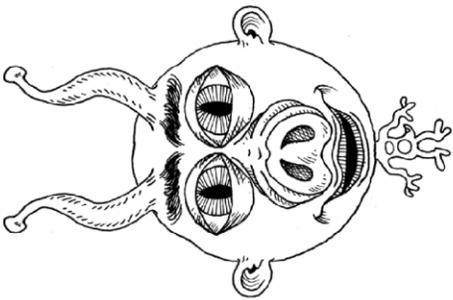
221 Earth-years old



Trait	Genotype
A = antlers	$A^B A^B$
M = mouth	Mm
P = ears	PP
H = head	$H^N H^W$
N = nose	Nn
E = eyes	Ee
X, Y = eyebrows	XY

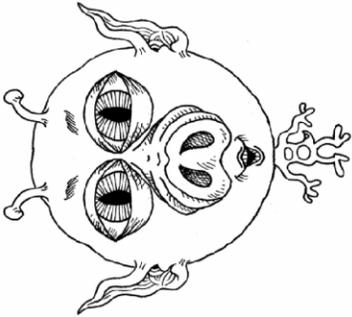
3rd Generation Cards

Suzy
62 Earth-years old



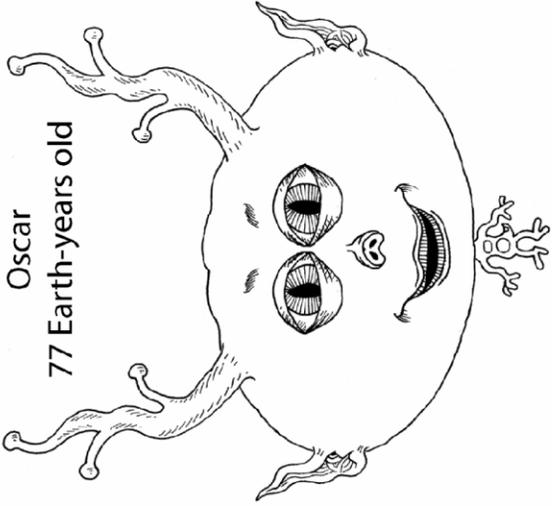
Trait	Genotype
A = antlers	
M = mouth	
P = ears	
H = head	
N = nose	
E = eyes	
X, Y = eyebrows	

Bruce
68 Earth-years old



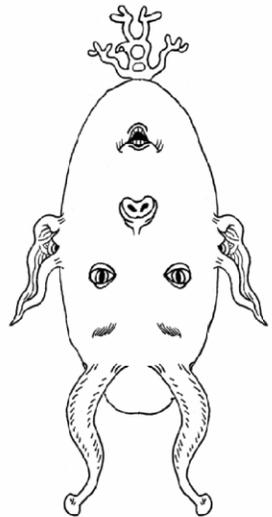
Trait	Genotype
A = antlers	
M = mouth	
P = ears	
H = head	
N = nose	
E = eyes	
X, Y = eyebrows	

Oscar
77 Earth-years old



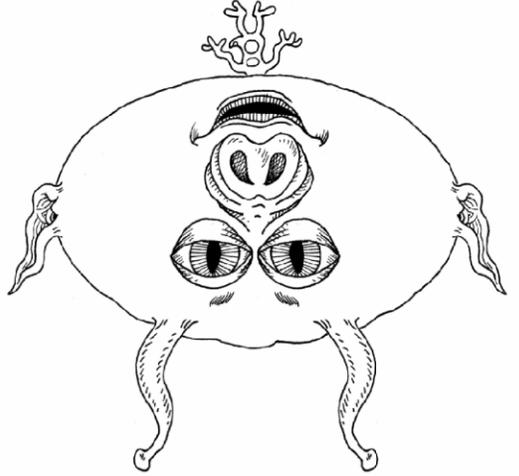
Trait	Genotype
A = antlers	
M = mouth	
P = ears	
H = head	
N = nose	
E = eyes	
X, Y = eyebrows	

Larry
76 Earth-years old



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

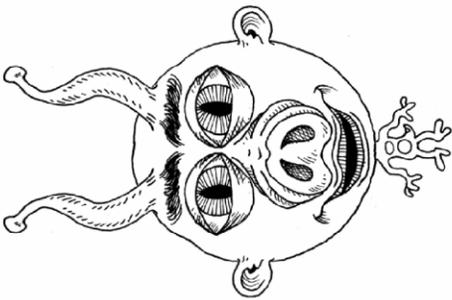
Chuck
73 Earth-years old



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

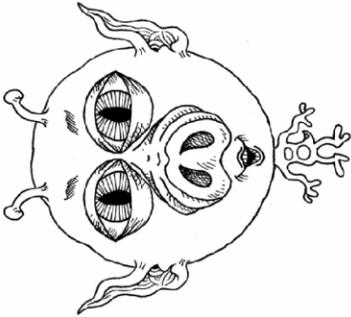
3rd Generation Cards

Suzy
62 Earth-years old



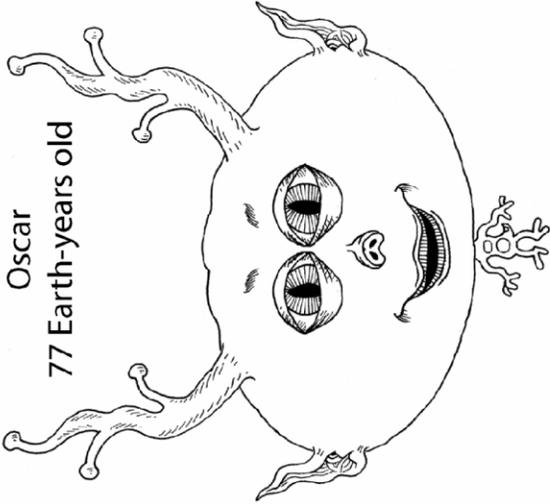
Trait	Genotype
A = antlers	A ^B A ^S
M = mouth	MM or Mm
P = ears	pp
H = head	H ^N H ^W
N = nose	nn
E = eyes	EE or Ee
X ₁ , Y = eyebrows	XX

Bruce
68 Earth-years old



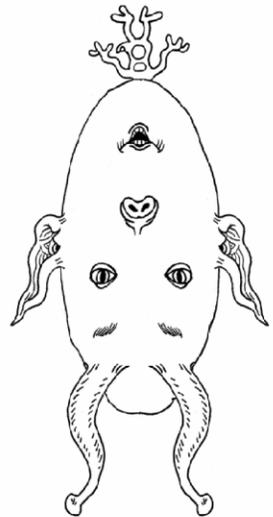
Trait	Genotype
A = antlers	A ^S A ^S
M = mouth	mm
P = ears	Pp or Pp
H = head	H ^N H ^W
N = nose	nn
E = eyes	EE or Ee
X ₁ , Y = eyebrows	XY

Oscar
77 Earth-years old



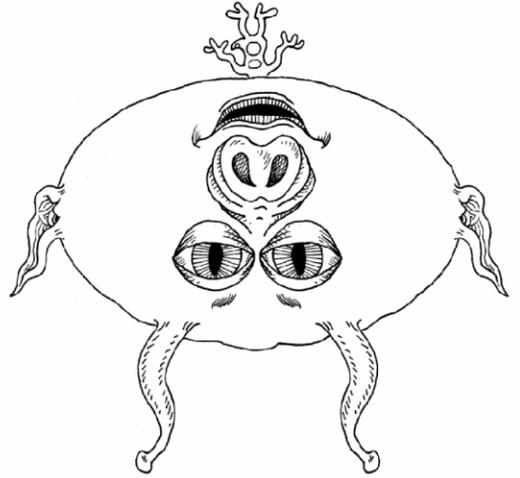
Trait	Genotype
A = antlers	A ^B A ^B
M = mouth	MM or Mm
P = ears	Pp or Pp
H = head	H ^W H ^W
N = nose	NN or Nn
E = eyes	EE or Ee
X ₁ , Y = eyebrows	XY

Larry
76 Earth-years old



Trait	Genotype
A = antlers	A ^B A ^S
M = mouth	mm
P = ears	Pp or Pp
H = head	H ^N H ^N
N = nose	NN or Nn
E = eyes	ee
X ₁ , Y = eyebrows	XY

Chuck
73 Earth-years old



Trait	Genotype
A = antlers	A ^B A ^S
M = mouth	Mm or Mm
P = ears	Pp or Pp
H = head	H ^W H ^W
N = nose	Nn
E = eyes	EE or Ee
X ₁ , Y = eyebrows	XY