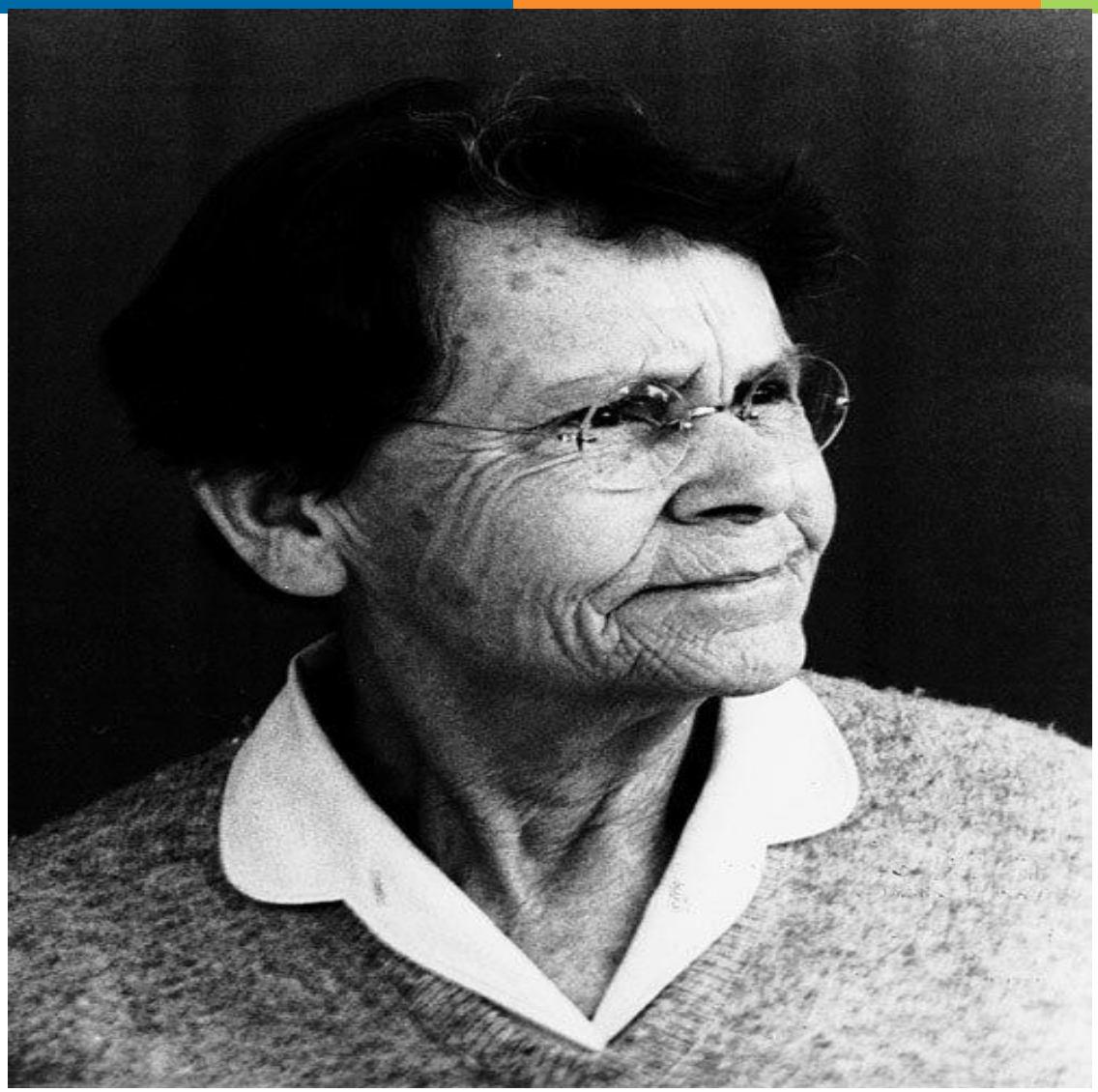
CONNECTICUT WOMEN'S HALL OF FAME
25TH ANNIVERSARY

STEMfemsJR.

Vol. 2



Connecticut Women's Hall of Fame *presents*

Inspirational Women *in* STEM

Barbara *McClintock*

NGSS Aligned

Grade 3

Life Science Unit

CONNECTICUT WOMEN'S HALL OF FAME
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- Nita Chai, Bridgeport Public Schools
- Andrea Greene, Hartford Public Schools
- Carly Imhoff, Ashford School
- Ashley Pereira, MS Ed., Career In STEM

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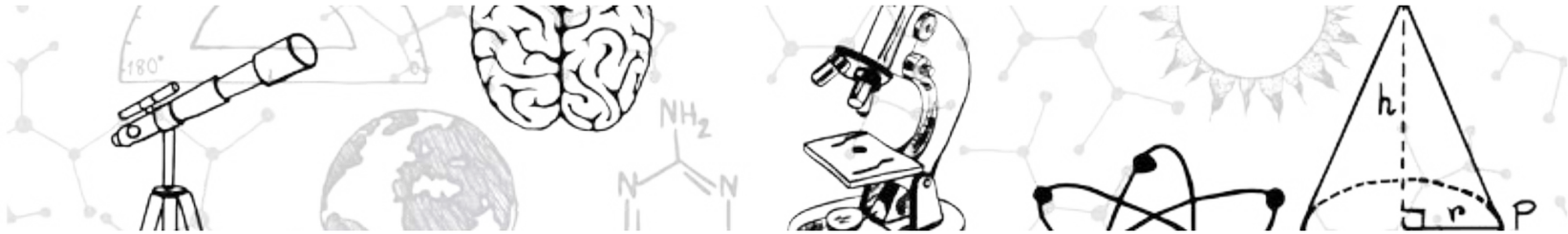
Inductee
In-depth



Reading *Passages*

Description Introduce students to Barbara McClintock, a famed geneticist and Nobel Prize winner. The story highlights both relevant science content and the challenges she overcame as a woman in science.

Standard By the end of the year, read and comprehend informational texts, including history, social studies, science, and technical texts, at the high end of the grades 2-3 text complexity band independently and proficiently. (CCSS.ELA-LITERACY.RI.3.10)

Close *Reading*

Description Use McClintock's story to develop your students' close reading skills. Review methods for close reading, including highlighting and annotating. Be sure to practice looking back in the text for evidence to support an answer.

Standards Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for answers.
CCSS.ELA-LITERACY.RI.3.1

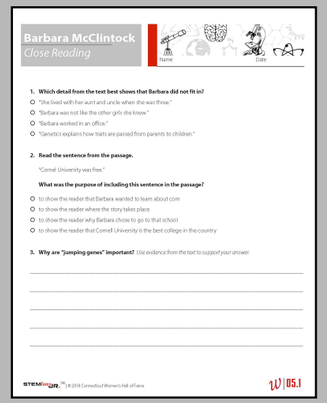
Differentiation

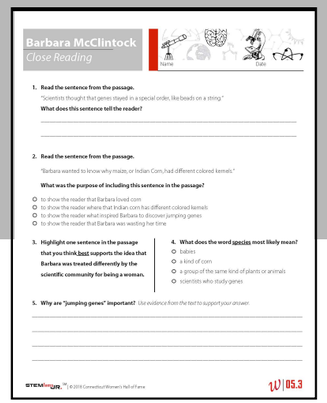
Provide students with the reading passage that aligns with their guided reading level.

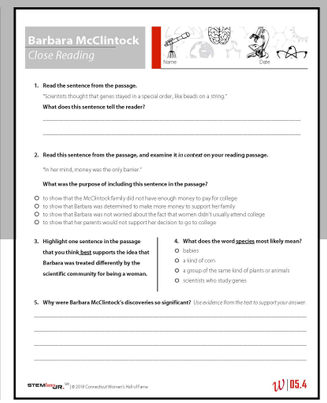
04.1 Level J
04.2 Levels K, L
04.3 Levels M, N
04.4 Levels O, P, Q
04.5 Levels R, S, T
04.6 Levels U, V, W

Navigation

Click directly on the image of any worksheet to access the printable version, then use the bookmarks icon to return to this page.







Differentiation

Provide students with the close reading printable that aligns with the leveled reading passage they read.

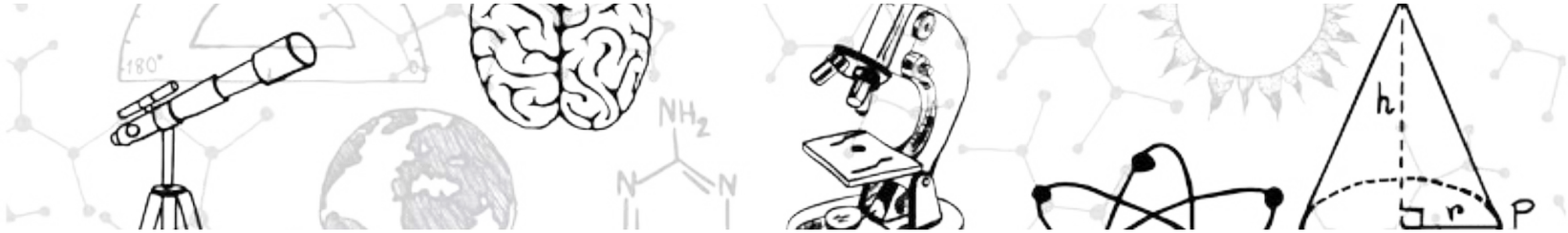
Levels J **05.1**
Levels K, L **05.2**
Levels M - Q **05.3**
Levels R - W **05.4**

Navigation

The page numbers for each student activity match the numbers in the teacher's guide for easy alignment.

Inductee

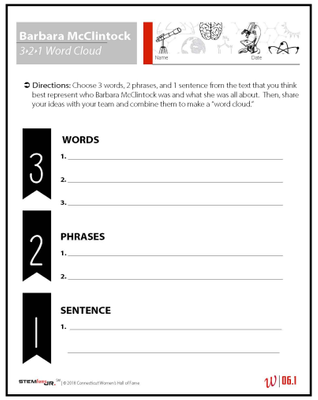
In-depth



3-2-1 Word Cloud - Discussion Protocol

Directions Engage your students in structured dialogue about Barbara McClintock by providing the opportunity for them to collaboratively create a word cloud based on the text. After students create their word clouds, challenge them to articulate new ideas that they developed as a team.

Standard Come to discussions prepared; draw on that preparation to explore ideas under discussion. CCSS.ELA-LITERACY.SL.3.1.A


Barbara McClintock
3•2•1 Word Cloud

Name Date

➲ **Directions:** Choose 3 words, 2 phrases, and 1 sentence from the text that you think best represent who Barbara McClintock was and what she was all about. Then, share your ideas with your team and combine them to make a "word cloud."

3 **WORDS**
1.
2.
3.

2 **PHRASES**
1.
2.

1 **SENTENCE**
1.

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w | 06.1

A Career in Genetics

Students who are inspired by Dr. Barbara McClintock may want to consider a career as a geneticist. A geneticist studies genes, including genetic diseases and conditions. Interested students can watch videos, practice building a DNA molecule by paring bases in an interactive game, and read more about careers in astronomy by visiting www.careerinstem.com/geneticist/

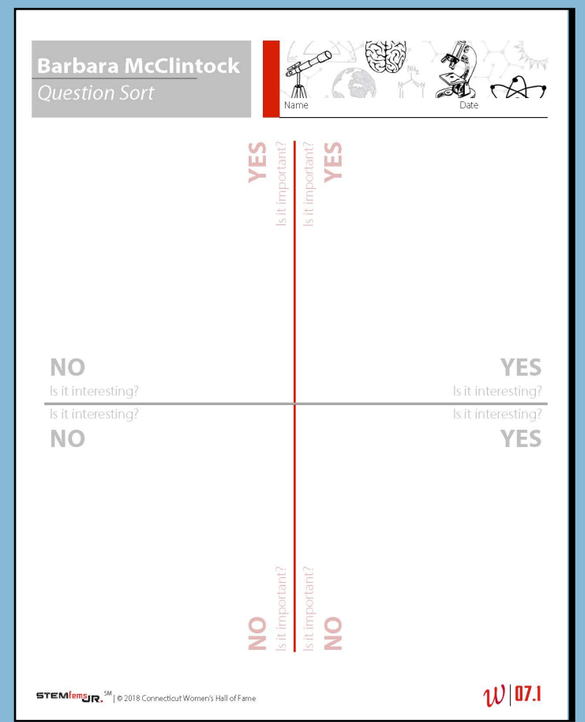
www.careerinstem.com

Science and Engineering Practices Activity

Asking Questions

Have students write their own questions about heredity and genetics on individual sticky notes. Questions can be generated based on the reading about Barbara McClintock, as well as videos of phenomena related to heredity and genetics provided by The Wonder of Science.

After students write their own questions, put students into small groups to sort their questions. As a team, students evaluate whether each question is important enough to warrant ongoing whole-class study, and whether or not it is interesting enough to sustain their peers' attention. Discuss each team's best questions with the whole class.


Barbara McClintock
Question Sort

Name Date

YES Is it important? YES Is it important?

NO Is it interesting? YES Is it interesting?

NO Is it interesting? YES Is it interesting?

NO Is it important? NO Is it important?

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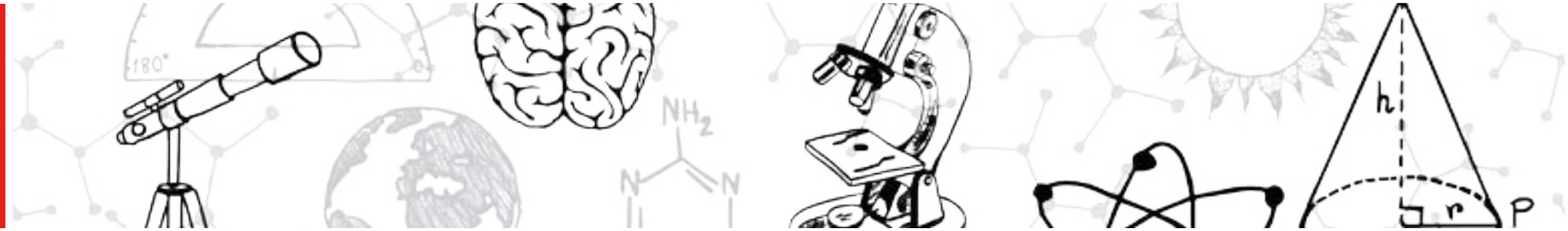
Disciplinary
Core Ideas



Discipline: Life Sciences

Core Idea LS3 | Heredity: Inheritance and Variation of Traits

Guiding Questions
How are characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?

Description
Many characteristics of organisms are inherited from their parents. Different organisms vary in how they look and function because they have different inherited information.

Performance Expectation
Students who demonstrate understanding can analyze and interpret data to provide evidence that plants and animals have traits inherited from their parents and that variation of these traits exists in a group of similar organisms. (3-LS3-1)

Overview

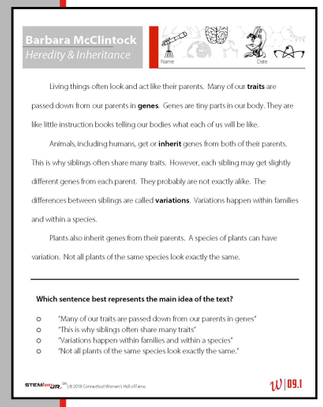
According to *A Framework for K-12 Science Education Practices*, "The third core idea... focuses on the flow of genetic information between generations. This idea explains the mechanisms of genetic inheritance and describes the environmental and genetic causes of gene mutation and the alteration of gene expression."

Third grade students should understand that many characteristics of living things are inherited from the parents' genes. Members of the same species have similar traits, but there will be some variation within a species and even within offspring of the same parents.

This genetic variation is related to ideas explored in the fourth core idea, Biological Evolution: Unity and Diversity. When certain traits lead a species to adapt better to their environment, the species evolves to have more of that trait over time. But what causes these drastically different traits to occur in the first place? This is where Dr. McClintock's findings become especially relevant. Transposons or "jumping genes" are bits of genetic material that can change location within a cell, causing mutations. Almost half of the human genome is made up of transposons, which explains why we don't look like chimpanzees, despite our shared DNA.

As you begin this unit, consider introducing your students to phenomena that will move them to inquire about genetics. Videos of phenomena are available here and more information about how phenomena are used in the Next Generation Science Standards is found here.

Content Based *Literacy*


Barbara McClintock
Heredity & Inheritance

Name Date

Living things often look and act like their parents. Many of our **traits** are passed down from our parents in **genes**. Genes are tiny parts in our body. They are like little instruction books telling our bodies what each of us will be like.

Animals, including humans, get or **inherit** genes from both of their parents. This is why siblings often share many traits. However, each sibling may get slightly different genes from each parent. They probably are not exactly alike. The differences between siblings are called **variations**. Variations happen within families and within a species.

Plants also inherit genes from their parents. A species of plants can have variation. Not all plants of the same species look exactly the same.

Which sentence best represents the main idea of the text?

- "Many of our traits are passed down from our parents in genes"
- "This is why siblings often share many traits"
- "Variations happen within families and within a species"
- "Not all plants of the same species look exactly the same."

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Directions Introduce students to the core ideas of heredity, inheritance and variation by assigning this brief reading passage and close reading question.

Standard Determine the main idea of a text; recount key details and explain how they support the main idea.
CCSS.ELA-LITERACY.RI.3.2


Barbara McClintock
Genetic Variation

Name Date

Animals or plants within a **species** have many things in common. Still, they are not all exactly the same. They have differences called **variations**. Some variations happen because **traits** come from both parents. Siblings get **genes** from their mother and father. This causes small variations, even within a family.

Other variations happen more suddenly. Sometimes this is because of **transposons** or "jumping genes." People used to think that genes stayed in a special order. However, in the 1940s, Barbara McClintock discovered that some genes can jump! When they move, they can change make big changes to a plant or animal. These big changes are called **mutations**.

Scientists think that genes jump when there is stress in the environment. Sometimes, this causes a change that helps the plant or animal survive. For example, when trees were covered with dark soot from factories, peppered moths turned black. This helped them blend in with the trees.

When one kind of plant or animal has many of these mutations over time, it can become something completely new. This is called **evolution**. Long ago, jumping genes caused many changes in primates. Some of them evolved into chimpanzees. Others evolved into humans. Our species exists today because of jumping genes. They make up almost half of our **DNA**!

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Directions Help students explicitly connect what they learned about genetic inheritance with Barbara McClintock's discovery of jumping genes by assigning this brief reading passage.

Standard Determine the meaning of domain-specific words and phrases.
CCSS.ELA-LITERACY.RI.3.4

Graphic Organizer


Barbara McClintock
Graphic Organizer

Name Date

Title

Main Ideas

Notes

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Directions As students research, they can take notes on this printable, using the column on the left to record main ideas.

Standard Compare and contrast the most important points and key details presented from two texts on the same topic.
CCSS.ELA-LITERACY.RI.3.9

Resources *for Further Research*

Speaking and Listening

Click the links for related videos.

- **Brainpop** | DNA
- **Brainpop** | Genetic Mutation
- **TED Ed** | Mendell's Pea Plants

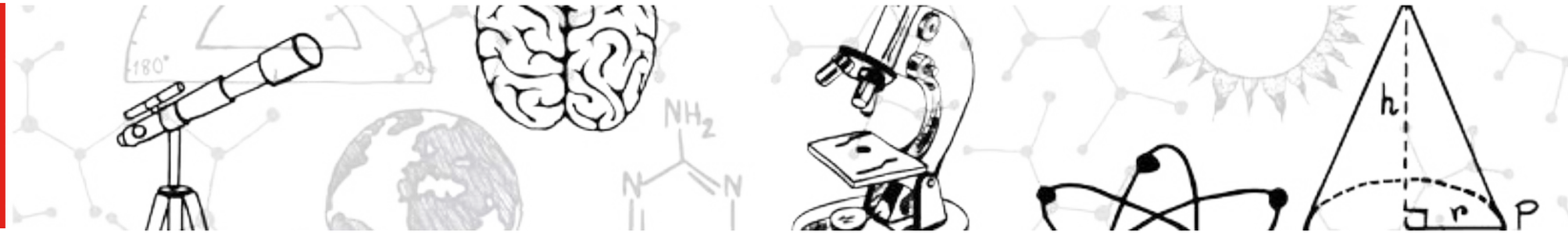
Reading Informational Text

Click the link for a related reading passage.

- **CommonLit** | "Where Did I Come From?"

Use the built-in "guided reading mode" to provide scaffolded questions to students or to allow them to listen to the text read aloud.

Crosscutting *Concepts*



Patterns, Similarity, and Diversity	Students explore how genetic ***similarities*** and ***differences*** affect heredity and inheritance of traits.
Cause and Effect	Students explore the ***effects*** inherited traits have on different organisms. Students consider what ***causes*** changes in inherited traits between generations.
Structure and Function	Students explore the ***structure*** of DNA and its impact on an organism's ***function***.

Discussion Questions

How are traits passed down from one generation to the next?

How is it possible for someone to have some traits that neither of their parents have, and why do animals of the same species sometimes have different traits than one another?

What causes traits to change from generation to generation?

How did Barbara McClintock's discovery of "jumping genes" affect our understanding of the structure of DNA?

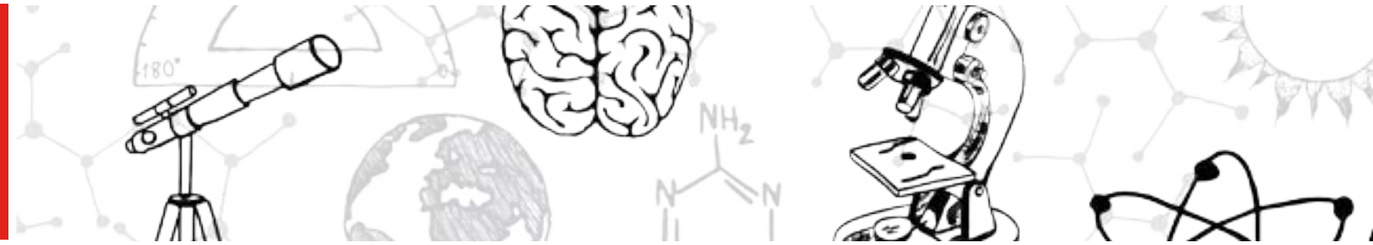
Activity: *Gallery Walk*

Directions Create anchor charts for each of the three cross-cutting concepts. On sticky notes, students write down how each concept relates to what they have learned about genetics After students place their sticky notes on the charts, provide time for them to read one another's thinking and respond directly on the chart with markers.

Standards Describe the relationship between a series of scientific ideas or concepts using language that pertains to time, sequence, and cause/effect. CCSS.ELA-LITERACY.RI.3.3

Science & Engineering

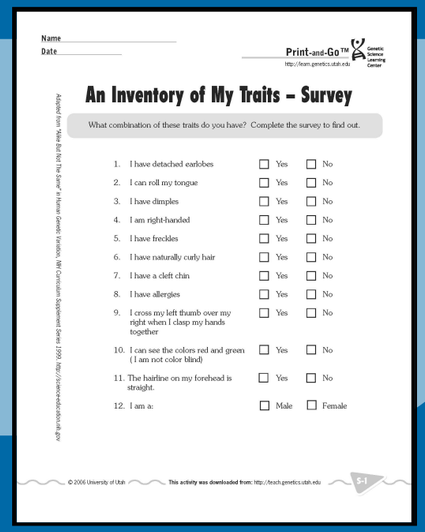
Practices



Analyzing and Interpretting Data

An Inventory of My Traits

Directions Developed by the Genetic Science Learning Center at the University of Utah, this activity allows students to take an inventory of their own observable traits and compare them with the traits of their classmates. Students represent data in a bar graph and analyze their findings. Worksheet available in English and Spanish.



Name
Date

Print-and-Go™ Genetic Science Learning Center
http://learn.genetics.utah.edu

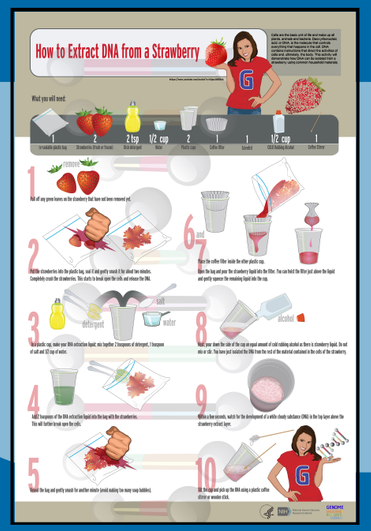
An Inventory of My Traits – Survey

What combination of these traits do you have? Complete the survey to find out.

1.	I have detached earlobes	☐ Yes	☐ No
2.	I can roll my tongue	☐ Yes	☐ No
3.	I have dimples	☐ Yes	☐ No
4.	I am right-handed	☐ Yes	☐ No
5.	I have freckles	☐ Yes	☐ No
6.	I have naturally curly hair	☐ Yes	☐ No
7.	I have a cleft chin	☐ Yes	☐ No
8.	I have allergies	☐ Yes	☐ No
9.	I cross my left thumb over my right when I clasp my hands together	☐ Yes	☐ No
10.	I can see the colors red and green (I am not color blind)	☐ Yes	☐ No
11.	The hairline on my forehead is straight.	☐ Yes	☐ No
12.	I am a:	☐ Male	☐ Female

Adapted from "How Alike Are We? The Science of Human Genetic Variation, MH Curriculum Supplement Series 1999, http://sciencenetlinks.com/lesson

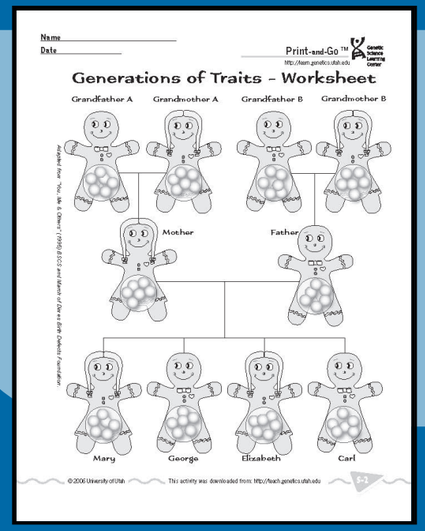
© 2006 University of Utah — This activity was downloaded from: http://teach.genetics.utah.edu — S-1



Planning and Carrying Out investigations

Extract DNA from Strawberries

Directions Using this activity from the National Human Genome Research Institute, your students can actually extract DNA from strawberries using simple and easily accesible materials. This hands on experience is sure to heighten students' curiosity and desire to investigate the topic further.



Name
Date

Print-and-Go™ Genetic Science Learning Center
http://learn.genetics.utah.edu

Generations of Traits – Worksheet

Grandfather A | Grandmother A | Grandfather B | Grandmother B

Mother | Father

Mary | George | Elizabeth | Carl

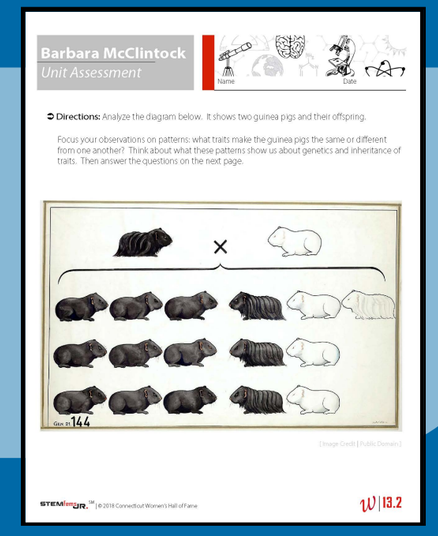
Adapted from "How Alike Are We?" ©1999 © 2006 University of Utah and Board of Directors, Salt Lake City School District

©2006 University of Utah — This activity was downloaded from: http://teach.genetics.utah.edu — S-2

Developing and Using Models

Generations of Traits

Directions Developed by the Genetic Science Learning Center at the University of Utah, in this activity students use pom poms to model genetic material that is passed from one generation to another. Students investigate how these traits are passed through three generations of "ginger-people." Worksheet available in English and Spanish.



Barbara McClintock
Unit Assessment

Name | Date

➲ **Directions:** Analyze the diagram below. It shows two guinea pigs and their offspring.

Focus your observations on patterns: what traits make the guinea pigs the same or different from one another? Think about what these patterns show us about genetics and inheritance of traits. Then answer the questions on the next page.

Gen 2: 144

[Image Credit | Public Domain]

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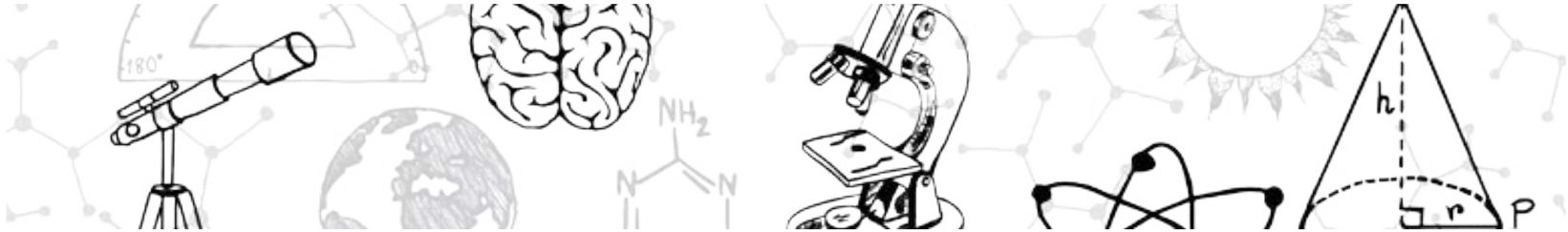
Analyzing and Interpretting Data

Unit Assessment

Directions Students analyze an image of two guinea pigs and their offspring, paying close attention to the patterns, similarity, and diversity in observable traits. Students then interpret their observations, using evidence from the image to support claims about trait inheritance and variation.

Additional *Resources*

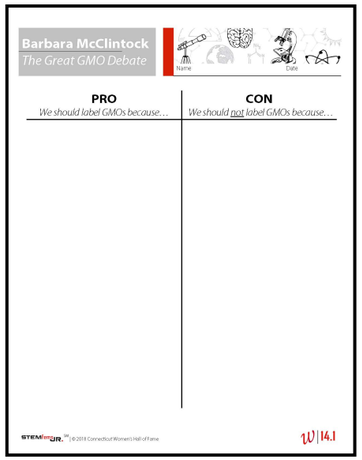


Interdisciplinary *Connections*

Persuasive Writing

The Great GMO Debate

Directions The first genetically modified food approved by the FDA came on the market in 1994, but the debate rages on about the risks and benefits of GMO crops and products. Should companies be required to label products containing GMOs? Have students research the issue on NewsELA.com and then sort their findings using a pro/con chart. Then, have students synthesize their findings in order to write a persuasive essay about their position. Students should include relevant facts to support their claim.



Integrating Technology & Visual Art

Play "Monster Maker"

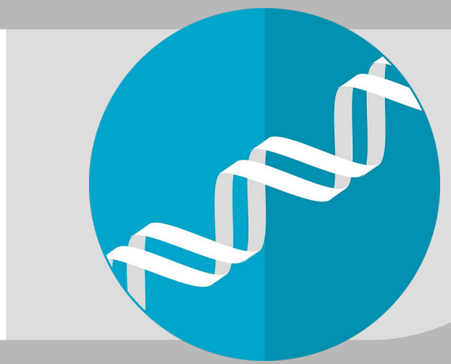
Directions Explore how DNA serves as a code that helps shape living things. If you have easy access to 1:1 technology for students, you can have them play the Monster Maker game online, developed by Arizona State University. If you do not have easy access to technology, or would prefer that your students utilize their visual art skills, you can print the related worksheets that provide space for students to draw their own monsters based on a genetic code.

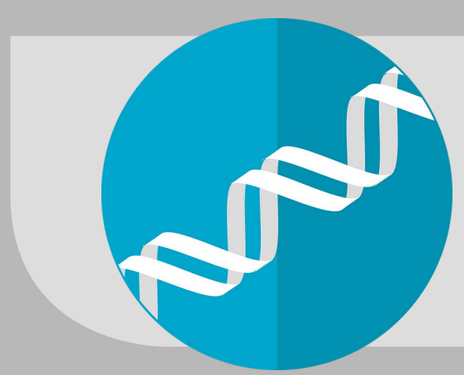
Women *in Genetics Today*

Jennifer A. Doudna, Ph.D

Biochemist and Cellular Biologist

Known for her new method of editing genes, Dr. Doudna has profoundly influenced the future of genetic engineering and medicine. She was recently named one of the "50 Top Women in STEM." Click here to learn more about her accomplishments.





Mary-Claire King, Ph.D

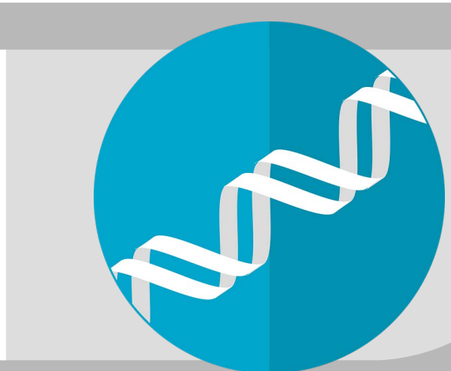
Professor of Genome Sciences and of Medicine

Awarded the National Medal of Science in 2016 by President Barack Obama, Dr. King was the first researcher to determine that humans and chimpanzees are so genetically similar. She also pioneered research into the connection between genetics and breast and ovarian cancers.

Gerneiva Parkinson

Medical Student, Yale School of Medicine

Described as "a medical student taking on the burden of a country," Parkinson is leading the efforts to research the genetic basis for the high rates of breast cancer in her home country of Trinidad and Tobago. Read more about her amazing effort.



References

Images & Resources

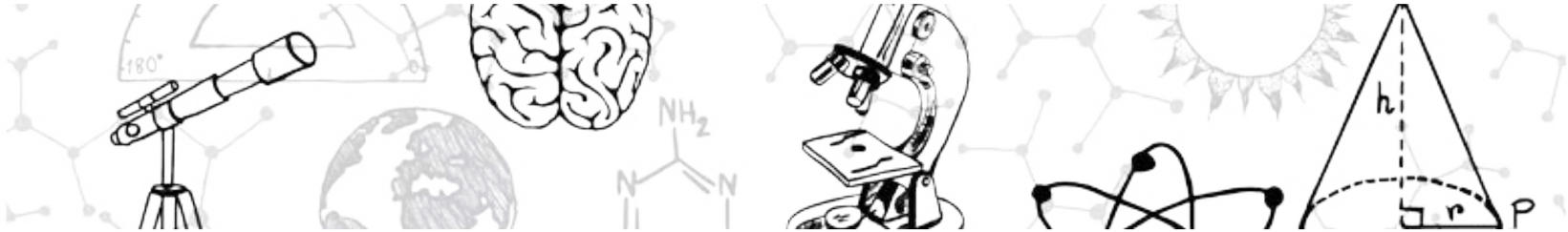


Image Credits

"A Gallery Walk." 2016. Photograph. New York, NY. *Parents Community Service Network.*

"Barbara McClintock, 1947." Barbara McClintock Papers. *National Library of Medicine.* Courtesy of the American Philosophical Society Library.

"McClintock in her lab with maize plants." Barbara McClintock Papers. *National Library of Medicine.* Courtesy of the American Philosophical Society Library.

"McClintock receiving her Nobel Prize in 1983." Courtesy of Cold Spring Harbor Laboratory.

"Peppered Moths." Photograph. Science News, 27 May 2017, p26.

Embedded Resources

Articles

"Where Did I Come From?" *CommonLit.*

Videos

Díaz, Hortensia Jiménez. "How Mendel's Pea Plants Helped Us Understand Genetics." Animated by Johan Sonestedt and Veronica Wallenberg. *Lessons Worth Sharing | TED-Ed.*

"DNA." 2018. *BrainPOP.*

"Genetic Mutations." 2018. *BrainPOP.*

Resources

"3-LS3-1: Inheritance and Variation of Traits." *The Wonder of Science.*

"Geneticist" *CareerInSTEM.*

"How to Extract DNA from a Strawberry." *Genome.gov*, National Human Genome Research Institute.

"Introduction to Heredity and Traits." *Teach.Genetics*. Genetic Science Learning Center.

"Monster Maker Game." *Ask A Biologist,* Arizona State University.

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Saey, Tina Hesman. "The Difference Makers: Transposons Sculpt Our Genomes, for Good and Bad." ***Science News*****, 27 May 2017, pp. 22–26.** ***One Search*****, ResearchIt CT.**

Stanton, Katie Jacobs. "Bold Women in Science – Color Genomics." ***Color*****, Color Genomics, 8 Mar. 2017, blog.color.com.**

Tracy, Kathleen. ***Barbara McClintock: Pioneering Geneticist*****. Mitchell Lane Publishers, 2002.**

Barbara McClintock

Reading Passage

Name Date

Barbara McClintock was born in 1902. Her family was poor.

She lived with her aunt and uncle when she was three. She went back to her parents when she was six.

Barbara was not like the other girls she knew. She liked to read and climb trees. Kids made fun of her. Her mom worried that she did not fit in.

Barbara worked in an office. She needed money to help her family. She wanted to go to college.

Cornell University was free. Barbara decided to go.

Barbara studied plants. She liked **genetics.** Genetics explains how **traits** are passed down from parents to children. This happens in plants and animals.

Barbara studied corn plants. She discovered something amazing. She learned that **genes** can jump. Genes are tiny parts in our body that control parts of who we are. When they move, genes can change how a plant or animal looks or acts. This helps plants and animals change over time.

People did not believe Barbara. They did not think genes could jump. It took 20 years for people to change their minds. Years later, she won a Nobel Prize.

Dr. Barbara McClintock was an important scientist.

Barbara McClintock

Reading Passage

Name Date

Barbara McClintock was born in Hartford, Connecticut in 1902. Her family did not have a lot of money.

Her parents sent her to live with her aunt and uncle when she was three. She went back to her parents when she was six.

Barbara was not like the other girls she knew. She liked to read, play baseball, climb trees, and do science. Kids made fun of her. Her mother worried that she did not fit in.

After high school, Barbara worked in an office. She needed money to help her family. But she dreamed of going to college.

Barbara learned that she could go to Cornell University for free. She convinced her father it was a good idea.

In college, Barbara studied plants. She was interested in **genetics**. Genetics is the study of how **traits** are passed on from parents to their offspring in plants and animals.

Barbara studied corn. She wanted to know why **maize**, or Indian Corn, had different colored kernels. She discovered something amazing. She learned that **genes** – the tiny parts in our body that control parts of who we are – can jump! When they move, they can change how a plant or animal looks or acts. This helps **species** change over time.

People did not believe her research. They did not think genes could jump. They did not think a woman could discover something so important.

It took 20 years for people to change their minds. Years later, Dr. Barbara McClintock won a Nobel Prize for her discovery.

Barbara McClintock

Reading Passage

Name

Date

Barbara McClintock was born in Hartford, Connecticut in 1902. Her family did not have a lot of money.

Her parents sent her to live with her aunt and uncle when she was three. She went back to her parents when she was six.

Barbara was not like the other girls she knew. She liked to read, play baseball, climb trees, and do science. Kids made fun of her. She thought the teasing was worth it, but her mother worried.

After high school, Barbara worked in an office. She needed money to help her family. But she dreamed of going to college. She learned that she could go to Cornell University for free. She convinced her father it was a good idea.

In college, Barbara studied the **genetics** of plants. Genetics is the study of how **traits** are passed on from parents to their offspring.

Barbara wanted to know why **maize**, or Indian Corn, had different colored kernels. She discovered something amazing. She learned that **genes** – the tiny parts in our body that control parts of who we are – can jump! When they move, they change how a plant or animal looks or acts. This helps a **species** change or **evolve** over time.

At first, people did not believe her research. Scientists thought that genes stayed in a special order, like beads on a string. They did not think a woman could discover something so important.

It took 20 years for people to change their minds. Years later, Dr. Barbara McClintock won a Nobel Prize for her discovery.

Barbara McClintock

Reading Passage

Name Date

Barbara McClintock was born in Hartford, Connecticut in 1902. Though her father was a doctor, her family did not have a lot of money. Her parents sent her to live with her aunt and uncle from the ages of three to six.

Barbara was not like the other girls she knew. She liked to read, play baseball, climb trees, and do science. Kids made fun of her because she was different, but Barbara thought it was worth it. Still, her mother worried that she was strange. She wanted Barbara to have a husband and a family someday and not always be alone.

Barbara was not worried about having a family of her own. After high school, she worked in an office to earn money to support her parents. But she dreamed of going to college, despite the fact that few women attended college in those days. In her mind, money was the only barrier. When she learned that she could go to Cornell University for free, she immediately convinced her father it was a good idea.

In college, Barbara studied the **genetics** of plants. Genetics is the study of how **traits** are passed on from parents to their offspring in plants and animals.

Barbara focused her studies on corn. She wanted to know why **maize**, or Indian Corn, had different colored kernels. She discovered something amazing. She learned that **genes** – the tiny parts in our body that control parts of who we are – can jump! When they move, they can change how a plant or animal looks or acts. These **mutations** help **species** change or **evolve** over time.

At the time, people did not believe McClintock's research. Scientists thought that genes stayed in a special order, like beads on a string. They did not think a woman could discover something so important. It took 20 years for people to change their minds. Then another 20 years later, Dr. McClintock finally won a Nobel Prize for her discovery.

Barbara McClintock

Reading Passage

Name Date

Barbara McClintock was born in Hartford, Connecticut in 1902. Her father, Thomas, was a physician. Her mother Sara was known as an independent thinker. Despite her father's profession, Barbara's family did not have a lot of money. Her parents sent her to live with her aunt and uncle from the ages of three to six.

Barbara was not like the other girls she knew. She liked to read, play baseball, climb trees, and do science. Kids made fun of her because she was different, but Barbara thought the teasing was worth it. Still, her mother worried that she was strange. She wanted Barbara to have a husband and a family someday rather than always being alone.

Barbara was not worried about having a family of her own. After graduating high school at age sixteen, she worked in an office to earn money. She dreamed of going to college, despite the fact that few women attended college in those days. In her mind, money was the only barrier. When she learned that she could go to Cornell University for free, she immediately convinced her father it was a good idea.

In college, Barbara discovered her love of **genetics** while studying plants. Genetics is the study of how **traits** are passed on from parents to their offspring in both plants and animals.

Barbara focused her studies on corn. She wanted to know why **maize** had different colored kernels. After years of research, she discovered that **genes** – the tiny parts in our body that control parts of who we are – can jump! When they move, they can change how a plant or animal looks or acts. These **mutations** help **species** change or **evolve** over time.

At the time, people did not believe McClintock's research. Scientists thought that genes stayed in a special order, like beads on a string. They did not think a woman could discover something so revolutionary.

It took twenty years for people to change their minds, and another twenty for her to gain recognition, but in 1983 Dr. Barbara McClintock finally won a Nobel Prize for her discovery. Today, her findings form the basis of **genetic engineering**.

Barbara McClintock

Reading Passage

Name Date

Barbara McClintock was born in Hartford, Connecticut in 1902. Her father, Thomas, was a physician. Her mother Sara was known as an independent thinker. Despite her father's profession, the McClintock family struggled to make ends meet. Her parents sent Barbara to live with her aunt and uncle from the ages of three to six.

Barbara was not like the other girls she knew. She liked to read, play baseball, climb trees, and do science. Kids made fun of her because she was different, but Barbara thought the teasing was worth it. She once stated, "I would take the consequences for the sake of an activity I knew would give me great pleasure."

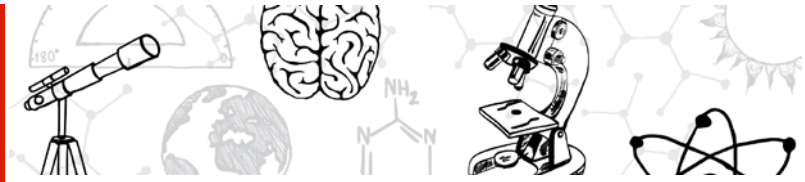
Despite her freethinking, Sara worried about her daughter. She wanted Barbara to have a husband and a family someday. Barbara, however, was not worried about having a family of her own. After graduating high school at age sixteen, she worked in an office and dreamed of going to college. Despite the fact that few women attended college in those days, in Barbara's mind, tuition was the only barrier. When she learned that she could attend the Cornell University College of Agriculture for free, she immediately convinced her father to let her attend.

In college, Barbara finally was surrounded by like-minded peers, and she enjoyed both her social and academic life. During her junior year she discovered her love of **genetics**. Genetics is the study of how **traits** are passed on from parents to their offspring in both plants and animals.

Barbara focused her research on corn. Early in her career, she produced the first genetic map of the **maize** plant. Later, she focused her studies on why maize had different colored kernels. After years of research, she discovered that some **genes** – the tiny parts in our body that control parts of who we are – can jump! When they move, they can change an organism's traits. These **mutations** help **species** change or **evolve** over time.

At the time, people did not believe McClintock's research. Scientists thought that genes stayed in a special order, like beads on a string, and did not think a woman could discover something so revolutionary. It took twenty years for people to change their minds, and another twenty for her to gain recognition, but in 1983 Dr. McClintock finally won a Nobel Prize for her discovery of **transposons** or "mobile genetic elements." Today, her findings form the basis of **genetic engineering**.

Barbara McClintock
Close Reading



Name Date

1. Which detail from the text best shows that Barbara did not fit in?

- ○ "She lived with her aunt and uncle when she was three."
- ○ "Barbara was not like the other girls she knew."
- ○ "Barbara worked in an office."
- ○ "Genetics explains how traits are passed from parents to children."

2. Read the sentence from the passage.

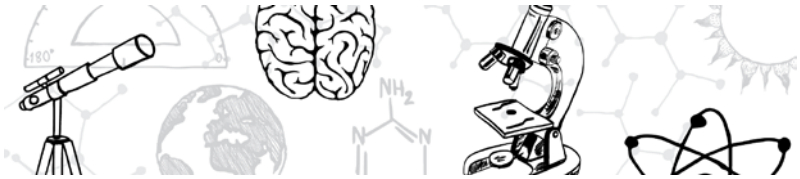
"Cornel University was free."

What was the purpose of including this sentence in the passage?

- ○ to show the reader that Barbara wanted to learn about corn
- ○ to show the reader where the story takes place
- ○ to show the reader why Barbara chose to go to that school
- ○ to show the reader that Cornell University is the best college in the country

3. Why are "jumping genes" important? *Use evidence from the text to support your answer.*

Barbara McClintock
Close Reading



Name Date

1. Which detail from the text best shows that Barbara did not fit in?

- ○ "Her parents sent her to live with her aunt and uncle when she was three."
- ○ "Barbara was not like the other girls she knew."
- ○ "After high school, Barbara worked in an office."
- ○ "Genetics is the study of how traits are passed on from parents to their offspring in plants and animals."

2. Read the sentence from the passage.

"Barbara learned that she could go to Cornell University for free."

What was the purpose of including this sentence in the passage?

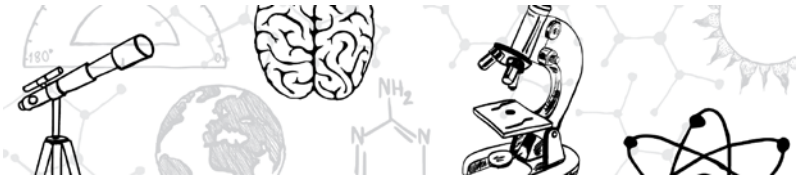
- ○ to show the reader that Barbara wanted to learn about corn
- ○ to show the reader where the story takes place
- ○ to show the reader why Barbara chose to go to that school
- ○ to show the reader that Cornell University is the best college in the country

3. What does the word <u>species</u> most likely mean?

- ○ babies
- ○ a kind of corn
- ○ a group of the same kind of plants or animals
- ○ scientists who study genes

4. Why are "jumping genes" important? *Use evidence from the text to support your answer.*

Barbara McClintock
Close Reading



Name _____ Date _____

1. **Read the sentence from the passage.**

   "Scientists thought that genes stayed in a special order, like beads on a string."

   What does this sentence tell the reader?

   _____

   _____

2. **Read the sentence from the passage.**

   "Barbara wanted to know why maize, or Indian Corn, had different colored kernels."

   What was the purpose of including this sentence in the passage?

- O to show the reader that Barbara loved corn
- O to show the reader where that Indian corn has different colored kernels
- O to show the reader what inspired Barbara to discover jumping genes
- O to show the reader that Barbara was wasting her time

3. **Highlight one sentence in the passage that you think <u>best</u> supports the idea that Barbara was treated differently by the scientific community for being a woman.**

4. **What does the word <u>species</u> most likely mean?**

- O babies
- O a kind of corn
- O a group of the same kind of plants or animals
- O scientists who study genes

5. **Why are "jumping genes" important?** *Use evidence from the text to support your answer.*

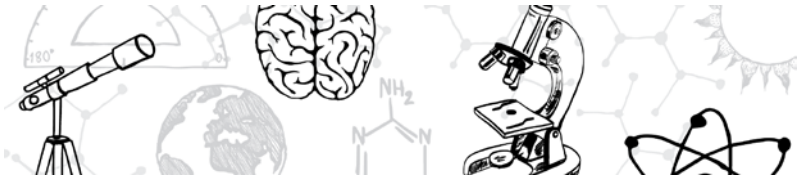
_____

_____

_____

_____

Barbara McClintock
Close Reading



Name _____ Date _____

1. **Read the sentence from the passage.**

   "Scientists thought that genes stayed in a special order, like beads on a string."

   What does this sentence tell the reader?

   _____

   _____

2. **Read this sentence from the passage, and examine it *in context* on your reading passage.**

   "In her mind, money was the only barrier."

   What was the purpose of including this sentence in the passage?

- O to show that the McClintock family did not have enough money to pay for college
- O to show that Barbara was determined to make more money to support her family
- O to show that Barbara was not worried about the fact that women didn't usually attend college
- O to show that her parents would not support her decision to go to college

3. **Highlight one sentence in the passage that you think <u>best</u> supports the idea that Barbara was treated differently by the scientific community for being a woman.**

4. **What does the word <u>species</u> most likely mean?**

- O babies
- O a kind of corn
- O a group of the same kind of plants or animals
- O scientists who study genes

5. **Why were Barbara McClintock's discoveries so significant?** *Use evidence from the text to support your answer.*

_____

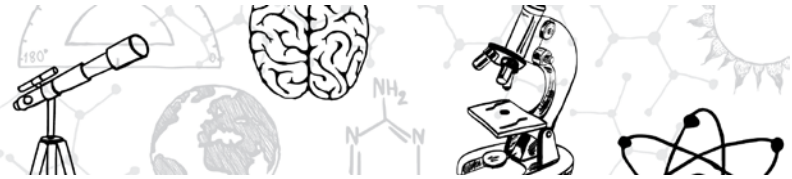
_____

_____

_____

Barbara McClintock

3›2›1 Word Cloud



Name _____ Date _____

➲ **Directions:** Choose 3 words, 2 phrases, and 1 sentence from the text that you think best represent who Barbara McClintock was and what she was all about. Then, share your ideas with your team and combine them to make a "word cloud."

3

WORDS

1. _____

2. _____

3. _____

2

PHRASES

1. _____

2. _____

1

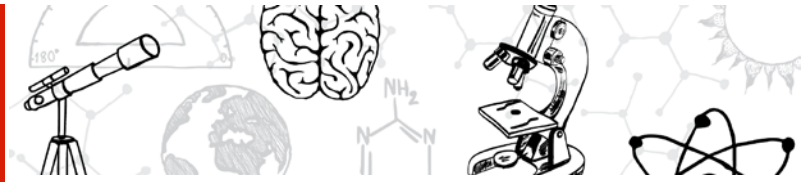
SENTENCE

1. _____

_____

Barbara McClintock

Question Sort



Name

Date

YES
Is it important?

Is it important?
YES

NO
Is it interesting?

YES
Is it interesting?

Is it interesting?
NO

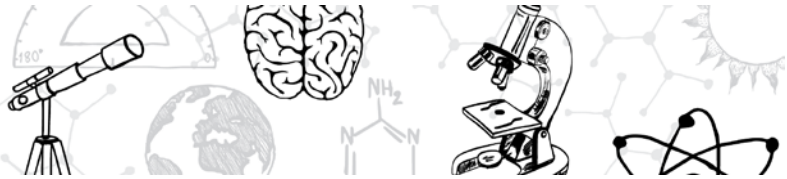
Is it interesting?
YES

NO
Is it important?

Is it important?
NO

Barbara McClintock

Heredity & Inheritance



Name Date

Living things often look and act like their parents. Many of our **traits** are passed down from our parents in **genes**. Genes are tiny parts in our body. They are like little instruction books telling our bodies what each of us will be like.

Animals, including humans, get or **inherit** genes from both of their parents. This is why siblings often share many traits. However, each sibling may get slightly different genes from each parent. They probably are not exactly alike. The differences between siblings are called **variations**. Variations happen within families and within a species.

Plants also inherit genes from their parents. A species of plants can have variation. Not all plants of the same species look exactly the same.

Which sentence best represents the main idea of the text?

- ○ "Many of our traits are passed down from our parents in genes"
- ○ "This is why siblings often share many traits"
- ○ "Variations happen within families and within a species"
- ○ "Not all plants of the same species look exactly the same."

Barbara McClintock

Genetic Variation

Name Date

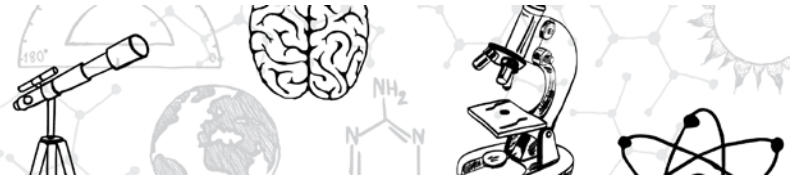
Animals or plants within a **species** have many things in common. Still, they are not all exactly the same. They have differences called **variations**. Some variations happen because **traits** come from both parents. Siblings get **genes** from their mother and father. This causes small variations, even within a family.

Other variations happen more suddenly. Sometimes this is because of **transposons** or "jumping genes." People used to think that genes stayed in a special order. However, in the 1940s, Barbara McClintock discovered that some genes can jump! When they move, they can change make big changes to a plant or animal. These big changes are called **mutations**.

Scientists think that genes jump when there is stress in the environment. Sometimes, this causes a change that helps the plant or animal survive. For example, when trees were covered with dark soot from factories, peppered moths turned black. This helped them blend in with the trees.

When one kind of plant or animal has many of these mutations over time, it can become something completely new. This is called **evolution**. Long ago, jumping genes caused many changes in primates. Some of them evolved into chimpanzees. Others evolved into humans. Our species exists today because of jumping genes. They make up almost half of our **DNA**!

Barbara McClintock
Graphic Organizer



Name Date

Title

Main Ideas

Notes

Barbara McClintock

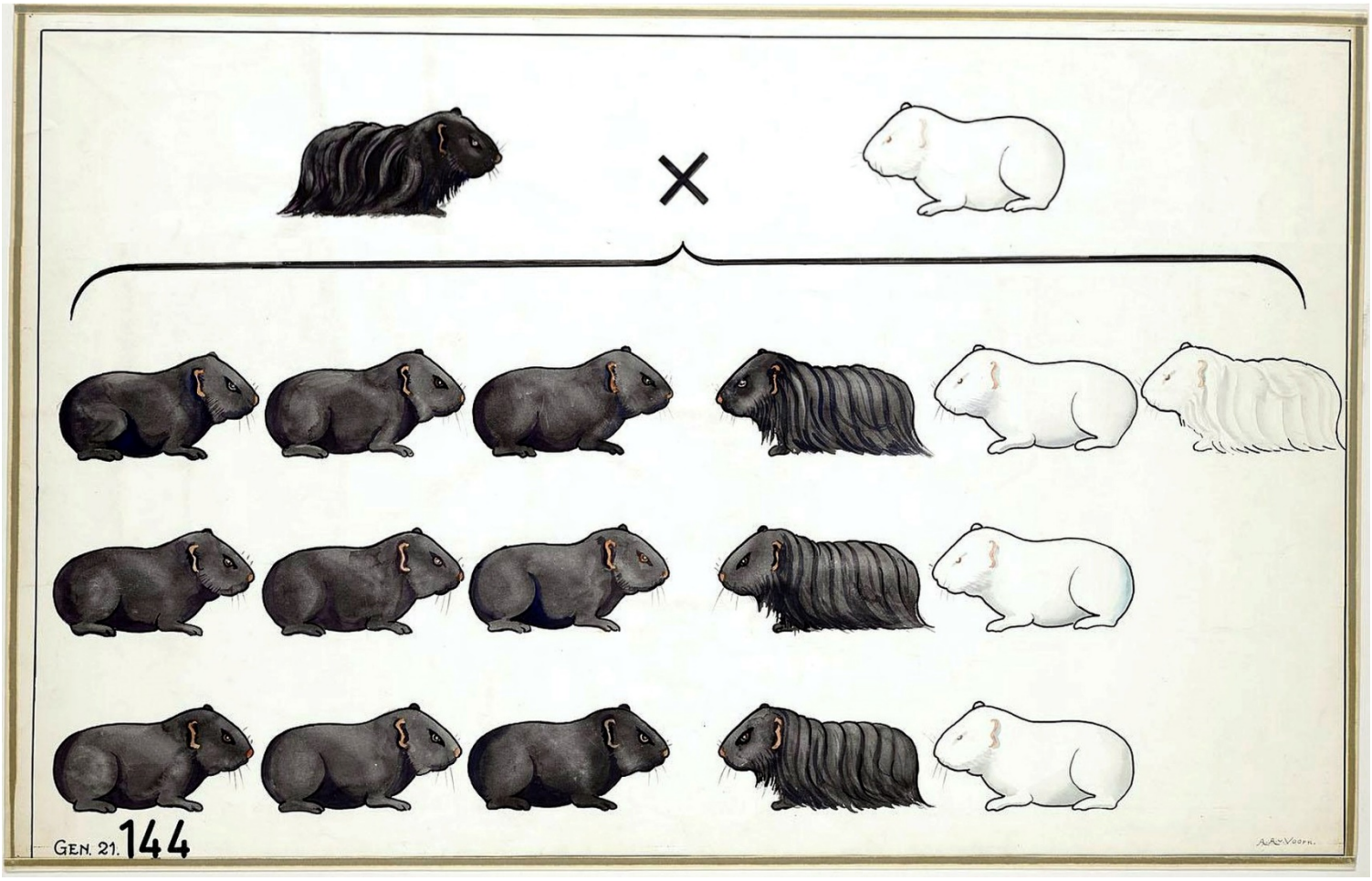
Unit Assessment

Name

Date

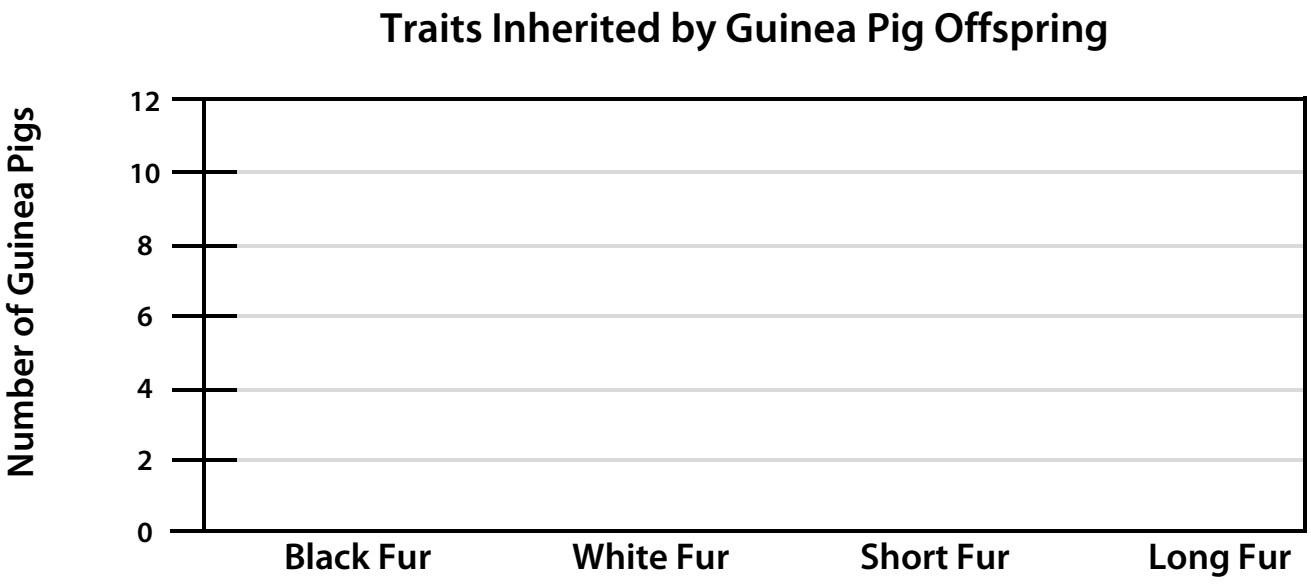
➲ **Directions:** Analyze the diagram below. It shows two guinea pigs and their offspring.

Focus your observations on patterns: what traits make the guinea pigs the same or different from one another? Think about what these patterns show us about genetics and inheritance of traits. Then answer the questions on the next page.



[Image Credit | Public Domain]

➲ **Part A:** Using the information provided in the diagram, create a bar graph that shows the number of *offspring* who inherited each trait.



➲ **Part B:** Which statement is supported by the graph in Part A?

- ○ Guinea Pigs are more likely to inherit white fur than black fur.
- ○ Guinea Pigs are more likely to inherit short fur than long fur.
- ○ Guinea Pigs are equally likely to inherit black or white fur.
- ○ Guinea Pigs are more likely to inherit their father's traits than their mother's.

➲ **Part C:** Read the claims below. Support each claim with evidence from the diagram and graph.

1. **Animals have traits inherited from their parents.**

_____

_____

_____

2. **Variations among traits can exist between offspring of the same parents.**

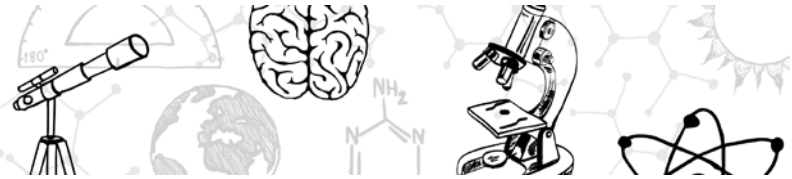
_____

_____

_____

Barbara McClintock

The Great GMO Debate



Name Date

PRO	CON
We should label GMOs because…	*We should <u>not</u> label GMOs because…*