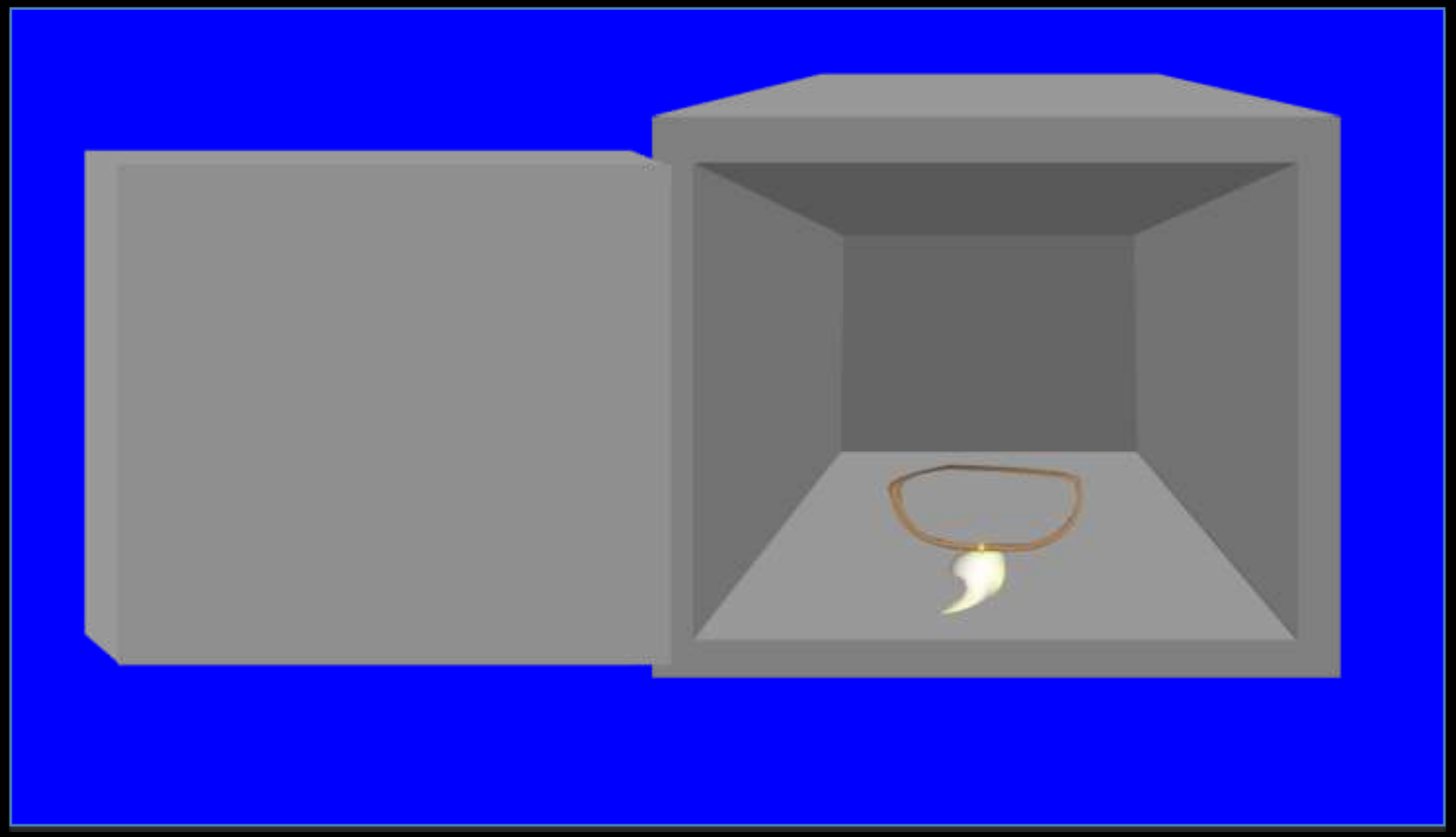
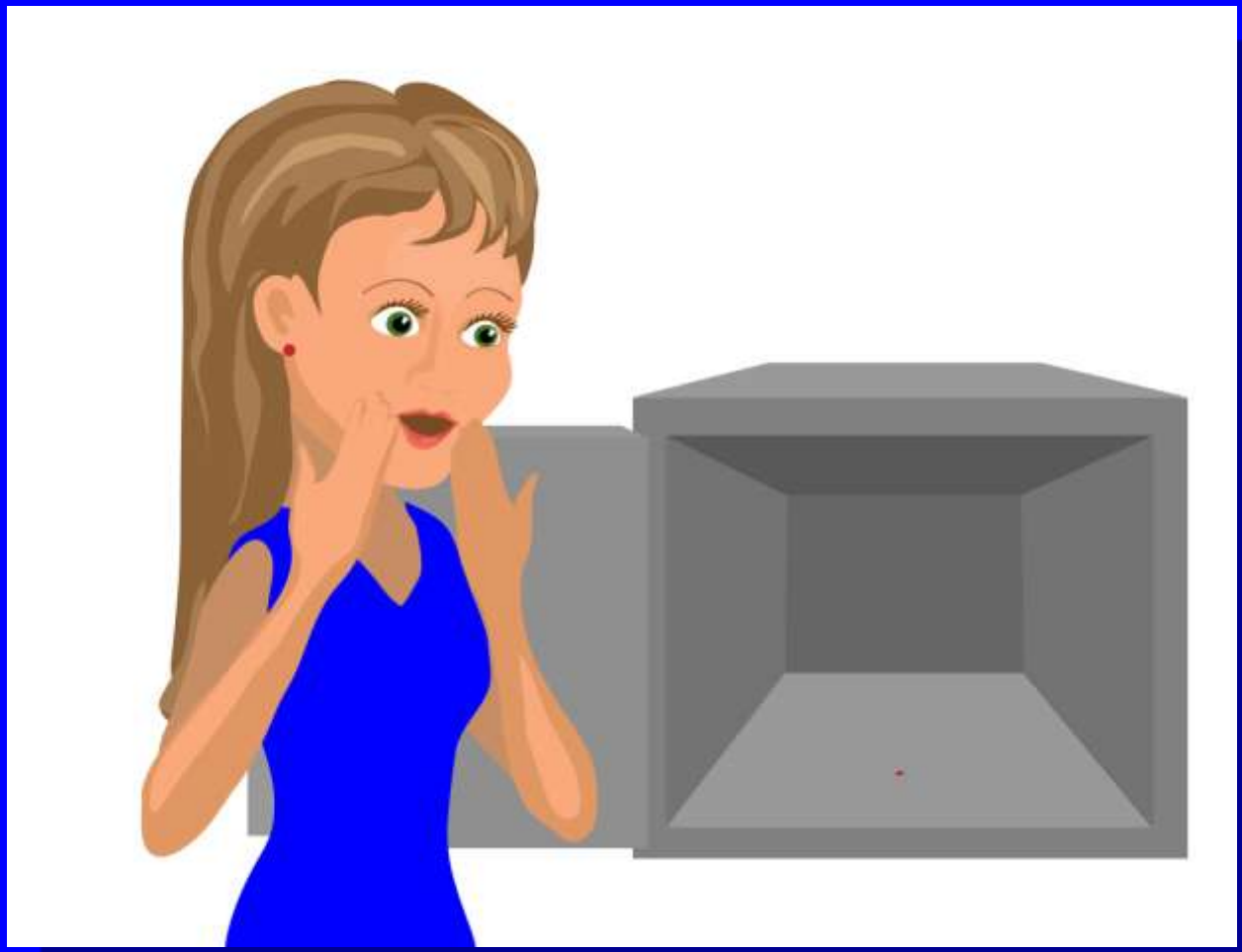
The Case of the Missing Necklace

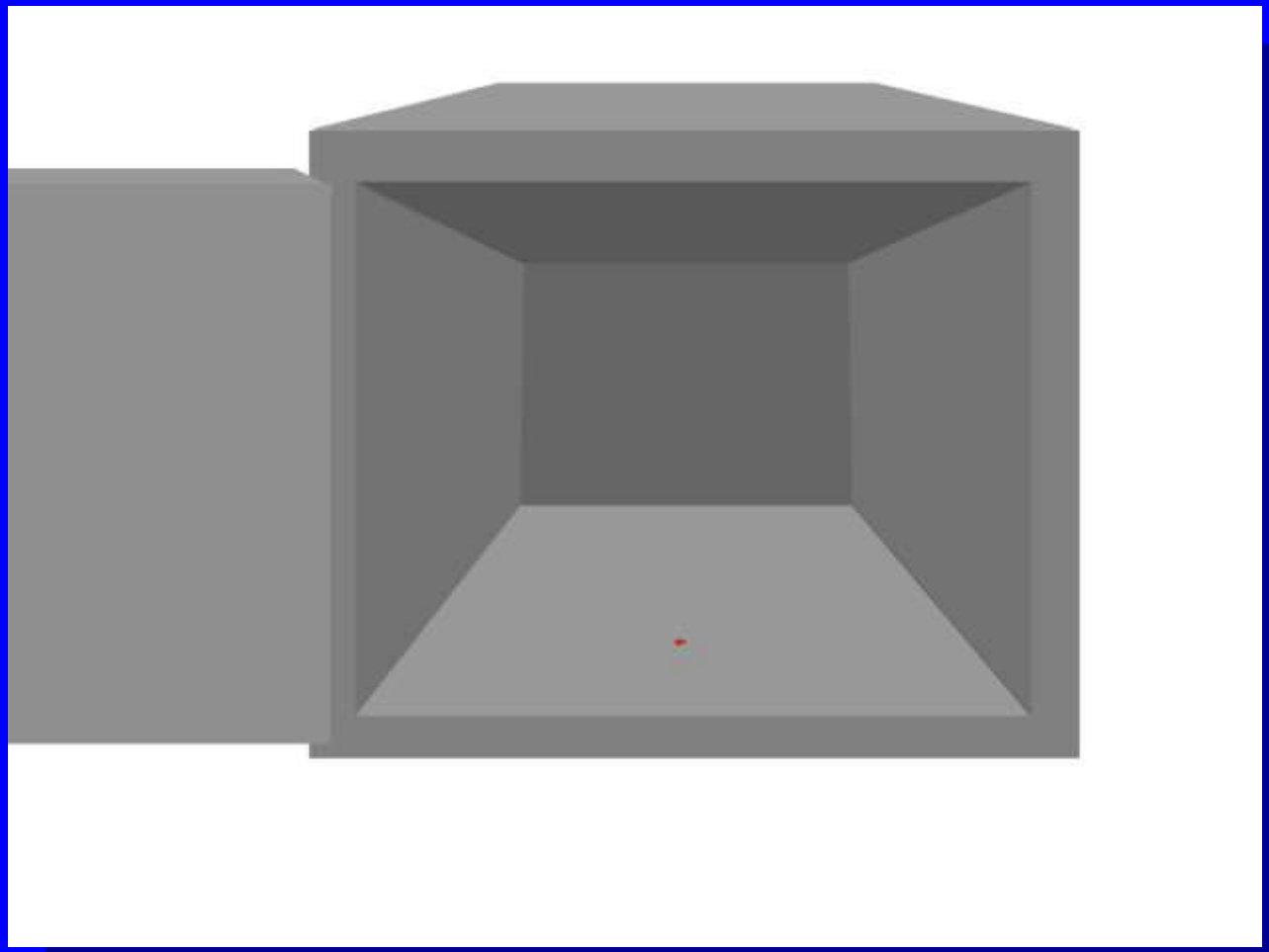
Ania Wieczorek PhD
Biotechnology Outreach Program
College of Tropical Agriculture and Human Resources
University of Hawaii
Illustrated by Gayle Hori
Adapted from *Case of the Crown Jewels*, The MdBioLab

Star starts world tour in Hawaii!





The DNA Evidence

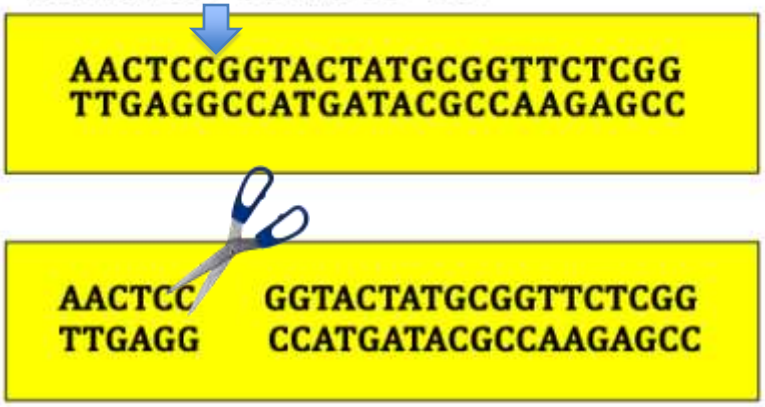


The Suspects

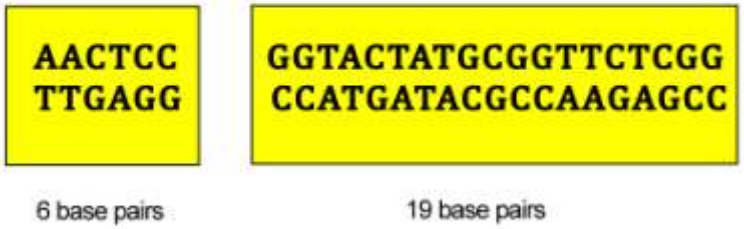
Restriction Enzymes

Example 1

The *HaeIII* enzyme cuts the DNA between CC - GG and GG - CC.

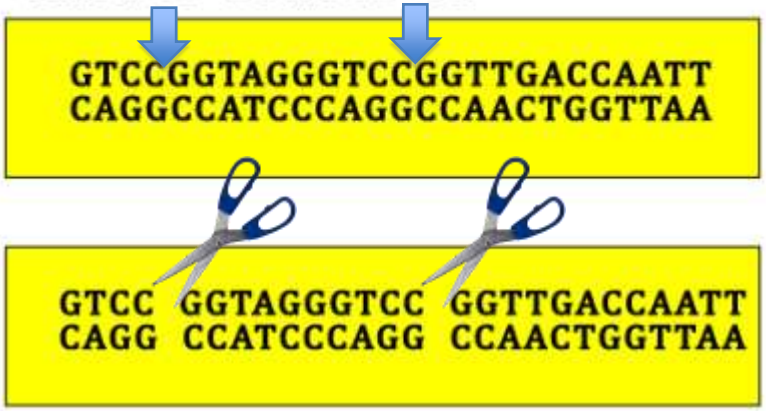


The result is pieces of different lengths.

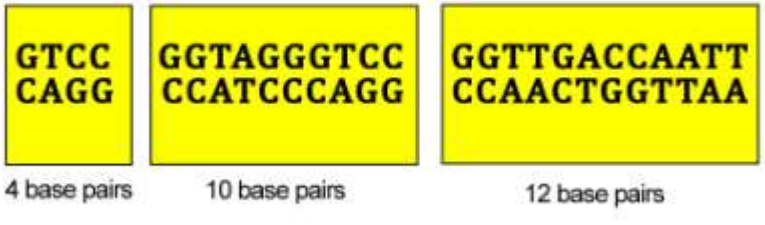


Example 2

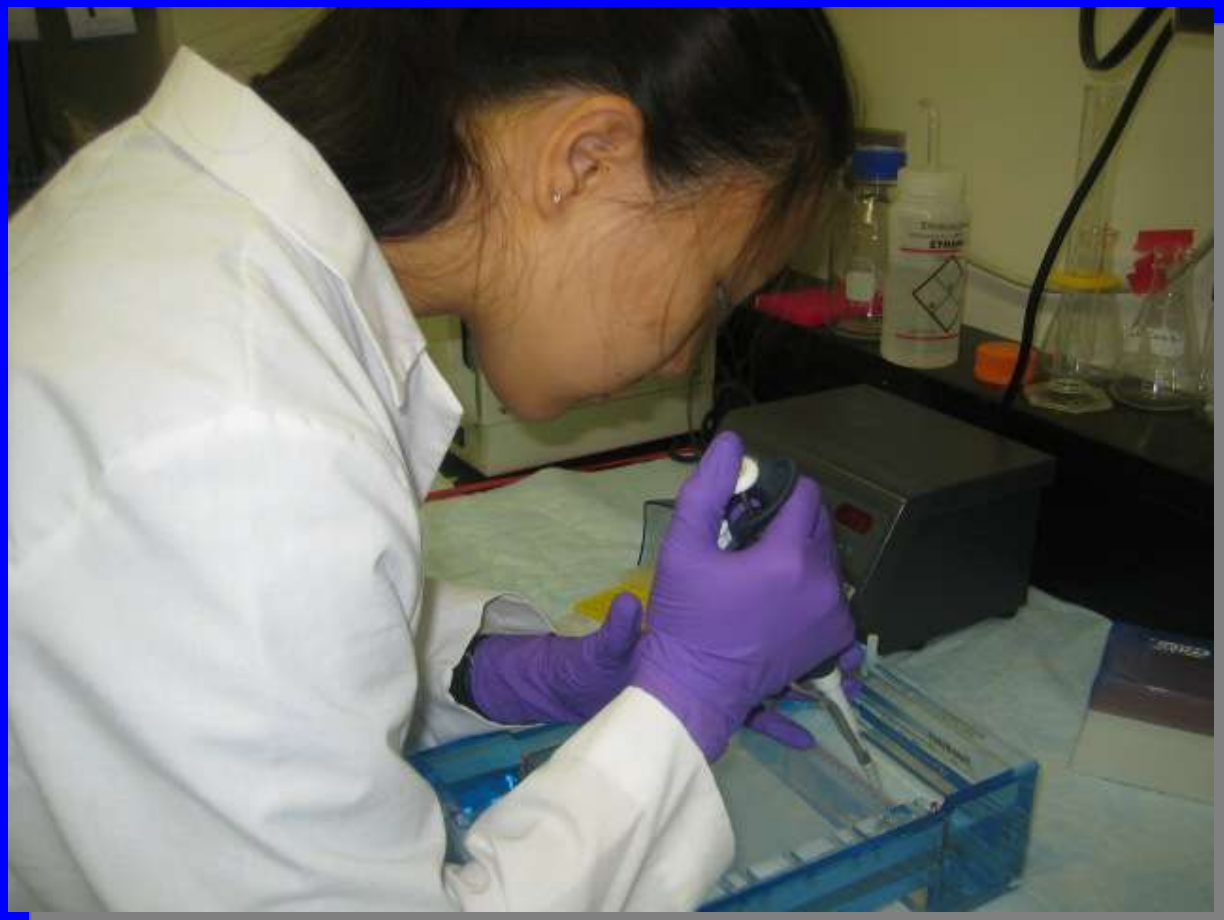
The *HaeIII* enzyme cuts the DNA between CC - GG and GG - CC.

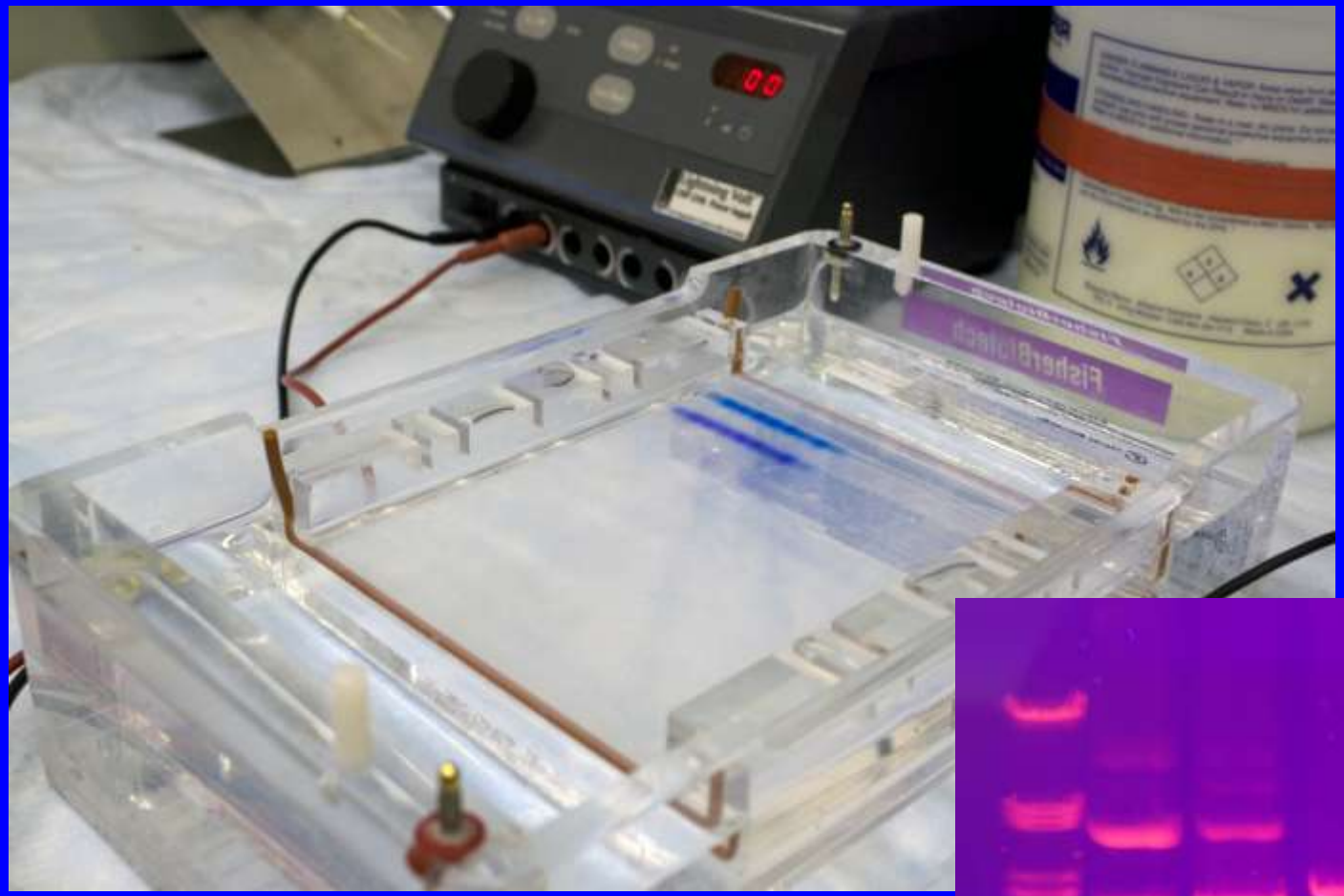


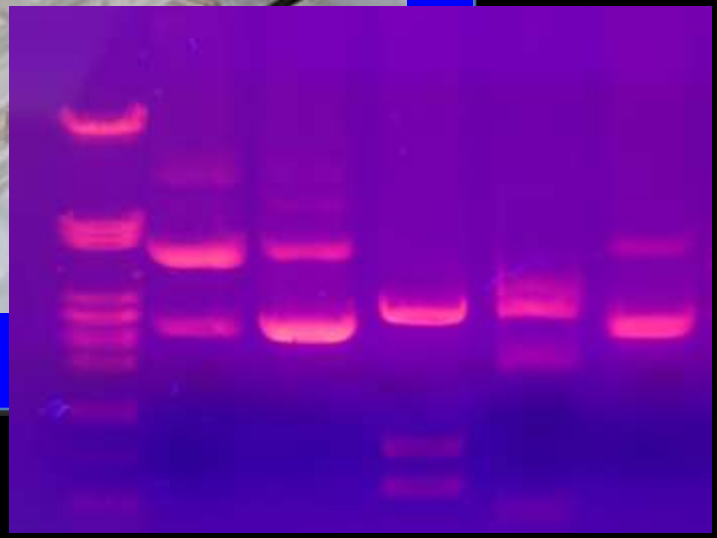
The result is pieces of different lengths.



Gel Electrophoresis

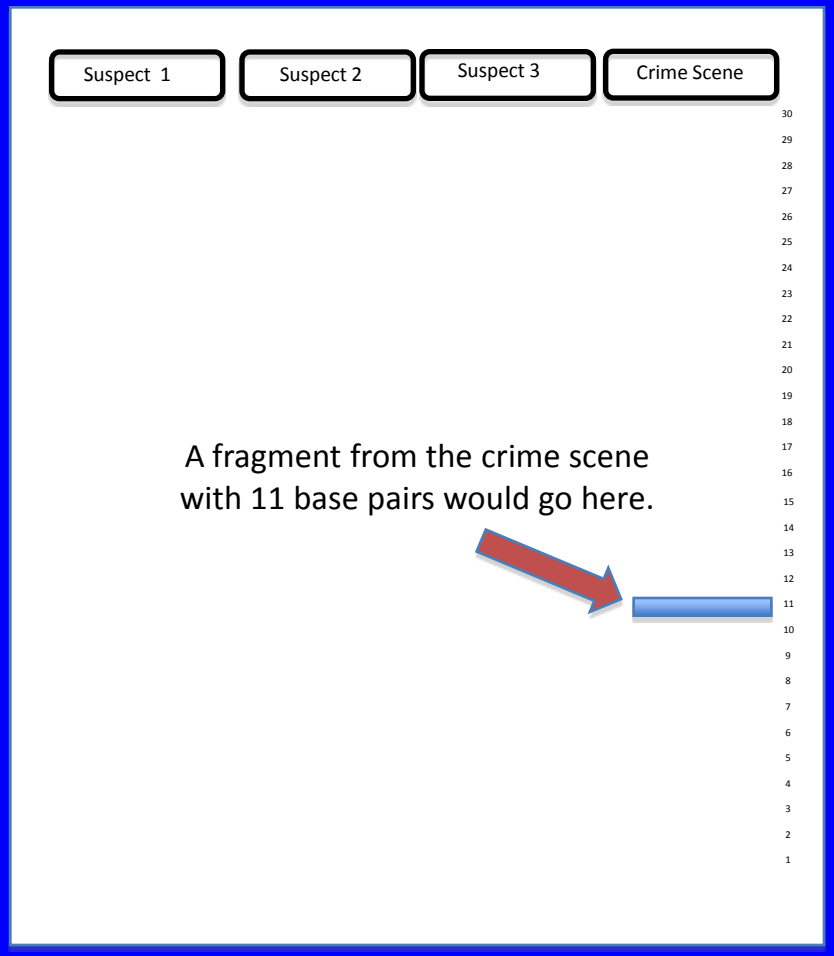






Gel Electrophoresis

You will imitate the use of restriction enzymes and gel electrophoresis to determine if one of the suspects dropped blood at the scene of the crime.You will cut DNA strips and then place them on a chart. Once the strips are placed on the gel electrophoresis chart it will be easy to compare them and determine if the blood drop belongs to one of the suspects.



Instructions

1. Divide into groups of four. Three people will have suspect DNA and one person will have the crime scene DNA. The person with the crime scene DNA will go last. Be careful not to mix your DNA samples.
2. Use your restriction enzyme (scissors) to cut your strip wherever you see the pattern GG – CC. Write the suspect number or crime scene on the back of each fragment. Count the number of base pairs and write the number on the back of each fragment.
3. Tape strips on the electrophoresis chart. Arrange the pieces by size using the guide on the side of the chart. The person with the crime scene sample should go last.
4. Compare patterns. Write your final report.

Questions to Consider

1. Did you have a DNA match?
2. How does DNA evidence influence a juries decision about a case?
3. If you don't find a match does it prove the suspect is innocent?
4. Should they have asked Ima for a DNA sample?
5. Why do they call this DNA fingerprinting?

TEACHER Materials

- Answer key slide 15
- Print slides 15, 17 -20
- Use pages 17-20 to make a chart for each group of students.

SUSPECT 1

ATAGCTCTGGTAGATCGTCCGGGTCGCCGGACCGTGTGACGTCCGGGCTGCTGATCGATGAT
TATCGAGACCATCTAGCAGGCCCAGCGGCCTGGCACACTGCAGGCCCGACGACTAGCTACTA

SUSPECT 2

ATAGCTGATCGAGCCGGCATGTCGAATTGCCGTGTTCCGGTGCCGGCTGCTGATCGATGGTTAT
TATCGACTAGCTCGGCCGTACAGCTTAACGGCACAAGGCCACGGCCGACGACTAGCTACCAATA

SUSPECT 3

ATAGCTGACCGGGTGCATGTGCCGGCAGAATTGCCGTGTGACGACCGGATGTCGATGGCGCAAT
TATCGACTGGCCCACGTACACGGCCGTCTTAACGGCACACTGCTGGCCTACAGCTACCGCGTTA

CRIME SCENE

ATAGCTGATCGAGCCGGCATGTCGAATTGCCGTGTTCCGGTGCCGGCTGCTGATCGATGGTTAT
TATCGACTAGCTCGGCCGTACAGCTTAACGGCACAAGGCCACGGCCGACGACTAGCTACCAATA

Print one page for each group of 4 students using colored paper.
Cut the sections apart and pass one out to each student in the group.
Have them write the suspect or crime scene on each fragment and remind them not to mix pieces.

SUSPECT

ATAGCTCTGGTAGATCGTCC GGGTCGCC GGACCGTGTGACGTCC GGGCTGCTGATCGATGAT

TATCGAGACCATCTAGCAGG CCCAGCGG CCTGGCACACTGCAGG CCCGACGACTAGCTACTA

20 8 16 18

SUSPECT 2

ATAGCTGATCGAGCC GGCATGTCGAATTGCCGTGTTCC GGTGCC GGCTGCTGATCGATGGTTAT

TATCGACTAGCTCGG CCGTACAGCTTAACGGCACAAGG CCACGG CCGACGACTAGCTACCAATA

15 23 6 20

SUSPECT 3

ATAGCTGACC GGGTGCATGTGCC GGCAGAATTGCCGTGTGACGACC GGATGTCGATGGCGCAAT

TATCGACTGG CCCACGTACACGG CCGTCTTAACGGCACACTGCTGG CCTACAGCTACCGCGTTA

10 13 23 18

CRIME SCENE

ATAGCTGATCGAGCC GGCATGTCGAATTGCCGTGTTCC GGTGCC GGCTGCTGATCGATGGTTAT

TATCGACTAGCTCGG CCGTACAGCTTAACGGCACAAGG CCACGG CCGACGACTAGCTACCAATA

15 23 6 20

Suspect 3

Crime Scene

Number of base pairs

30

29

28

27

26

25

24

23

22

21

20

19

18

17

16

Suspect 1

Suspect 2

15

14

13

12

11

10

9

8

7

6

5

4

3

2

1

The Biotechnology Outreach Program of the
College of Tropical Agriculture and Human Resources
University of Hawaii at Manoa
provides educational resources about agricultural biotechnology.
If you would like more information about this program
or if you have feedback on this activity please contact:

Ania Wieczorek, PhD
Department of Tropical Plant and Soil Science
College of Tropical Agriculture and Human Resources
3190 Maile Way, St John 102
Honolulu, Hawaii 96822
808-956-7058
ania@hawaii.edu

This PowerPoint activity was adapted from:
Case of the Crown Jewels by Donald A. DeRosa and B. Leslie Wolfe ☐
http://www.csun.edu/science/biology/genetics/genetics_activity/crown_jewels.pdf