ROBERSON MUSEUM AND SCIENCE CENTER
Pre-Visit Gel Electrophoresis

Grade Level: 9 through Adult
New York State Learning Standards: MST 2, 4, 5 & 7
Pennsylvania Learning Standards: S & T 3.1, 3.2, 3.3, & 3.7

Objectives: Students will read an article published in Discover Magazine June 1988, entitled "DNA Fingerprinting, Witness for the Prosecution." In reading this article, students will gain an understanding of the molecular nature of DNA, how DNA fingerprinting is done, and they will read about how DNA has been used as evidence for the first time in court.

Materials:

- Article Lewis, R. (1988). "DNA Fingerprinting: Witness for the Prosecution." *Discover*. Vol. 9. Issue 6. pp 44-52.
- Worksheet
- Pen or Pencil

Procedure:

1. Have students read article in class and complete worksheet in pairs. Another option is to have students read article for homework and complete worksheet either at home or in class.

2. Review worksheet as a class so that you may go over the more difficult concepts concerning DNA as a molecule (such as: "junk" DNA, the use of restriction enzymes and the concept of DNA fingerprinting.) This will help to prepare them for their experience at Roberson Museum and Science Center when they extract DNA and when they discuss certain aspects of the Anastasia mystery.

Conclusion:

1. Pages that follow are a student worksheet with questions from the article and an answer sheet for the teacher.

Student Worksheet: Pre-Visit Gel Electrophoresis **Name:** _____

Directions: Read the article "DNA Fingerprinting; Witness for the Prosecution" from Discover Magazine June 1988 issue. Then, follow your teachers' directions and answer the questions below.

A. Where and in what criminal case was DNA Fingerprinting first used?

B. For what use was DNA Fingerprinting first developed?

C. What is Life-Codes?

D. Why are long stretches of DNA the same in all people?

E. What is found in the regions of DNA that vary from person to person? Why is this region so important?

F. How did serologists match criminals to a crime scene before the advent of DNA Fingerprinting? How accurate is this method?

G. What are restriction enzymes?

H. What is gel electrophoresis?

I. What does the article compare gel electrophoresis band patterns to?

J. The DNA found at the crime scene and the DNA from suspect Andrews seemed to match. The frequency of this banding pattern is one in 10 billion. What does this mean?

K. What is a Frye Standard?

L. Why did Baird say "I tried to get across to the jury that we didn't need to look at the entire DNA molecule."

M. Why do prosecutors have to convince the judge of a scientific technique's general acceptance before it is admissible in court?

N. Do you agree or disagree with Baird's comment, "If you are a criminal; it's like leaving your name, address, and social security number at the scene of the crime. It's that precise."

Teacher Answer Sheet: Pre-Visit Gel Electrophoresis

A. Where and in what criminal case was DNA Fingerprinting first used?
Great Britain, Colin Pitchfork, Murder/Rape Case

B. For what use was DNA Fingerprinting first developed?
DNA Fingerprinting was first used as a marker to locate genetic diseases

C. What is Life-Codes?
A DNA testing service

D. Why are long stretches of DNA the same in all people?
Because much of our DNA codes for the same thing, such as arms, legs etc.

E. What is found in the regions of DNA that vary from person to person? Why is this region so important?
Short sequences of repetitive DNA (Stutter) that we call "junk" DNA because it does not code for anything that we know of. It is unique to each individual and has a common pattern among family members.

F. How did serologist match criminals to a crime scene before the advent of DNA Fingerprinting? How accurate is this method?
They used blood typing which much less accurate than DNA Fingerprinting.

G. What are restriction enzymes?
These are enzymes that recognize repetitive sequences and cut the DNA at those specific sequences.
We use these enzymes to cut up the DNA into fragments when forming a DNA Fingerprint.
They help to create the banding pattern or bar code that is the DNA Fingerprint.

H. What is gel electrophoresis?
Gel Electrophoresis is a means of separating molecules by electrical charge and by size.

I. What does the article compare gel electrophoresis band patterns to?
It compares them to a bar code one would find on an item in a grocery store.

J. The DNA found at the crime scene and the DNA from suspect Andrews seemed to match. The frequency of this banding pattern is one in 10 billion. What does this mean?

Only one in 10 billion people could have the suspects pattern and there are only 5 billion people on the planet therefore it is likely that he is responsible for the crime.

K. What is a Frye Standard?

This is a standard used to determine if a certain new technology is admissible in court.

L. Why did Baird say "I tried to get across to the jury that we didn't need to look at the entire DNA molecule."

Because most of the DNA codes for the same thing, arms , legs etc…we only need to look at the variable regions (junk) to see the junk DNA.

M. Why do prosecutors have to convince the judge of a scientific technique's general acceptance before it is admissible in court?

This is important because we need to protect individuals against technologies that are not yet proven.

N. Do you agree or disagree with Baird's comment, "If you are a criminal; it's like leaving your name, address, and social security number at the scene of the crime. It's that precise."

AMV

Developed by: Barbara Betza & Article Lewis R. (1988) "DNA Fingerprinting: Witness for The Prosecution." Discover Vol. 9. Issue 6. pp 44-52.

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