PAPER RFLP
ELEPHANT PARAGRAPHS

Paper = DNA
Scissors = Restriction Enzyme
Desktop = Electrophoresis

OBJECTIVES: To help you understand how DNA is analyzed for forensics, diseases, paternity, species comparison, ancient DNA, mutations, and preparing a DNA sequence for recombinant work. Keep in mind, this simulation is meant to give you the basic idea of how fragments of DNA can be separated into pieces and studied.

MATERIALS: A page with two copies of the same (similar) paragraph, scissors and tape (or glue).

GET READY: Isolating your paper DNA

1. Your class is provided with three different paragraphs that represent different DNA samples. Choose one of the three paragraphs. You will notice that you have two copies of the same (similar) paragraph.
2. Using scissors cut the first paragraph into strips (keep the strips in order), and carefully tape the ends together so that it is one long strip. Treat spaces and punctuation in the paragraph as if they are letters too. Make the strip as neat as possible. Now, this paragraph pieced together end-to-end will be used to represent a strand of DNA that might be isolated from a tissue sample.

PART 1

THE RESTRICTION DIGEST: Cut up the DNA into fragments

Endonucleases occur naturally in most bacteria, and act as the bacteria's defense system to "restrict" the growth of invading viruses by breaking apart the virus' DNA. Scientists have learned to isolate these "restriction enzymes" and use them to cut desirable DNA into smaller pieces so that when these pieces are loaded into the well of an agarose gel and electrophoresed, the fragments will move through the gel at different rates, and therefore become separated.

1. The scissors represent the endonuclease. Use them to cut the DNA-paragraph between every "ea" (not "ae").

THE ELECTROPHORESIS: (Separate the fragments by size)

2. Now, turn the sentence fragments over--printed side down-- and arrange them from largest (on your left) to the smallest (on your right).
3. Big fragments can not electrophorese very well—they get "stuck" in the gel, whereas little fragments are able to move great distances. Now, walk around the room, and determine other tabletop "gels" that have the same banding pattern as yours by:
    - Comparing the SIZE of the fragments
    - Comparing the NUMBER of fragments (bands) that show up on the tabletop "gel"

CLASS DISCUSSION: PART 1

4. Was it easier to INCLUDE other groups as matching yours--or was it easier to EXCLUDE groups?

5. Was your banding pattern an EXACT match to another group? What might account for differences?

PART 2

Finding Polymorphisms

1. Now repeat the process with the second paragraph. Prepare it into strips, tape the ends together, and then cut between every "ea" combination. Lay out your fragments on your tabletop, and compare your second banding pattern with your first banding pattern.

CLASS DISCUSSION: PART 2

2. Describe HOW your second banding pattern is different from your first banding pattern.
3. What caused the differences between these two patterns?