Paper = DNA
Scissors = Restriction Enzyme
Desktop = Electrophoresis

NOTE: There are TWO versions of this activity – one where the students write their own sentences (to represent DNA segments) on graph paper, and another where they are given paragraphs about elephants (pages 38-40) to cut into strips. The graph paper version is more direct and takes less time, but the elephant-paragraph version allows for more discussion.

MATERIALS:
Graph paper (1/4 inch, half sheet)
Or
Elephant paragraphs
Scissors
Tape or glue

OBJECTIVES:
- To understand how DNA is analyzed in forensics, diseases, paternity, species comparison, ancient DNA, mutations, and preparing a DNA fragment for recombinant DNA work.
- To understand the basic principle of how endonucleases (restriction enzymes) are used to fragment DNA into smaller pieces.
- To introduce and explain RFLP's—Restriction Fragment Length Polymorphisms, an understanding of which will be critical for the upcoming lab on elephant DNA and ivory.

Getting Started: Students get instruction sheet, paper paragraph or graph paper, scissors, tape and cut out their paragraphs into strips, taping them end-to-end into one long continuous statement.

In **Part 1**, students should find it quite easy to see that they have a different banding pattern because they have a different sentence (DNA) than other students. They should relate this to the concept that different DNA cut with the same enzyme results in different banding patterns.

In **Part 2,** students should notice that their banding pattern has changed because the second sentence is not identical. One sentence has an addition or a deletion of a word, perhaps adding a restriction site or making one band considerably longer, therefore changing the banding pattern.

Be sure to direct the students toward the concept of POLYMORPHISMS:

RFLP'S AND POLYMORPHISMS

RFLP's are "Restriction Fragment Length Polymorphisms"

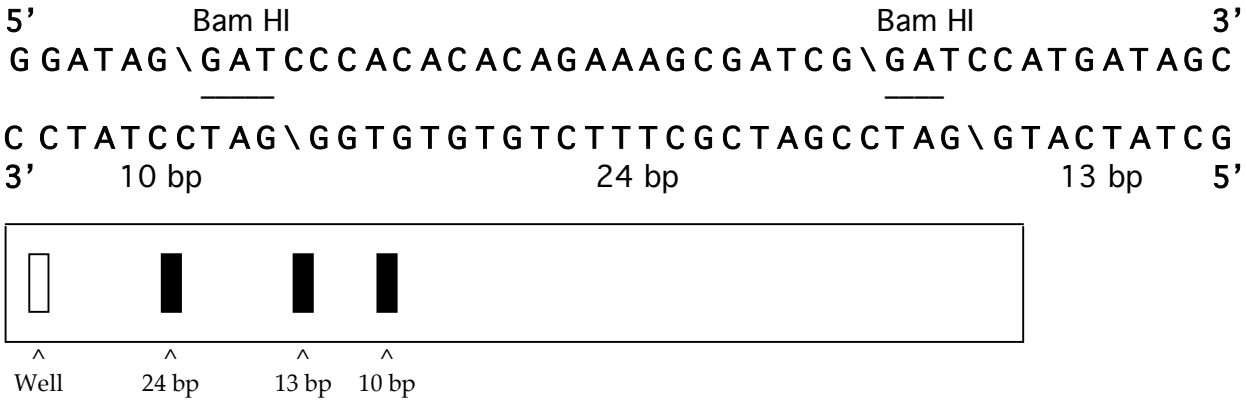
RFLP's are the structural variations in DNA between alleles and can be used as genetic markers to map genes to specific locations on a chromosome, to diagnose disease or as in this simulation of DNA "fingerprinting".

Polymorphisms are differences in a DNA sequence because of mutations (changes such as single base pair changes, deletions, insertions, repetitions and substitutions) in the sequence. Polymorphisms are used by scientists as DNA markers.

When DNA is cut into fragments by restriction enzymes, the polymorphisms will cause the DNA to be cut in different fragments. When the DNA is electrophoresed, there will be new banding pattern. Every living organism (except exact clones/identical twins) has harmless polymorphisms that make their banding pattern unique.

EXAMPLE: RFLP due to an 8bp repetitive DNA insertion

DNA SAMPLE A



DNA SAMPLE B