Cold Spring Harbor Laboratory
DNA Learning Center

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# *Harlem DNA Lab*

## High School Lab Field Trips 2014-2015

### BIOTECHNOLOGY

These experiments, which are required for AP Biology students, introduce key methods for manipulating DNA and transferring genes between living organisms.

**Bacterial Transformation***
Lab time: 2½ hours

This experiment illustrates the direct link between an organism's genetic complement (genotype) and its observable characteristics (phenotype). Students genetically engineer the bacterium *E. coli* to uptake genes for antibiotic resistance and bioluminescence. Following overnight incubation, transformed bacteria are compared to unexposed bacteria for their ability to grow in the presence of ampicillin and fluoresce.

**DNA Restriction Analysis***
Lab time: 3½ hours

This experiment demonstrates that DNA can be precisely manipulated and that it behaves as predicted by the Watson-Crick structure. Students use restriction enzymes to cut DNA and analyze the resulting DNA fragments by agarose gel electrophoresis. Photographs of students' results are posted on the *Harlem DNA Lab* web site.

* *DNA Restriction Analysis* and *Bacterial Transformation* labs are required by the Educational Testing Service as part of the Advanced Placement Biology Curriculum.

### HUMAN DNA VARIATIONS

These experiments allow each student to safely prepare a sample of DNA from their own cheek cells and use polymerase chain reaction (PCR) to analyze different regions of their own DNA.

**Human DNA Fingerprinting:**
**Genotyping a Human "Jumping Gene"+**
Lab time: 4 hours

This experiment detects the presence or absence of a transposon on chromosome 16. Students amplify the polymorphic region from their own DNA, use gel electrophoresis to generate their molecular genotypes and use class data to study population genetics, Hardy-Weinberg equilibrium, and theories of human evolution.

**Human Mitochondrial Sequencing+**
Lab time: 4 hours

This lab examines Single Nucleotide Polymorphisms (SNPs) in the human mitochondrial genome. Students amplify a small region of their own mitochondrial DNA and use the product as a template for DNA cycle sequencing. The students obtain their "finished" sequence and perform computer analysis of the data using the DNALC's online bioinformatics tool Sequence Server.

+ Participation in this laboratory requires a signed consent form (provided by the DNALC) from the parent/guardian of each student younger than 18 years of age, and is only for students in 10th, 11th and 12th grades.

### RESERVATION DETAILS

- Cost is $22 per student per lab; there is a minimum charge of $440 per lab.
- Scholarship funds are available for qualified classes.
- Unless other arrangements have been made in advance, all labs begin promptly at 9:30 AM.
- Before the visit, teachers will receive an information package to help with student preparation.
- Classes cancelled less than one month prior to the scheduled date will not be permitted additional visits.
- **For reservations, please contact: Mary Lamont at (516) 719-1296**