

## High School Field Trip Opportunities

High schools throughout New York City are invited to the *Harlem DNA Lab* for half-day lab field trips. Each lab is inspired by techniques and tools currently in use by research scientists. The experiences embody key concepts and process skills of the New York City *Scope and Sequence for Science*, NY State Science Core Curriculum, and National Science Education Standards, and complement Living Environment and Advanced Placement Biology coursework. Select individual or a series of labs for 10<sup>th</sup>–12<sup>th</sup> grade science classes from the following:

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

### 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.

**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 Mitochondrial Sequencing<sup>+</sup>

Lab time: 3¾ 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*.

### Genotyping a Human "Jumping Gene"<sup>+</sup>

Lab time: 3¾ hours

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

### Forensic DNA Profiling<sup>+</sup>

Lab time: 3¾ hours

This lab examines a highly variable tandem repeat polymorphism, like those examined by the FBI for DNA fingerprinting. Students amplify the polymorphic locus and use a DNA chip to determine their genotype, use population genetics to calculate the frequency of their genotype, and learn how this analysis relates directly to forensic DNA identification.

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

## RESERVATION DETAILS

- Cost is \$20 per student with a minimum charge of \$400 per class. Class size is limited to 32 students. Funds may be available for scholarships.
- Unless other arrangements have been made in advance, all labs begin promptly at 9:30 a.m.
- Before the visit, teachers will receive an information package to help with student preparation.
- To make a reservation, please contact: Mary Lamont at (516) 719-1296.