

*Participate in the Biology Revolution . . .*

### **High School Student Field Trips to *Regeneron DNALC***

The DNA Learning Center (DNALC) is a unique educational resource - the nation's first facility dedicated to improving DNA science education. In our modern teaching laboratories, DNALC staff stress an interactive approach linking the process of discovery to learning. Students perform key techniques used by molecular biologists. The laboratory protocols were developed by the Cold Spring Harbor Laboratory's DNA Literacy Program and have been performed by thousands of teachers and students nationwide.

Four different laboratory experiences will be offered for 2019-20 at *Regeneron DNALC*. **DNA Restriction Analysis** and **Bacterial Transformation** are now required by the Educational Testing Service as part of the Advanced Placement Biology Curriculum. The restriction analysis and transformation labs provide students with an extensive hands-on laboratory experience. The **Human DNA Fingerprinting (Genotyping a "Jumping Gene")**, and **Human Mitochondrial Sequencing** labs will allow students to analyze their own DNA.

#### **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, the scissors of molecular biologists, to cut DNA from the bacteriophage *lambda*. The resulting DNA fragments are analyzed by agarose gel electrophoresis. Photographs of students' results will be posted on the DNALC web site.

#### **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 introduce a gene for antibiotic resistance into the bacterium *E. coli*. Following overnight incubation, transformed bacteria are compared to unexposed bacteria for their ability to grow in the presence of ampicillin.

#### **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 by Polymerase Chain Reaction (PCR) and use the product as a template for DNA Cycle Sequencing. The students obtain their "finished" sequence and perform computer analysis of the data at school using the DNALC's bioinformatics tool "Sequence Server". **\*Participation in this laboratory requires a signed consent form (provided by the DNALC) from the parent/guardian of each student under 18 years of age.**

#### **Human DNA Fingerprinting**

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. **\*Participation in this laboratory requires a signed consent form (provided by the DNALC) from the parent/guardian of each student under 18 years of age.**

#### **RESERVATION DETAILS:**

- **Human DNA Fingerprinting** and **Human Mitochondrial Sequencing** labs are restricted to students in 10<sup>th</sup>, 11<sup>th</sup>, or 12<sup>th</sup> grade.
- The group lab rate is \$25 per student with a minimum fee of \$500 (for 20 students or fewer).
- Unless other arrangements have been made in advance, all labs begin **promptly** at 9:30 AM. Any group that arrives more than 30 minutes late for their scheduled lab will run the risk of forfeiting their reservation.
- Before their visit, teachers may access lab protocols for student preparation through our Lab Center at [labcenter.dnalc.org](http://labcenter.dnalc.org)