

The **DNA Learning Center** (DNALC) is the world's first science center devoted entirely to genetics education. The DNALC is an operating unit of **Cold Spring Harbor Laboratory** (CSHL), a world-renowned research institution that has been home to eight Nobel Prize winners. CSHL is ranked number one in the world by Thomson Reuters for the impact of its research in molecular biology and genetics.



Harlem DNA Lab draws on the DNALC's long experience in translating current biological research into hands-on learning activities and establishing teaching centers worldwide. *Harlem DNA Lab* makes use of instructional methods and technology developed with more than \$26 million in federal and foundation grants. Since its founding in 1988, the DNALC has provided experiments for over 450,000 students from the NY metro area during field trips, in-school instruction, and summer camps. More than 9,000 educators have received intensive training at DNALC workshops conducted in 48 states and several countries.

The 1,200-square-foot *Harlem DNA Lab* occupies a former graphics arts classroom in the John S. Roberts Educational Complex. The state-of-the-art laboratory is equipped with dissecting and compound micropipettes, an autoclave, incubators, centrifuges, micropipettes, electrophoresis apparatuses, and DNA thermal cycler. The laboratory can accommodate up to 32 students for experiments ranging from basic genetics and cell biology to modern DNA manipulation and typing. *Harlem DNA Lab* is directly administered by the DNALC and is staffed by educators and Ph.D. biologists who have been trained to deliver an exceptional learning experience for every visitor.

Where:

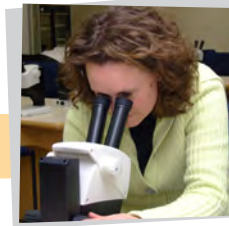
John S. Roberts
Educational Complex
2351 First Avenue at 120th Street
East Harlem, New York 10035
www.dnalc.org/harlemdnalab



What:

Lab field trips for 5th–12th grade students

Professional development for
8th–12th grade science teachers



Who:

To speak with someone about the *Harlem DNA Lab*, please call (516) 367-5170
or email harlemdnalab@cshl.edu

To make a reservation for a high school lab field trip, contact:

Mary Lamont (516) 719-1296

More info on labs:

www.dnalc.org/programs/fieldtrips/

For information about the *Teacher Professional Development Program*:

Amanda McBrien (516) 367-5175

Harlem DNA Lab

on First Avenue at 120th Street

a collaboration of the
New York City
Department of Education
and
Cold Spring Harbor Laboratory
DNA Learning Center

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Howard Hughes Medical Institute
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The Goldman Sachs Foundation

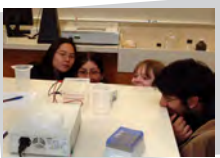
Watch for a new
DNA Center NYC
in Spring 2015

Student Lab Field Trips

Elementary, middle and high school classes throughout New York City (NYC) 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 NYC Scope and Sequence for Science, NY State Science Core Curriculum, National Science Education Standards and Next Generation Science Standards, and complement NYC Scope and Sequence, Living Environment and Advanced Placement Biology coursework.

Laboratory experiences for students in grades 5-8 include a variety of hands-on experiments to introduce basic genetics and molecular biology. Labs include, but are not limited to:

- *DNA Models* (1 hour) Build a model of the double helix to better understand the genetic code.
- *Observing Mutant Organisms* (1 hour) Use stereo microscopes to view mutant flies or worms.
- *DNA Extraction* (1 hour) Isolate DNA from living cells
- *Industrial Enzymology* (1 hour) Use enzymes to make common foods.
- *Glowing Genes* (1 hour) Transform bacteria with a gene from a jellyfish.
- *DNA Fingerprint* (1 hour) Use gel electrophoresis to compare “evidence” DNA to “suspects.”



The high school program includes labs that highlight current biotechnology practices. Select individual or a series of labs for 9th–12th 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* (2½ hours) Students genetically engineer the bacterium *E. coli* to uptake genes for antibiotic resistance and bioluminescence.
- *DNA Restriction Analysis* (3½ hours) Students use restriction enzymes to cut DNA and analyze the resulting DNA fragments by agarose gel electrophoresis.

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.

- *Genotyping a Human “Jumping Gene”* (3¾ hours) Students use a DNA chip to generate their own molecular genotypes and use class data to study population genetics, Hardy-Weinberg equilibrium, and theories of human evolution.
- *Forensic DNA Profiling* (3¾ hours) Students use a DNA chip to investigate a highly polymorphic marker, use population genetics to calculate the frequency of their genotype, and learn how this analysis relates directly to forensic DNA identification.
- *Human Mitochondrial Sequencing* (3¾ hours) Students prepare their own DNA for sequencing at the CSHL Genome Center, then compare their DNA sequences to modern and ancient humans to discover the DNA evidence for human evolution.

Teacher Development in Genetics & Biotechnology

This teacher professional development program is designed to train 5th through 12th grade teachers to implement activities to complement the NYC Scope and Sequence, Living Environment, and AP Biology curricula.

Training (6 hour sessions) during the academic year or summer provides in-depth experience with labs that “target” key topics in genetics and biotechnology. Topics include, but are not limited to:

- Mendelian Genetics
- Mutations and Variability
- DNA Transformation and Protein Isolation
- DNA Structure and Isolation
- DNA Analysis and Forensics
- PCR and Human DNA Variation
- DNA Barcoding

Training will provide conceptual context and connections to NY-based science research, lab planning and preparation, and classroom implementation. An online *Lab Center* accompanies each lab with pre- and post-lab activities, video interviews, and animations. Upon completion of training workshops, teachers are eligible to borrow corresponding equipment footlockers and reagent/supply kits that support each targeted experiment.

