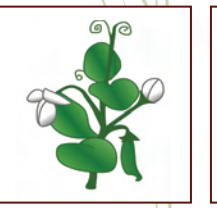
# Annual Report 2007


# Dolan DNA Learning Center

**Dolan DNA Learning Center Expert Advisors and Corporate Support**

We are lucky to have high-level support from two advisory bodies: the DNALC Committee and the Corporate Advisory Board (CAB). The Education Committee formulates policy and assists with strategic planning, whereas the CAB provides a liaison to the Long Island business community. The CAB conducts an annual golf tournament and a fund campaign that are the major sources of unrestricted funds to support the DNALC.

**DNALC Committee**
Chairperson: **Laurie Landeau, V.M.D.**

Marion Wood Ahmed
Lori Bressler
Edward A. Chernoff
Lola N. Grace
Suzanne Kleinknecht
Suzanne Leeds
Lawrence Scherr, M.D.
Arthur M. Spiro
Peter Tilles
Edward Travaglianti
Marianne Dolan Weber

**Corporate Advisory Board**
Chairperson: **Edward A. Chernoff,** Motors & Armatures Inc.
CSHL Trustee Liaison: **Laurie Landeau, V.M.D.**

Michael Aboff, Aboff's Inc.
Paul Amoruso, Oxford & Simpson Realty
Rocco S. Barrese, Dilworth & Barrese
Edward Blaskey, Commerce Bank
Thomas J. Calabrese, Daniel Gale Sothebys International Realty
Richard A. Catalano, KPMG, LLP
Marian Conway, Roslyn Savings Foundation
James Chinitz, Population Diagnostics
Dan Decker, Eppendorf North America
Robert Dickstein, Ph.D., Pall Corporation
David Epstein, Ph.D., OSI Pharmaceuticals, Inc.
Candido E. Fuentes-Felix, M.D., F.A.C.S.
David Garbus, Huntington Business Products Centre
Lawrence Goodman, Curtis, Mallet-Prevost, Colt & Mosle LLP
Mary Jane Helenek, Luitpold Pharmaceuticals
Diana Hoadley, JP Morgan
Arthur D. Herman, Herman Development Corporation
Robert Hoppenstedt, Bethpage Federal Credit Union
Robert Isaksen, Bank of America
Neil M. Kaufman, Davidoff, Malito & Hutcher
John C. Kean III, Kean Development Corporation
Norman Kelker, Enzo Life Sciences
Robert Keller, Keyspan Foundation
Teresa Kemp-Zielenski, United Way of Long Island
Scott Livingston, Axiom Capital, Livingston Group
James E. Mattutat, Ingleside Investors, Inc.
John Passarelli, MD
Patricia Petersen, Daniel Gale Sothebys Real Estate
Frank Posillico, Rose Racanelli Realty/Aireco
Christiaan B. Reynolds
William D. Roche
Charles R. Schueler, Cablevision
Lee Shuett, Nikon Instruments
Kurt Timmel, Marsh USA
Jeffrey K. Tupper, U.S. Trust Company of New York
Robert Van Nostrand, AGI Dermatics
Hans Zobel, Festo Corporation

# DOLAN DNA LEARNING CENTER EXECUTIVE DIRECTOR'S REPORT

*Preparing students and families to thrive in the gene age*


| ADMINISTRATION | INSTRUCTION | BIOMEDIA | TECHNOLOGY DEVELOPMENT |
|---|---|---|---|
| **Mary Lamont** | **Elna Carrasco** | **Steven Blue** | **Cornel Ghiban** |
| **Valerie Meszaros** | **Jennifer Cutillo** | **John Connolly** | **Bruce Nash** |
| **David Micklos** | **Natalia Hanson** | **Eun-Sook Jeong** | **Jermel Watkins** |
| **Karen Orzel** | **Brian Lang** | **Susan Lauter** | |
| **Carolyn Reid** | **Erin McKechnie** | **Chun-hua Yang** | |
| | **Amanda McBrien** | | |
| | **Lauren Weidler** | | |


For practical, philosophical, and political reasons, plant research has lagged behind medically oriented research. Practically, the plant cell presents its own tremendous barrier to research. Although animal cells are surrounded by a single permeable membrane, plant cells also include a tough cell wall. This "wooden box" makes plant cells difficult to genetically engineer. Transformation—the process of inserting a new DNA sequence into a living cell and the constraining point in the genetic engineering of a species—was first accomplished in bacteria in the 1970s and in animal cells in the 1980s. However, plant cells could not be reliably transformed until the 1990s.

Philosophically, humans are naturally self-absorbed with improving the quality and length of their own lives. After World War II, this desire was translated into political will by Vannevar Bush. As director for the Office of Scientific Research and Development (OSRD), he had marshaled the academic research effort in support of the war. In his 1945 report, *Science, The Endless Frontier*, Bush eloquently argued that the federal government should maintain the strong sponsorship of academic research it had established during the war, but to bend it toward fostering improved public health. This led to the rapid expansion of the National Institutes of Health (NIH) and its rise as the preeminent medical research organization in the world. In the 1960s, Mary Lasker joined with Senators J. Lister Hill and John E. Fogarty to raise public and political awareness of cancer, which stimulated the ascension of the National Cancer Institute as the largest of all the national institutes.

Plant research had received early federal support through the system of land grant universities established by Congress in 1862. Now sponsored by the Department of Agriculture, this decentralized research program produced the "green revolution" that dramatically increased crop yields through a combination of improved plant cultivars, petrochemical fertilizers, and mechanization. However, despite the lobbying of congressmen from agricultural states, in the post-war era, the Department of Agriculture's research budget fell far behind NIH's. At $2.3 billion, the Department of Agriculture's 2007 research budget was less than 10% of the NIH's $28.4 billion budget.

In the last 10 years, basic plant research has received a new champion—the National Science Foundation (NSF). Given NIH's public health mandate, NSF has been excluded from funding most human or medically oriented research. Thus, NSF sat on the sidelines during the sequencing of the human genome and important model organisms. However, with the advent of the National Plant Genome Initiative (NPGI) in 1988, NSF rose to fill a vacuum in plant genome sequencing that was not being filled by the Department of Agriculture. NSF became the lead agency in the focused effort to determine the DNA sequences of the grains and other crop plants that feed most of the world's population—with the hope that insights into plant genomes would fuel a second green revolution, allowing us to feed the ten billion people expected to occupy the planet by 2050. During the last decade, NPGI provided $780 million in research funding, culminating in a $29.5 million NSF project to sequence the maize (corn) genome.

### *iPlant Consortium*

With the maize genome sequence imminent, NSF announced in 2007 a $50 million grant competition to establish a cyberinfrastructure to integrate genome data with insights across many disciplines of plant research. The DNALC was fortunate to have been included in the *iPlant Consortium*, headed by the University of Arizona, which won this five-year award. Through a series of symposia and workshops, the *iPlant Consortium* will engage the research community to identify a number of "grand challenges" whose resolution will include input from scientists working at all levels of plant function and organization: molecular biology, genetics, genomics, biochemistry, cell biology, physiology, plant breeding, systematics, ecology, and evolutionary biology. Each *Grand Challenge* Team will then work with computer scientists at the University of Arizona and Cold Spring Harbor Laboratory to develop a "discovery environment" that will provide bioinformatics and database tools to integrate findings across disciplines. As a member of the Education, Outreach, and Training (EOT) Component, the DNALC will work with the project team to embed outreach materials within the *iPlant* portal, thus tightly linking plant research and education.

The DNALC will receive $2.1 million to develop an educational gateway at the *iPlant* portal and work with the *Grand Challenge* Teams to develop educational interfaces to the *Discovery Environments*. Our objective is to get tools and data sets into the hands of high school and college faculty who are "gatekeepers" at the cusp of research and science education. We will extract elements from the *Discovery Environments* and package them with example data in intuitive, visually appealing interfaces. The objective is to engage novices and allow them to quickly learn the rudiments of integrative analysis and then generalize these skills to gain insight into biological concepts. Whenever possible, each tool will be packaged in an attractive "skin" and take on the properties of a stand-alone, desktop object.

During years 2–5 of the grant, we will conduct a nationwide program of 1.5-day workshops to train 1000 science teachers on how to use the *iPlant* tools for student projects that support integrative and computational thinking. The workshops will target faculty in the "2+2+2" continuum of advanced high school, two-year college, and four-year college. These biologists will need a basic understanding of how to use the *Discovery Environments* and educational interfaces to apply to their own research and to use with classes they teach.

## Continuing Plant Research Collaborations

Plant biologists are now in transition from an era when their experiments were limited by the time required to collect new data to a new age when there is literally too much new data to effectively analyze. Faced with exponentially accumulating data from genome sequencing projects, plant scientists rely heavily on computers to search for genes and other functional components of chromosomes. The *iPlant* award marked the culmination of the DNALC's continuing effort to train teachers on how to access this sort of genome data and to analyze it with the same tools used by research biologists.

In 2007 we thus continued several collaborations with researchers to provide high school and college faculty access to the new world of plant genomics. We worked with CSHL researchers Lincoln Stein and Doreen Ware on their NSF-funded *Gramene* project, which provides informatics tools for analyzing and comparing grain genomes. Our companion Internet site, *Dynamic Gene* (www.dynamicgene.org), provides background information on gene analysis and bioinformatics tools that enable students to analyze genes from the newly sequenced rice genome. Because many of these genes have only been predicted using computer algorithms, students may well be the first "scientists" to examine many of these genes in detail.

Animated tutorials in the *Meaning, Structure*, and *Evidence* sections of the site explain how DNA sequence encodes information, how computers identify patterns that predict gene structures, and how experimental evidence complements computer predictions to correctly identify genes. The *Annotation* section provides detailed instructions on how to analyze a predicted gene with *Apollo*, research software developed to analyze the *Drosophila* genome. The *Projects* section allows students to download fragments of the rice genome, annotate predicted genes, and upload their results to compare with classmates or share with researchers. During the year, Faculty Fellows Bob Wheeler (Pine Creek High School, Colorado Springs, Colorado) and Debra Burhans (Canisius College, Buffalo, New York) contributed many improvements to the site, including narrated tutorials and animations on experimental evidence used to confirm computer predictions.

We continued our collaboration with CSHL researchers Dick McCombie and Marja Timmermans, and Mike Scanlon at Cornell University to encourage underrepresented minorities to teach and study plant genomics. In past summers, six Faculty Fellows have spent two weeks working in plant genome labs at CSHL or Cornell and one week working with us at the DNALC. In 2007, we collaborated with Faculty Fellows Gokhan Hacisalihoglu and Diomede Buzingo to conduct teacher training at their home institutions—Florida Agricultural & Mechanical University (Tallahassee) and Langston University (Oklahoma). These three-day workshops presented a lab and Internet-based curriculum on modern plant research to mixed groups of high school and college faculty. Fellows Olga Kopp, Mary Smith, Muhammad Mian, and Javier Gonzalez also hosted 1.5-day follow-up workshops at their institutions: Utah Valley State College (Orem, Utah), North Carolina Agricultural & Technical State University (Greensboro, North Carolina), Rust College (Holly Springs, Mississippi), and Texas Agricultural & Mechanical University (Weslaco, Texas). Building on previous workshops conducted at each site, the follow-ups introduced teachers to mobile "footlockers" that include PCR (polymerase chain reaction) and electrophoresis equipment needed to conduct experiments that test for GM foods and to analyze transposon polymorphisms in maize and *Arabidopsis*. Workshop participants can borrow the equipment footlockers from host institutions for use in their classes, removing a major barrier to the implementation of modern experiments in plant molecular genetics.

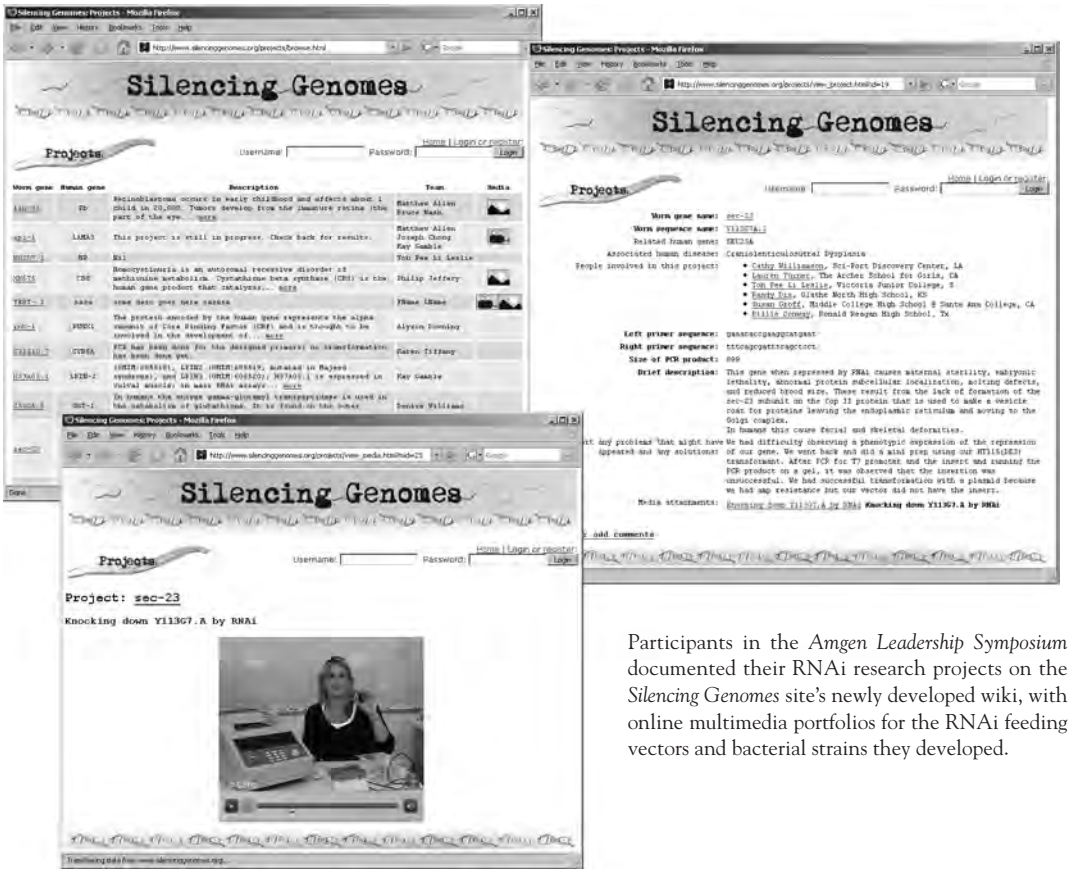
**Record Year for New Grants**

The educational grant programs to which the DNALC applies are suffering from the same low funding rates as research programs. Evidence of the dire straights at the NSF: there are no longer any distinct programs to provide in-service training for science teachers. These programs had, since the 1950s, provided summer institutes that kept science teachers up-to-date and were a major source of funding for our own training activities. Despite this extremely difficult funding situation, we obtained three new teacher-training grants. Along with the *iPlant* award, these grants brought to $3.67 million the total of new federal and foundation grants received—our largest one-year total since opening in 1988.

***NSF Course, Curriculum, and Laboratory Improvement Program: Phase II Project*** *($444,134 over 2 years)*. Today's biology students will face the future challenge of unraveling the biological meaning of the millions of genome sequences that are rapidly accumulating in DNA databases. RNA interference (RNAi) provides a powerful tool to move directly from DNA sequence to the analysis of gene function in living organisms. During Phase I of this project, we developed an experiment- and bioinformatics-based curriculum, *Silencing Genomes*, that explores RNAi in the model eukaryotic organism, *Caenorhabditis elegans*. The curriculum begins with observation of mutant phenotypes and basic worm "husbandry" and then progresses to simple methods to induce RNAi and use RNAi to rescue (compensate) a mutant phenotype. A more advanced experiment uses "single-worm PCR" to examine the mechanism of RNAi, comparing the DNA of worms with identical phenotypes induced by either RNAi or a gene mutation. The curriculum culminates with open-ended methods that support student projects. Students can perform RNAi "from scratch" using bioinformatics to identify a target gene and develop their own RNAi reagents. Students also have free access to the DNALC's collection of RNAi feeding strains, which can be used to screen for genes involved in a particular biological pathway.

An online lab notebook *Silencing Genomes* (www.silencinggenomes.org) combines lab methods with user-friendly features adapted from the DNALC's popular text *DNA Science*, including flow charts, reagent recipes, and extensive instructor information. Supporting resources include photos and video of *Caenorhabditis elegans* mutants, as well as a simple checkout system to obtain any of 80 *C. elegans* mutants and *Escherichia coli* feeding strains. The site also provides a launch pad for bioinformatics exercises that accompany each experiment. This is, to our knowledge, the first integrated set of RNAi experiments specifically designed for the teaching laboratory, and the completion of the Phase I project coincided with the awarding of a 2006 Nobel Prize for the discovery of RNAi.

The Phase II project will introduce the *Silencing Genomes* curriculum to 208 college teachers at week-long workshops conducted at eight sites nationwide. At least half of the workshops will be conducted at historically Black or Hispanic institutions, which will triple participation by underrepresented minorities. In a unique capacity-building effort, workshop participants will collaborate to develop targeting vectors to silence approx-




Participants in the *Amgen Leadership Symposium* documented their RNAi research projects on the *Silencing Genomes* site's newly developed wiki, with online multimedia portfolios for the RNAi feeding vectors and bacterial strains they developed.

imately 100 *C. elegans* genes, which will be freely available to students and teachers. During a 1.5-day follow-up workshop, participants will test their feeding vectors and develop online multimedia portfolios, including videos, a notes-enabled *Wiki* report, and a simple bulletin board. Thus, each vector will include its own evolving record of how it has been developed and used by a community of committed "experts."

***NIH Science Education Partnership Award: Phase II Project*** *($377,644 over 2 years)*. With Phase I funding, we developed *Inside Cancer* (www.insidecancer.org), a multimedia Internet resource for understanding the molecular genetic basis of cancer. On a biological level, the site takes students inside the cell to explore the molecular and genetic roots of cancer. On a sociological level, it provides the insider's perspective of the world of cancer research. One objective is to help students understand how modern concepts from molecular and cellular genetics are being integrated into ideas about cancer diagnosis, prevention, and treatment. Another objective is to allow students to learn modern biology in the same way as basic cancer researchers—by meeting scientists, seeing how experiments are done, and visualizing the unseen world of genes and molecules.

The Phase II project will focus on disseminating the *Inside Cancer* site to precollege teachers and evaluating its educational effects. During the term of the grant, 800 secondary biology and health teachers will receive intensive training at one-day workshops held at 20 sites nationwide. The workshops will be conducted in conjunction with teacher professional meetings and science outreach programs at universities and historically Black and Hispanic institutions. Forty workshop participants will receive fellowships to conduct second-round training to reach an additional 640 teachers. Participants' teaching behaviors will be monitored over time, and a controlled study will compare attitudinal and learning effects among 280 high school students. We will also develop an online *Teacher Center* with links to teaching standards, tools to build custom multimedia presentations, and an exchange for collaboratively generated lesson plans.

***Howard Hughes Medical Institute (HHMI) Initiative for Biomedical Research Institutions*** *($746,243 over 5 years)*. This professional development program is a collaboration with the New York City Department of Education (DOE) to develop a strong base of teachers who can competently introduce six "targeted" experiments in genetics and biotechnology at identified points in required science courses. The program focuses on the 8th and 9th grade levels, where all students receive their first, and often last, exposure to genetics and biotechnology. During the course of the grant, 820 teachers will receive four days of training, which will certify them to implement the target labs. Embedded within the school year, the certificate training will allow educators to readily implement their new knowledge and abilities. Two weeks of leadership training conducted during the summer will then allow 160 teachers to extend their expertise, develop student research capabilities, and formulate biology electives. An equipment footlocker and reagent kit administered by the DNALC will also support each targeted lab.

The project will be unique in the extent to which student and purpose-built computer tools and multimedia items will support teacher learning. A mini-Internet site, or *Lab Center*, will accompany each targeted laboratory and will include (1) a video introduction to the experiment, (2) interactive and PDF versions of the experiment, (3) follow-up activities, (4) science stories that relate the experiment to local research, (5) scientist interviews, (6) animations, and (7) selected links. Registered teachers will be able to customize the *Lab Center* to include class name, selected links, bulletin board for class announcements, and lab results. An editor will allow teachers to select from more than 3000 multimedia items and include them in windows within the *Lab Center*. Each customized *Lab Center* will be stored on the DNALC server and accessed by students using a unique address associated with the teacher's profile. We will increase the local appropriateness of instruction by linking each lab to NY "science stories," a series of minidocumentaries about the past or current work of notable researchers from CSHL, The Rockefeller University, Columbia University, American Museum of Natural History, Cornell University, and other New York institutions.

***Harlem DNA Lab***

The HHMI was a substantial step toward the fruition of our dream of a DNALC facility to serve the students and teachers of New York City. Since its founding in 1988, the DNALC has provided hands-on experiments for a third of a million students from the New York Metropolitan area during half-day field trips, in-school instruction, and week-long DNA camps. The natural clientele for this enrichment has been students who attend schools within a 40-minute commute of Cold Spring Harbor. In 2002, we partnered with the North Shore–Long Island Jewish Health System to open a satellite facility, DNALC *West*, in Lake Success. However, because of rules that restrict New York City school buses from traveling outside the city, the DNALC's local programs have primarily benefited the relatively affluent school systems of Nassau and Suffolk Counties.

In July 2006, we received a $50,000 planning grant from the Goldman Sachs Foundation to develop support for a satellite center to extend the DNALC's expertise in genetics instruction to the students and teachers of New York City. As part of the HHMI proposal, New York City Schools Chancellor Joel Klein provided us exclusive use of a 1200-square-foot classroom in the John S. Roberts Educational Complex (MS45) in East Harlem in which to provide teacher training. By year's end, this space had been renovated identically to our facility in Cold Spring Harbor, including our signature student lab desks, and opened on schedule in early spring 2008.

Because the HHMI teacher-training program will occupy only about 20% of the lab's capacity, the facility will support a broader program of science enrichment to New York City students. *Harlem DNA Lab* will serve approximately 4000 6th to 12th grade students per year, offering them access to accelerated lab experiences that heretofore have been primarily offered to students from Long Island. The Jerome L. Greene Foundation provided $100,000 for equipment for experiments ranging from basic genetics and cell microscopy to modern DNA manipulation and forensic biology. State-of-the art gene chip readers and DNA sequencers will help us begin to fulfill our vision of enabling every New York City student to see their own DNA before they graduate from high school.

During the academic year, each John S. Roberts student will participate in three to four genetics laboratories at the facility, and students from schools throughout New York City will visit the facility for half-day "lab field trips." During the summer, week-long camps will provide intensive enrichment for top students citywide. (The

The *Harlem DNA Lab* logo is used on brochures, letterhead, and the *Harlem DNA Lab* Internet site (www.dnalc.org/harlemdnalab/).

DNALC has applied for funding from the New York State Excelsior Scholars Program to support four weeks of instruction for middle school students in summer 2008.) A cadre of student interns will provide lab support and conduct independent research projects that will allow them to compete in state and national science competitions—and seamlessly transition to research projects at local universities and research institutions.

All activities are sequenced, so that a student can grow academically and be tracked through multiple experiences over a period of years. The experiments embody key concepts and process skills of the New York City *Scope and Sequence for Science*, the New York State *Science Core Curriculum*, and the *National Science Education Standards*. The lab program is also in syncs with New York City's strong existing base of biological and clinical research and the emerging biotechnology industry that will be supported at the new East River Science Park.

*Harlem DNA Lab* will make cost-effective use of instructional technology and methods developed with more than $26 million in federal and foundation grants. The venture will also draw on our experience in establishing teaching centers worldwide. Like DNALC *West*, the *Harlem DNA Lab* will be a satellite—directly administered by the DNALC and staffed by DNALC personnel. In this way, we can control the quality of instruction and offer New York City students an experience that is identical to that received by their Long Island peers.


Renovations to the former graphics lab in J.S. Roberts Junior High School were near completion in early December.

*Harlem DNA Lab* can provide a reproducible model for how science institutions can interact with large school systems to help transform science education for urban students. We also hope that it will establish our presence in Manhattan and provide a springboard for the establishment of a stand-alone facility equal in size to the Dolan DNALC (10,000 square feet).

**Supporting Real Forensic Biology**

In the mid-1980s, British researcher Sir Alec Jeffreys coined the term "DNA fingerprinting" and was the first to use DNA variations (polymorphisms) in human paternity, immigration, and murder cases. Jeffreys discovered a class of repeat polymorphisms, termed VNTRs (variable number of tandem repeats), in which a DNA sequence is repeated end-on-end. Like boxcars in a train, different numbers of DNA repeats create alleles that differ in length. The alleles inherited from mother and father can be separated by electrophoresis, and the specific combination is "scored" as a genotype.

In the late 1980s, the DNALC worked in parallel to researchers as they developed a PCR-based assay for human VNTRs called D1S80. Although D1S80 became the first amplified polymorphism used in forensic biology—and was part of the evidence in the O.J. Simpson murder case—the DNALC abandoned this experiment because the different alleles proved to be impossible to distinguish using simple gel electrophoresis. In the meantime, human forensic analysis moved on to STRs (short tandem repeats), which are detected on a DNA sequencer.

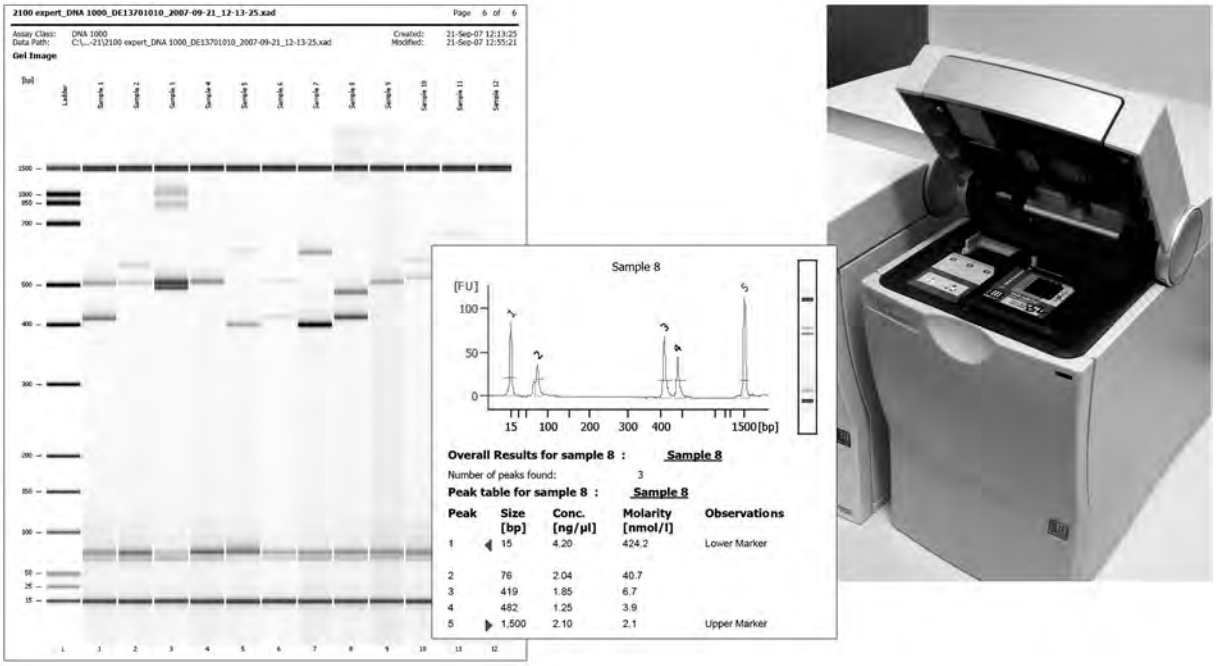
With the current rage over forensic biology, caused primarily by the television show *Crime Scene Investigation* (*CSI*), we decided to revive D1S80 analysis for student field trips. This required entirely revamping the way in which we analyze student DNA. First, we developed a fast PCR protocol that uses a two-temperature profile to cut cycling time in half—to just 30 minutes. Second, we shifted electrophoresis to an Agilent microfluidics chip that separates D1S80 alleles in two minutes per sample. Amplified DNA fragments pass through microfluidic channels and each digital output displays the concentration and size of each allele. A set of 12 samples is entirely analyzed in 30 minutes, including generating a PDF genotype report for each student. The electropherogram result is identical to a single channel of the CODIS panel used in criminal investigations.

As a result, students can have a complete experience in forensic DNA analysis—from introduction, to buccal DNA isolation, to PCR amplification, to electrophoretic analysis, to analysis of electropherograms and population genetics—in a single 3.5-hour lab session. D1S80 forensic analysis will be routinely available in 2008 for classes visiting the Dolan DNALC and *Harlem DNA Lab*. We believe that we will be first group worldwide to make this sort of automated DNA analysis available to large numbers of precollege students.

This state-of-the-art technology was made possible through two important donations. Leo Brizuela, Director of Biology at Agilent Technologies and a former CSHL employee, arranged the donation of a Bioanalyzer valued at $16,280. Tom White, Chief Scientific Officer of Celera, arranged the donation of a super-fast Veriti thermal cycler, valued at $7,995, from Applied Biosystems. Dr. White was an early supporter of our work to popularize PCR, helping us to obtain an educational license and donating several of our first PCR machines in the early 1990s.

During the year, we also continued to support a second forensic DNA experiment by providing free sequencing of student DNA samples submitted by biology classes worldwide. This project analyzes the DNA found in the cell's energy-producing organelle, the mitochondrion (mt). With thousands of copies of the mt chromosome per cell, as opposed to two copies of nuclear chromosomes, mt DNA is abundant in tissue samples. Thus, mt DNA is the DNA of last resort in forensic cases where tissue remains are very old or degraded. Forensic analysis usually focuses on the noncoding "control" region of the mt chromosome that rapidly accumulates mutations and, thus, is highly variable between people. This is the same DNA analyzed by National Geographic's *Genographic Project* and described in the popular book *The Seven Daughters of Eve*. Notably, mt DNA was used to identify the remains of the Romanov royal family and to determine the relationship of Neandertal fossils to modern humans.

Using DNALC protocols or ready-to-use kits available from several science suppliers, students use PCR to amplify a 440-nucleotide sequence of their mt control region and send their amplified samples to the DNALC via overnight mail. The student samples are prepared for sequencing by college interns Alina Duvall (Hofstra University) and Jennifer Aiello (Long Island University at C.W. Post). The samples are then sent to the CSHL




*CSI-DNALC:* Using the new Bioanalyzers, gel images and electropherogram results are available to each student.

sequencing center in Woodbury, where they are processed on an Applied Biosystems 3730xi Genetic Analyzer. The finished sequences are uploaded to a student DNA database at the DNALC's *BioServers* Internet site (www.bioservers.org). The *Sequence Server* site provides tools to perform comparative analysis of mt DNA sequences from world populations, as well as ancient samples, including Neandertal and Otzi "the ice man."

In 2007, we sequenced 6303 student DNA samples submitted by high schools and colleges from 34 states and British Columbia. On average, results were posted on the *Sequence Server* site within 16 days of receipt. The free *Sequencing Service* is made possible by the donation of sequencing reagents by Applied Biosystems.

**Visitation and Student Instruction**

Annual visitation reached 41,897 in 2007. This included 19,973 students who conducted experiments at the DNALC or DNALC *West* and 10,629 who received in-school instruction by DNALC staff members. More than half of all visitors (20,909) were middle school students who conducted experiments under the banner of *Genetics as a Model for Whole Learning* (*GMWL*). Cablevision's *Long Island Discovery* multimedia show drew 6750 visitors, primarily fourth graders studying Long Island history.

A record 971 students participated in week-long summer camps conducted at the DNALC, DNALC *West*, Central Islip High School, Sarah Lawrence College (Bronxville), and Aspen High School (Colorado). This great result was facilitated by a new system for online registration and payment via PayPal. More than 60% of parents took advantage of this streamlined way of enrolling their children, saving valuable staff time.

The roundworm *C. elegans* made its first appearance in summer camps this year. In *Fun with DNA*, 5$^{th}$ to 6$^{th}$ grade students used stereomicroscopes to compare wild-type and mutant worms, illustrating that gene mutations cause visible changes in traits. In *Genetic Horizons*, 8$^{th}$ to 9$^{th}$ graders used RNAi to induce phenotypes and bioinformatics to learn more about the genes they were disrupting. These were likely the first middle school students in the world to use RNAi!

We also initiated a collaboration with *Project Grad Long Island*, a nonprofit organization that works within economically disadvantaged communities to increase high school graduation rates. *Project Grad* provided scholarships and daily bussing for 26 middle school students from the Westbury school district to attend a week-

long camp at DNALC *West*. This custom experience—combining hands-on labs from our popular *Fun with DNA* and *World of Enzymes* camps—was designed to build a strong foundation in basic genetics and molecular biology for future high school work.

The annual *Great Moments in DNA Science* honors seminar series drew 437 students for insights into modern biological research. Dr. Elizabeth Murchison explained how scientists are attempting to understand the genes involved in a mysterious transmissible cancer in Tasmanian devils, with the hope of saving this unique animal from extinction. Dr. Bill Keyes discussed an intriguing theory about how cellular mechanisms aimed to protect our bodies from cancer may also contribute to aging. In the final lecture, Dr. James Watson presented anecdotes from his latest book about how to succeed in science. *Saturday DNA!* continued to be popular with both students and adults, drawing 350 participants for hands-on sessions ranging from "Jellyfish Genes" to "CSI: Learning Center."

Fifth grade students observe *C. elegans*.

In its second year, our partnership with Cold Spring Harbor High School (CSHHS) provided a challenging experience for ten students. The year-long "capstone" course was coinstructed by DNALC staff and CSHHS biology teacher Scott Renart, with students coming on alternate days to the DNALC for their final two class periods. The course emphasized critical thinking and included experiments and independent projects across a range of biological systems. A bacterial unit focused on recombinant DNA technology and gene manipulation; a plant unit analyzed transgenes in genetically modified food and newly sequenced genes in rice; human-based experiments used molecular tools to examine human origins and genetic variation; and work with *C. elegans* introduced the cutting-edge RNAi technique.

During the winter, graduate students from the Watson School of Biological Sciences completed 12 half-day teaching sessions during their annual rotation at the DNALC. During the first phase of training, each pair of students observed a DNALC instructor at work and organized a lesson plan that integrated their own perspectives. In the second phase, each pair worked closely with a DNALC instructor to coteach several labs, developing their communication skills and preparing them for independence. During the final phase, each pair was responsible for presenting an entire lab, under the close observation of a DNALC staff member. After completing this cycle for middle and high school classes, students chose three additional lessons to independently demonstrate instructional and classroom management skills.

**Faculty Training**

In 2007, more than 500 educators participated in a variety of professional development activities conducted at sites around the United States and Europe. With sponsorship primarily from the NSF, we collaborated with 13 host institutions to conduct 1.5–5-day workshops on plant genomics, bioinformatics, and RNAi. Demand for these workshops remained strong, with 384 applicants competing for 226 spaces. Five of these workshops were conducted at historically Black (HBCU) or Hispanic (HACU) institutions, where 36% of participants were Black or Hispanic. Overall, 27% of participants at offsite workshops were underrepresented minorities, mirroring their proportion among American residents (2005 Census Figures). An additional 250 educators attended workshops at professional meetings in the United States and Europe, which covered topics including neurobiology, bioinformatics, the molecular genetics of taste and smell, detecting GM foods by PCR, DNALC online tools for education, and forensic analysis of the Romanov family remains.

Twenty-five high school teachers, representing 14 states and Singapore, attended the annual *Amgen Leadership Symposium in Human and Genomic Biology*. Initiated in the mid-1990s with NSF support, the *Leadership Symposium* is the DNALC's capstone course, aimed at providing super-order training for progressive biology teachers who emphasize hands-on instruction in genetics or biotechnology. During their three-week residence, participants lived and breathed science on the CSHL campus, where they walked in the footsteps of Nobel laureates.

The curriculum began with two weeks of the DNALC's latest experiments on RNAi, human DNA polymorphisms, and bioinformatics. Participants explored RNAi in the roundworm *C. elegans*, first observing mutant

Leadership participants strike a pose with James Watson and Learning Center staff on the DNALC terrace.

phenotypes and learning basic worm care, progressing to simple methods of inducing RNAi, and then to the construction of their own reagents to "knock down" a gene of their choice. Participants examined their own DNA for several polymorphisms. Point mutations in mitochondrial DNA and an *Alu* insertion on chromosome 16 provided an entry point into the study of human populations and early migrations of our species. A mutation in a taste receptor correlated with the ability to taste the bitter chemical phenylthiocarbamide (PTC), showing the relationship between genotype and phenotype. Participants used a variety of online tools and DNA sequence analysis software to find gene elements in DNA sequences, to find genes in databases, and to compare computer predictions with biological evidence. The *Symposium* concluded with a week of independent or group projects that included optimizing RNAi methods for classroom instruction, screening a variety of supermarket foods for DNA evidence of genetic modification, annotating newly discovered genes from the rice genome, and creating video introductions to RNAi experiments. The experience was further enhanced by seminars by CSHL plant biologist Robert Martienssen, CSHL structural biologist Leemor Joshua-Tor, and Nobel laureate James Watson.

The DNALC continued to provide teacher training under its long-term collaboration with the Singapore Ministry of Education. Initiated in 2000 with a visit by Minister Rear Admiral Teo Chee Hean, the collaboration was guided by a memorandum of understanding through which licensed DNA learning centers were established at the Singapore Science Center and National Institute of Education. Two junior college teachers and an instructor from the Singapore Science Center participated in the *Leadership Symposium*, and five elementary teachers came in November for a two-week attachment. The attachment included hands-on lab work, lab preparation, and instructional pedagogy. The Singaporean teachers observed and cotaught labs alongside DNALC instructors and visited several local elementary schools. Each teacher developed a plan for translating their experience into hands-on instruction for Singaporean students.

**Internet Visitation and Development**

Visits to DNALC Internet sites rose to 7.14 million in 2007. The brightest spots were the *Image Archive on the American Eugenics Movement*, which more than doubled to 731,913 visits, and *Inside Cancer*, which increased 63%, to 196,138 visits. We began tracking the amount of data downloaded from our sites in February and were impressed to see that our content-based sites averaged more than 47 gigabytes (GB) per month. According to answers.com, one GB of data is roughly equivalent to 1000 novels at 100,000 words each, 18 hours of MP3 music, or 12 hours of Flash video. *DNA Interactive*, our richest multimedia site, came out on top of this statistic, serving a total 1200 GB in the year.

We launched two new Internet sites in 2007. *Silencing Genomes* offers laboratory and bioinformatics exercises to introduce students to RNAi and its effects on *C. elegans* anatomy and behavior. *Dynamic Gene* introduces modern concepts of gene analysis and provides "doable" student projects using research tools to analyze new genome data. *RedOrbit.com*, a science community site, recognized *Silencing Genomes* (June 13) as well as *Inside Cancer* (August 27) as "Red Hot Sites of the Day."


Educators, students, and scientists present their idea of a gene on *Dynamic Gene*'s home page.

We were disappointed, however, by the decreased visitation to our home page, *Gene Almanac*, and to *Your Genes, Your Health* and *DNA from the Beginning*. The decrease at *Gene Almanac* most likely reflects the fact that increasing numbers of visitors now reach our family of Internet sites directly by Internet searches, without going by way of the home page. We believe that the decreases at *Your Genes, Your Health* and *DNA from the Beginning* relate to the fact that content created in Adobe's multimedia authoring tool *Flash* is less "visible" to search engines than html-based sites. As the volume of Web content increases exponentially and people increasingly rely on Internet searches, we will need to solve this problem of search engine visibility.

We have already undertaken several simple strategies: registering site maps on Google; creating html directories of the sites on our servers; and cross-featuring newer sites on other more established sites or within the *Resources* section of *Gene Almanac*. We are also working on more involved solutions to the visibility problem. Beginning in July, our sites benefited from "piggybacking" on a Google AdWords grant. AdWords is Google's advertising program that displays "sponsored" links on the right side or top of a search results page. Through the grant, we receive these advertisements free-of-charge. For each DNALC site, a set of keywords is stored in the AdWords account. Each time one of the keywords is typed into Google's search box, a short ad for the site is displayed and logged as an "impression." If the searcher clicks on our ad, it counts as a "click-through" and a cost per click of up to $1.00 is applied. *DNA from the Beginning* is our most successful site on AdWords, with 2,608,437 impressions and 43,356 click-throughs. Not surprisingly, 79.28% of these click-throughs resulted from a search of "DNA." All DNALC sites received 5,901,454 impressions and 62,740 click-throughs, which would have cost $37,106 for a commercial enterprise to purchase from Google. A quick analysis of search engine referrals in the first half of 2007 (prior to initiating the AdWords program) versus the second half showed a 2% increase.

| **Internet site** | **Average visit (min)** | **Average monthly bandwidth** | **Visits in 2007** | **% Change from 2006** |
|---|---|---|---|---|
| Content-based sites: | | | | |
| *Gene Almanac* | 8:33 | 66.45 GB | 1,923,185 | –16.37 |
| *DNA from the Beginning* | 8:32 | 29.68 GB | 1,451,572 | –1.99 |
| *Your Genes, Your Health* | 7:40 | 46.97 GB | 962,151 | –13.72 |
| *DNA Interactive & myDNAi* | 8:24 | 100.43 GB | 1,459,865 | 15.26 |
| *Image Archive on the American Eugenics Movement* | 16:28 | 11.83 GB | 731,913 | 120.86 |
| *Inside Cancer* | 7:09 | 30.08 GB | 196,138 | 62.98 |
| Laboratory/bioinformatics sites: | | | | |
| *BioServers* | 16:10 | 2.29 GB | 251,597 | 10.13 |
| *Genetic Origins* | 7:04 | 1.59 GB | 132,748 | –12.06 |
| *Greenomes* | 3:27 | 0.40 GB | 9,443 | 10.60 |
| *Dynamic Gene* | 6:20 | 0.60 GB | 7,986 | n.a. |
| *Silencing Genomes* | 8:11 | 0.44 GB | 12,168 | n.a. |
| *DNALC Kits/Carolina Collaboration* | 15:26 | 1.60 GB | 4,396 | n.a. |
| **All sites** | | | **7,143,172** | **2.00** |

In addition, the increasing use of sophisticated search engines to find specific information runs counter to narrative structure of our older content sites. Thus, we are decomposing all our Internet sites into content "atoms" that can be searched for and viewed independently. Using the content management system (CMS) created for *Genes to Cognition Online*, each item is equipped with meta-tags that make it more visible to search engines and more useful to end users. Each animation and video item is saved as an individual atom of content with a CMS entry including keywords, media type, and educational uses and context. We are also linking the atomized content to a specialized search tool/viewer that will soon be a major feature of a redesigned *Gene Almanac* portal. We look forward to the day when our CMS, meta-tag, and search tool/viewer will deliver exactly what any visitor is looking for.

### *Genes to Cognition Online*

A cornerstone of DNALC's strategy to maintain its leadership in online science education has been to stay in touch with thought leaders in research and education. Thus, late in 2006, we hosted *New Horizons in Internet Site Development*, a 2.5-day conference that brought together experts in cognitive and neural science, learning theory, and technology to determine how research can support science teaching using advanced Internet technologies. In 2007, we responded to insights from the conference with a number of content and design initiatives to improve *Genes to Cognition* (*G2C*) *Online*, an Internet site on the molecular basis of human thinking and disorders of thinking that we are developing under grants from the Dana Foundation and the William and Flora Hewlett Foundation.

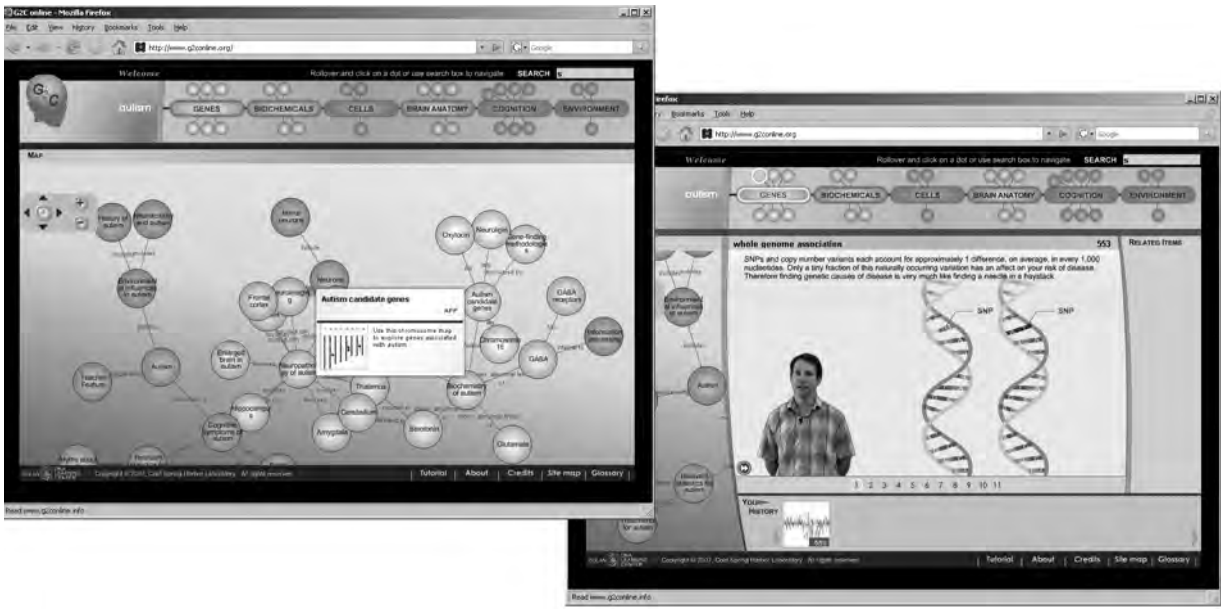
Insights were collated to produce a working paper of performance indicators, intended to guide project development. One of the main recommendations was the need to create a smooth interface for interacting with content. We responded by creating a networked map that builds on open-source code recently developed by The Media Lab at the Massachusetts Institute of Technology. The map displays site content as a network of dimensional content "atoms." These atoms cluster around major nodes such as schizophrenia, autism, or neuroimaging and are direct translations of expert concept maps we elicited from science experts in 2006. The atom map provides an enticing interactive entrée to *G2C Online* content, allowing users to visualize relationships between content items. Rolling over an atom provides a preview of the content item which can be accessed by a single click. Users can also make use of traditional online mapping tools such as zoom and pan.

We also addressed search and navigation functions. A familiar problem with Internet sites built in *Flash* is that users encounter difficulty switching between recently visited items. Thus, we developed a history function that keeps track of content that makes for easy forward/backward navigation.

Interactivity with content was a major theme in our Advisory Panel meeting, which we convened in October. We followed up on the Panel's recommendation to make the atom map the primary tool for accessing content. Now, when users visit *G2C Online*, their first interaction with material will be with the map, which provides a visual impact. Further interaction with the atoms should encourage users to make associations between different areas of research.

Following the meeting, we agreed to build two major interactive animations, which will be the centerpiece of the *G2C Online* project—an interactive brain map and a three-dimensional action potential animation. We are currently in negotiations with an animation studio, AXS-3D, to develop the content. The 14 advisors and staff members who attended the annual meeting were pleased with the free-flowing and frank discussions and willingness to take changes on board.

Project development was additionally guided by a series of evaluations conducted with the Center for Children and Technology. We used two different types of assessments, which enabled us to troubleshoot potentially problematic content and design issues. One-on-one qualitative evaluations with students from Philadelphia and New York City high schools allowed us to assess how students independently explore *G2C Online*. We learned that Internet site users generally cannot view animations and listen to narration simultaneously. In response, we restructured relevant items to make animation and narration features sequential as opposed to parallel. The second arm of the evaluation program consisted of a usability study conducted with 92 high school students from Long Island and Philadelphia. We identified problems with functionality and slow-loading media items that were addressed in a subsequent revision of the site.




Another step in the evolution of the *Genes to Cognition* Internet site; users will navigate the site using the network map. Project staff expect to launch the site in 2008.

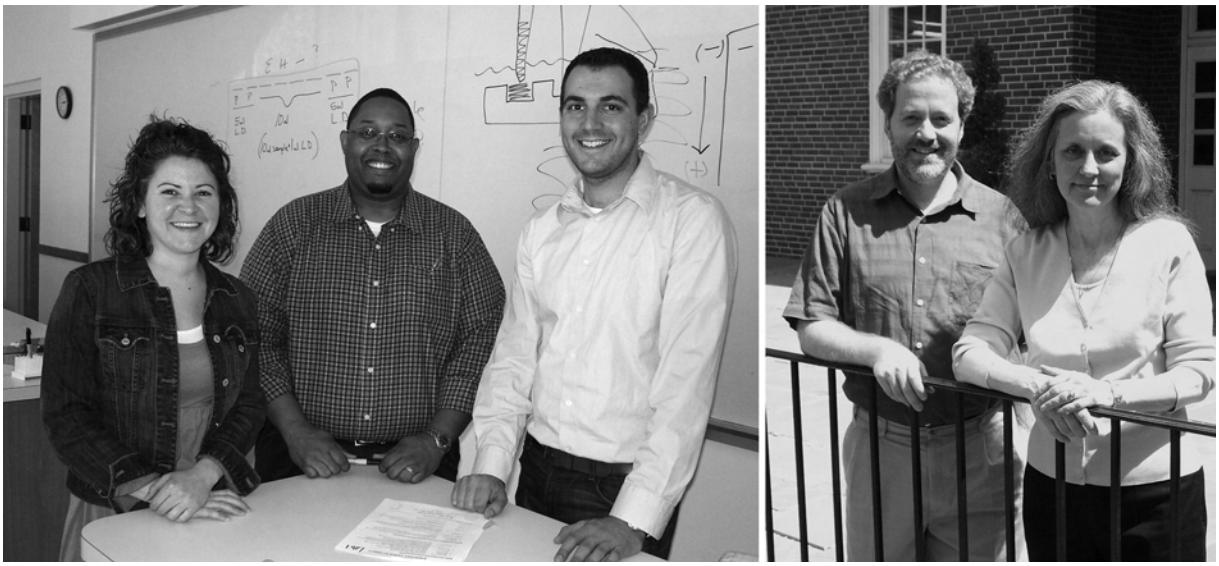
G2C *Online* content continues to evolve. During the year, we edited more than 200 video items and made many available on our demo site. We collaborated with the Dana Foundation to repackage and host 68 articles from www.dana.org. In addition, we stepped up production of educational tools and created a number of innovative media, including:

- *Fly School*, an interactive game that allows students to structure experiments to test memory in normal and mutated fruit flies. This module was developed in collaboration with CSHL researcher Tim Tully.
- *Model Center*, a bioinformatics tool that allows students to compare protein sequences in different model organisms.
- *Chromosome Map Viewer* is also a bioinformatics tool that allows students to examine the chromosome locations and biological functions of genes associated with cognitive disorders.

**Staff and Interns**

In October, DNALC Assistant Director Uwe Hilgert left to become Assistant Dean of the Watson School of Biological Sciences. Reared on a riverboat in Germany, Uwe received a Ph.D. from the Max-Planck Institute for Plant Breeding in Cologne and conducted postdoctoral research at the University of Arizona. Uwe started at the DNALC in 2000 as a high school instructor and then quickly became leader of bioinformatics teacher training under an HHMI grant. As Assistant Director, beginning in 2005, Uwe assumed responsibility for all of the DNALC's professional development activities, in addition to overseeing the instructional staff and the operations of DNALC *West*. Uwe's stamina, dedication, and attention to detail will be sorely missed.

After Uwe's departure, the assistant directorship was split into two positions. Amanda McBrien became Assistant Director for Instruction, and Bruce Nash became Assistant Director for Science. Amanda joined the DNALC 1998, and under her direction, the middle school program has grown by 65% and become a major source of annual operating income. She brings to her new position intimate knowledge of local school systems and experience as an expert trainer. Amanda is responsible for the smooth running of student programs, including field trips, in-school instruction, summer camps, and Watson School teaching rotations. Bruce Nash earned his Ph.D. in molecular genetics at the University of Toronto and conducted postdoctoral research on cell division in *C. elegans* at the University of Oregon. He was specifically recruited to bring *C. elegans* and



New staff at the DNALC in 2007 (*left to right*): Jennifer Cutillo, Jermel Watkins, Brian Lang, Stephen Blue, and Valerie Meszaros

RNAi technology to the DNALC. Bruce is responsible for technical support of the lab and DNA sequencing programs, development of new labs, and external teacher training.

At mid year, we lost three innovative and inspirational instructors. Greg Chin returned to his native San Jose to spend time with his family. After receiving a Ph.D. in Developmental Biology from Stanford University and conducting postdoctoral research at the DNAX Research Institute, Greg was recruited in 2005 (along with Bruce Nash) to jump-start our RNAi effort. David Gundaker moved to Dover, Massachusetts, with his family to accept a full-time teaching position at the Charles River School. He came to the DNALC in 2005 with master's degree in education and real-world teaching skills developed in middle schools in Colorado and Long Island. Laura Johns took a position with the technical support staff of the biotech company, Invitrogen. With a bachelor's degree in genetics and graduate studies in marine chemistry, Laura brought the technical skills needed to administer our DNA sequencing service.

We were pleased to bolster the DNALC's instructional staff by welcoming two high school instructors, Jermel Watkins and Brian Lang, and one middle school instructor, Jennifer Cutillo. We were especially happy to welcome back Jermel, who began his science career as a DNALC intern from 1994 to 2000. During the summers, he also worked alongside his father and DNALC collaborator Jerry Watkins, teaching *DNA Science* to minority students from his home school, Central Islip. Jermel went on to earn his Ph.D. in molecular and cellular pharmacology at Stony Brook University. After receiving his bachelor's degree from South Hampton College in marine microbiology, Brian worked as a lab technician at Pall Corporation. He went on to receive a master's degree in secondary education and New York State certification. After receiving her bachelor's degree in biology and secondary education from Providence College, Jennifer taught life science and biology for two years in Boston.

The *BioMedia* Group received a boost when Stephen Blue started late in the year as a part-time multimedia designer. Stephen is a graduate of Parsons School of Design, where he is an adjunct computer instructor.

In the spring, the administrative staff lost two strong clerical workers. Nancy Daidola left to pursue personal goals, and Stacy Leotta took on a position in the CSHL Office of Sponsored Programs. Prior to joining the DNALC in 1999, Nancy built her skills in administration at Grumman Aerospace and as real estate agent with Coldwell Banker Sammis. Nancy performed a myriad of administrative tasks that kept the DNALC running smoothly. Stacy joined the DNALC in 2005, using her database skills to aid in the computerization of the front office. Valerie Meszaros arrived in the spring to fill the open administrative position left by Stacy. Valerie, a Long Island native, was formerly an editor and writer for Healing Tao Press.

Our internship program continues to offer Long Island high school and college students the opportunity to gain practical laboratory experience. Joining the intern program in 2007 were Charmaine Browne (Westbury High School), Victoria Grace (Oyster Bay High School), Emily Lopes (Commack High School), and Stephanie Parascandolo (Half Hollow Hills High School). Tara Dolan (University of Miami) and Danielle Sganga (Vanderbilt University), who were graduates of the first CSH Partnership Program, joined with current Cold Spring Harbor High School student Rachel Gellerman to work on RNAi and *C. elegans* under the guidance of Bruce. New members of the intern team joined returning high school students Seth Schortz (Half Hollow Hills High School) and Matthew Levy, Hal Mutlu, Arielle Scardino, Nick Wilken, and Janice Yong (all of Kings Park High School). Several interns returned from college to assist with summer workshops: Benjamin Blond (Amherst College), Joseph Hakoopian (Cornell University), Alexandra Sloane (Loyola College), and Margarita Varer (SUNY Binghamton).

High School intern Rachel Stephan (Kings Park), was a semifinalist in the 2007 Intel Science Talent Search for her project on eliminating polychlorinated biphenyls from the environment. Rachel won first place in the environmental science category of the International Science and Engineering Fair and presented her project in New Mexico.

In August, we bid farewell to the following interns as they left for their freshman year at college: Matt Giambrone (Walt Whitman High School) to Cornell University; Carissa Maurin (Lynbrook High School) to Monmouth University; Ronnie Morasse (Plainedge High School) to Stevens Institute of Technology, and Brittany Woods (Cold Spring Harbor High School) to Boston College.

**David A. Micklos**
*Executive Director*

**2007 Workshops, Meetings, and Collaborations**

| | |
|---|---|
| January 2–5 | Site visit by Debra Burhans, Canisius College, Buffalo, New York |
| January 4 | Site visit by Magda Hayden, Bob Isakkson, Elena Perrez, and Peter Quick, Bank of America, Melville, New York |
| January 14 | Site visit to Gates Foundation, Washington, D.C. |
| January 16 | Site visit by Stephanie Tzall and Charlie Pamaro, Brooklyn Technical High School, New York |
| January 18 | Site visit by Mike Hyde and Rick Woychik, Jackson Laboratory, Bar Harbor, Maine |
| January 20 | *Saturday DNA!*, "Designer Experiment" and "Macro Concepts of Microarrays," DNALC |
| January 25 | Site visit by Robert Hoppenstedt, Bethpage Federal Credit Union, Bethpage, New York |
| January 25 | Site visit to Center for Children and Technology, New York, New York |
| February 1 | Cold Spring Harbor High School Partnership Program, Independent Project Presentations, DNALC |
| February 5–8 | Cancer Biomedical Informatics Grid (caBIG) Meeting, Washington, D.C. |
| February 8 | Site visit by Christopher Hahn and Teresa Kemp-Zielenski, United Way Long Island |
| February 10 | *Saturday DNA!*, "The Mystery of Anastasia Romanov" and "Mitosis, Meiosis, and Chromosomes, Oh Mei!," DNALC |
| February 13 | Site visit by Exploratorium Center for Learning and Teaching, San Francisco, California |
| February 15 | Site visit by Lewis Ranieri, Computer Associates and Hyperion, and Peter Quick, Bank of America, Melville, New York |
| February 23–24 | NSF *Plant Molecular Genetics and Genomics* Follow-up Workshop, with Minority Fellow Mary Smith, Greensboro, North Carolina |
| February 28 | Site visit by Syd Mandelbaum and WLIW Channel 21, Garden City, New York |
| March 1 | Site visit by Walter J. Dillingham, Jr., Bank of America, New York, New York |
| March 5, 12, 19 | *Reading Your DNA*, Cold Spring Harbor Central School District Adult Education Workshop, DNALC |
| March 7 | *G2C Online* interview with Daniel Weinberger, National Institute of Mental Health, Bethesda, Maryland |
| March 16–17 | NSF *Plant Molecular Genetics and Genomics* Follow-up Workshop, with Minority Fellow Muhammad Milan, Holly Springs, Mississippi |
| March 19–20 | *G2C Online* interview with Seth Grant, Wellcome Trust Sanger Institute, Hinxton, United Kingdom |
| March 22 | *G2C Online* interview with James Watson, CSHL |
| March 22 | Site visit by Charterhouse School, Surrey, United Kingdom |
| March 23–24 | NSF *Dynamic Gene* Workshop, Austin Community College, Texas |
| March 24 | *Saturday DNA!*, "When Dinosaurs Roamed the Earth" and "CSI: Learning Center," DNALC |
| March 24 | *DNA Extraction* Student Workshop, American Museum of Natural History, New York, New York |
| March 25–26 | NSF *Plant Molecular Genetics and Genomics* Follow-up Workshop, with Minority Fellow Javier Gonzalez, Weslaco, Texas |
| March 26–April 1 | National Science Teachers Association Annual Meeting, St. Louis, Missouri |
| March 27 | Hewlett Open Education Meeting, Houston, Texas |
| March 27–28 | NSF *Dynamic Gene* Workshop, St. Louis Science Center, Missouri |
| March 28 | *G2C Research Programme* Meeting, London, United Kingdom |
| April 2 | Site visit by Peter Jann, Life Science Zurich Learning Center, Zurich, Switzerland |
| April 3 | Lymphatic Research Foundation meeting, Huntington, New York |
| April 6–7 | NSF *Plant Molecular Genetics and Genomics* Follow-up Workshop, with Minority Fellow Olga Kopp, Orem, Utah |
| April 12 | Search Engine Strategies Meeting, New York, New York |
| April 13 | New York City Department of Education meeting, New York |
| April 13–14 | NSF *Dynamic Gene* Workshop, Colorado Springs, Colorado |
| April 17 | *Great Moments in DNA Science* Honors Seminar: "The Devils' Own Hell: Tasmanian Devil Transmissible Cancer," Elizabeth Murchison, CSHL |
| April 17 | New York City Department of Education meeting, New York |
| April 19 | *G2C Online* interview with William Kristan, University of California, San Diego |
| April 21 | *Saturday DNA!*, "How Does Your Garden Grow?" and "Eureka! Art of Scientific Discovery," DNALC |
| April 21 | *DNA Extraction* Student Workshop, American Museum of Natural History, New York, New York |
| April 23 | *Great Moments in DNA Science* Honors Seminar: "Cancer and Aging: Getting the Balance Right," Bill Keyes, CSHL |
| April 25 | Site visit from *The Times of Northport*, New York |
| April 25 | Meeting with Tom Taratko, New York City Department of Education, New York |
| April 26, May 3, 10 | *Reading Your DNA*, Adult Education Workshop, American Museum of Natural History, New York |
| April 30 | *Great Moments in DNA Science* Honors Seminar: "Rules for Science," James Watson |
| May 1 | Site visit by William Mak and Suet Ying Lee, Hong Kong Biotechnology Education Resources Centre Limited, China |
| May 7 | New York State Department of Education Task Force meeting, New York Hall of Science, New York |
| May 9 | Site visit by Doug Postl, Agilent Technologies, Wilmington, Delaware |
| May 11 | New York City Department of Education meeting, New York |
| May 15 | Site visit by Marion Conway, Roslyn Savings Foundation, and Tom Calabrese, Daniel Gale Sothebys Real Estate |

| | |
|---|---|
| May 17 | The Human Genome Project: Library Training presentation "What DNA Says About Our Human Family," Baruch College, New York, New York |
| May 21 | Cold Spring Harbor Laboratory Association meeting, DNALC |
| May 19 | *Saturday DNA!*, "Fruit Fly Island" and "Tracking Ancient Treks," DNALC |
| May 24 | Site visit by John Passarelli and Tom Gibbons, Notre Dame Club Development, New York, New York |
| May 31 | Site visit by Robert Root, Brumsic Brandon, Oneil Eastmond, and Constance Clark, Westbury Public Schools; Robert Troiano, and Kim Arias, Project Grad; and Christopher Hahn and Terri Kemp Zielenski, United Way of Long Island |
| June 1–2 | NSF *Dynamic Gene* Workshop, Canisius College, Buffalo, New York |
| June 2 | *As the Worm Turns* Student Workshop, American Museum of Natural History, New York, New York |
| June 4–8 | NSF *Plant Molecular Genetics and Genomics* Workshop, Oklahoma City, Oklahoma |
| June 5 | Site visit by Bob Frehse and Ligia Cravo, Hearst Foundation, New York, New York |
| June 6 | Site visit to Northport High School, New York, for *G2C Online* |
| June 6 | Cold Spring Harbor High School Partnership Program graduation ceremony, CSHL |
| June 6, 13, 20 | *Reading Your DNA*, Adult Education Workshop, American Museum of Natural History, New York, New York |
| June 7 | Site visit by Kidgie Williams, Hospitality Committee for United Nations Delegations, Inc., and United Nations' family members, New York, New York |
| June 8 | Site visit by Anne Marie Agnelli, Computer Associates International, Inc., Islandia, New York |
| June 9 | *Saturday DNA!*, "Jellyfish Genes," DNALC |
| June 13–14 | National Science Foundation *iPlant* Site Review, University of Arizona, Tucson |
| June 16 | *The Iceman Cometh* Student Workshop, American Museum of Natural History, New York, New York |
| June 20 | Site visit by Bob Keller, Keyspan Foundation, Hicksville, New York |
| June 21 | *G2C Online* interview with Portia Iversen, Los Angeles, California |
| June 25–29 | NSF *Plant Molecular Genetics and Genomics* Workshop, with Minority Fellow Gokhan Hacisalihoglu, Tallahassee, Florida |
| June 25–29 | *DNA Science* Workshop, DNALC<br>*Fun with DNA* Workshop, DNALC *West*<br>*Fun with DNA* Workshop, DNALC<br>*World of Enzymes* Workshop, DNALC |
| June 28 | Site visit by Rod Miller, University of the Sciences in Philadelphia (USP), Russell DiGate, Philadelphia College of Pharmacy, and John Porter, Faculty Council, USP, Pennsylvania |
| July 2–8 | *DNA Science Workshop*, Central Islip, New York<br>*DNA Science* Workshop, DNALC<br>*Fun with DNA* Workshop, DNALC<br>*Green Genes* Workshop, DNALC<br>*World of Enzymes* Workshop, DNALC *West* |
| July 9 | Site visit by Anna Pascucci, University of Naples, and Liceo Scientifico Statale "G. Salvermini," Sorrento, Italy |
| July 9–13 | *DNA Science* Workshop, DNALC *West*<br>*Genetic Horizons* Workshop, DNALC<br>*World of Enzymes* Workshop, DNALC |
| July 9–27 | Amgen *Leadership Symposium*, DNALC |
| July 12 | Site visit by Oscar Orrantia Vernaza, Pilar Morla de Orrantia, and Pilar Orrantia Quentin, Junta de Beneficencia in Guayaquil, Ecuador |
| July 12–13 | National Science Foundation CCLI Grant Review, Arlington, Virginia |
| July 13 | *G2C Online* interview with Thomas Nuhse, University of Manchester, United Kingdom |
| July 16 | *G2C Online* interview with Jonathan Sebat, CSHL |
| July 16–20 | *Fun with DNA* Workshop, DNALC<br>*Green Genes* Workshop, DNALC *West*<br>*Human Genomics* Workshop, DNALC |
| July 20 | Site visit by Bill and Ursula Niarakis, Hoffman Center, Long Island, New York |
| July 23–27 | *Green Genes* Workshop, DNALC<br>*World of Enzymes* Workshop, DNALC |
| July 30–August 3 | *DNA Science* Workshop, DNALC<br>*Fun with DNA* Workshop, DNALC *West*<br>*Fun with DNA* Workshop, DNALC<br>*Genetic Horizons* Workshop, DNALC |
| July 31 | Site visit by Bob Keller, Keyspan Foundation, Hicksville, New York |
| August 2 | Site visit by Leslie Beller, Christine Knight, Edward Murphy, and Douglas Taylor, University of Virginia |
| August 6–10 | *DNA Science* Workshop, DNALC<br>*Green Genes* Workshop, DNALC<br>*World of Enzymes* Workshop, DNALC<br>*World of Enzymes* Workshop, DNALC *West* |

| | |
|---|---|
| August 9 | Site visit by Fran Brennan, Veeco Instruments, Woodbury, New York |
| August 14 | Site visit by Joe Novak, *G2C Online* Advisory Panel, and Joan Novak |
| August 14 | Site visit by Jeff Carstens, Sovereign Bank, Long Island, New York |
| August 20–24 | New York City Department of Education *DNA Science* and *PCR and Bioinformatics* Workshops, Brooklyn Technical High School, Brooklyn, New York |
| August 20–24 | *DNA Science* Workshop, Sarah Lawrence College, Bronxville, New York |
| August 21 | Site visit by Karen Agostisi and Tricia Russell, Office of Congressman Steve Israel |
| August 23–24 | Hackathon Meeting, Chicago, Illinois |
| August 28 | Bioinformatics Seminar, International Chromosome Conference, Amsterdam, The Netherlands |
| August 31 | *PTC Bioinformatics*, International Chromosome Conference, Vienna Open Lab, Vienna, Austria |
| August 31 | Site visit by Bob Keller, Keyspan Foundation, Hicksville, New York |
| September 24 | Site visit by Dmitri Dumas, Diefendorf Capital Planning Associates, Locust Valley, New York |
| October 11 | Site visit by Roy Crawford, The University of Waikato, New Zealand, and Renee Crawford |
| October 13 | President's Council Meeting at DNALC, Sydney Brenner, Salk Institute; Phil Sharp, McGovern Institute for Brain Research at Massachusetts Institute of Technology; Gregory Hannon and Marja Timmermans, CSHL |
| October 15 | *G2C Online* Advisory Panel Meeting, DNALC |
| October 20 | *Saturday DNA!*, "Breaking Up is Hard to Do" and "The Ins and Outs of Cancer," DNALC |
| October 22–24 | Howard Hughes Medical Institute Precollege Program Director's meeting, Washington, D.C. |
| October 31 | Enhancing Collaborative Leadership for Improved Performance in Science Education, (ECLIPSE), Albany, New York |
| Oct. 31–Nov. 2 | Novartis Exploratory Oncology Development Group Educational meeting, DNALC |
| November 5 | Site visit by Ed Lee, *Apollo* Developer, Berkeley Bioinformatics and Ontologies Project, Lawrence Berkeley National Labs, California |
| November 7 | Site visit by Yoshi Ishikawa, Masahiro Nei, and Lee Shuett, Nikon Instruments |
| November 12 | Site visit by Bob Keller, Keyspan Foundation, Hicksville, New York |
| November 16–18 | Howard Hughes Medical Institute Genomics Education Meeting, Chevy Chase, Maryland |
| November 17 | *Saturday DNA!*, "Yeasty Beasties" and "Beyond DNA," DNALC |
| November 27–28 | NSF *Dynamic Gene* Workshop, Fernbank Science Center, Decatur, Georgia |
| November 28 | National Association of Biology Teachers, "Sense in Molecules," Atlanta, Georgia |
| November 29 | National Association of Biology Teachers meeting, "Detecting GM Food by PCR," "Dynamite WWW Teaching Resources," Atlanta, Georgia |
| December 5 | Presentation to New York State Genetics Task Force, New York University Medical Center |
| December 7 | NSF *Dynamic Gene* Workshop, Caltech, Pasadena, California |
| December 7 | Singapore Primary Teachers Attachment, DNALC |
| December 15 | *Saturday DNA!*, "Iceman" and "The Buzz on Bees," DNALC |
| December 21 | *G2C Online* interview with Jon Lieberman, Psychologist, Hampton Bays, New York |

**Sites of Major Faculty Workshops 1985–2007**

Key: *Middle School* High School **College**

| | | |
|---|---|---|
| ALABAMA | University of Alabama, Tuscaloosa | 1987–1990 |
| ALASKA | University of Alaska, Fairbanks | 1996 |
| ARIZONA | Tuba City High School | 1988 |
| ARKANSAS | Henderson State University, Arkadelphia | 1992 |
| CALIFORNIA | **California State University, Fullerton** | **2000** |
| | **California Institute of Technology, Pasadena** | **2007** |
| | Canada College, Redwood City | 1997 |
| | City College of San Francisco | 2006 |
| | Contra Costa County Office of Education, Pleasant Hill | 2002 |
| | **Foothill College, Los Altos Hills** | **1997** |
| | Harbor–UCLA Research & Education Institute, Torrance | 2003 |
| | **Los Angeles Biomedical Research Institute, Torrance** | **2006** |
| | Laney College, Oakland | 1999 |
| | Lutheran University, Thousand Oaks | 1999 |
| | **Pierce College, Los Angeles** | **1998** |
| | Salk Institute for Biological Studies, La Jolla | 2001 |
| | **San Francisco State University** | **1991** |
| | **San Jose State University** | **2005** |
| | University of California, Davis | 1986 |
| | **University of California, Northridge** | **1993** |
| COLORADO | Aspen Science Center | 2006 |
| | Colorado College, Colorado Springs | 1994, 2007 |
| | **United States Air Force Academy, Colorado Springs** | **1995** |
| | University of Colorado, Denver | 1998 |
| CONNECTICUT | Choate Rosemary Hall, Wallingford | 1987 |
| FLORIDA | Armwood Senior High School, Tampa | 1991 |
| | Florida Agricultural & Mechanical University, Tallahassee | **2007** |
| | North Miami Beach Senior High School | 1991 |
| | University of Miami School of Medicine | 2000 |
| | University of Western Florida, Pensacola | 1991 |
| GEORGIA | Fernbank Science Center, Atlanta | 1989, 2007 |
| | **Morehouse College, Atlanta** | **1991, 1996–1997** |
| HAWAII | Kamehameha Secondary School, Honolulu | 1990 |
| IDAHO | University of Idaho, Moscow | 1994 |
| ILLINOIS | Argonne National Laboratory | 1986, 1987 |
| | **University of Chicago** | **1992, 1997** |
| INDIANA | Butler University, Indianapolis | 1987 |
| IOWA | Drake University, Des Moines | 1987 |
| KANSAS | University of Kansas, Lawrence | 1995 |
| KENTUCKY | Murray State University | 1988 |
| | University of Kentucky, Lexington | 1992 |
| | Western Kentucky University, Bowling Green | 1992 |
| LOUISIANA | Jefferson Parish Public Schools, Harvey | 1990 |
| | John McDonogh High School, New Orleans | 1993 |
| MAINE | Bates College, Lewiston | 1995 |
| | Foundation for Blood Research, Scarborough | 2002 |
| MARYLAND | Annapolis Senior High School | 1989 |
| | Frederick Cancer Research Center, Frederick | 1995 |
| | McDonogh School, Baltimore | 1988 |
| | Montgomery County Public Schools | 1990–1992 |
| | National Center for Biotechnology Information, Bethesda | 2002 |
| | *St. John's College, Annapolis* | *1991* |
| | **University of Maryland, School of Medicine, Baltimore** | **1999** |
| MASSACHUSETTS | Beverly High School | 1986 |
| | Biogen, Cambridge | 2002 |
| | **Boston University** | **1994, 1996** |
| | CityLab, Boston University School of Medicine | 1997 |
| | Dover-Sherborn High School, Dover | 1989 |
| | Randolph High School | 1988 |

| | | |
|---|---|---|
| | Winsor School, Boston | 1987 |
| | Whitehead Institute for Biomedical Research, Cambridge | 2002 |
| MICHIGAN | Athens High School, Troy | 1989 |
| MINNESOTA | University of Minnesota, St. Paul | 2005 |
| MISSISSIPPI | Mississippi School for Math & Science, Columbus | 1990–1991 |
| | Rust College, Holly Springs | 2006–2007 |
| MISSOURI | Stowers Institute for Medical Research, Kansas City | 2002 |
| | **Washington University, St. Louis** | **1989, 1997** |
| NEVADA | University of Nevada, Reno | 1992 |
| NEW HAMPSHIRE | **New Hampshire Community Technical College, Portsmouth** | **1999** |
| | St. Paul's School, Concord | 1986, 1987 |
| NEW JERSEY | Coriell Institute for Medical Research, Camden | 2003 |
| NEW YORK | Albany High School | 1987 |
| | American Museum of Natural History | 2007 |
| | Bronx High School of Science | 1987 |
| | Canisius College, Buffalo | 2007 |
| | **Columbia University** | **1993** |
| | Cold Spring Harbor High School | 1985, 1987 |
| | **Cornell University, Ithaca** | **2005** |
| | *DeWitt Middle School, Ithaca* | *1991, 1993* |
| | DNA Learning Center | 1988–1995,2001–2004, 2006–2007 |
| | **DNA Learning Center** | **1990, 1992, 1995, 2000** |
| | *DNA Learning Center* | *1990–1992* |
| | DNA Learning Center *West* | 2005 |
| | *Fostertown School, Newburgh* | *1991* |
| | Huntington High School | 1986 |
| | Irvington High School | 1986 |
| | *Junior High School 263, Brooklyn* | *1991* |
| | *Lindenhurst Junior High School* | *1991* |
| | Mt. Sinai School of Medicine | 1997 |
| | New York City Department of Education | 2007 |
| | New York Institute of Technology | 2006 |
| | **New York Institute of Technology** | **2006** |
| | *Orchard Park Junior High School* | *1991* |
| | *Plainview-Old Bethpage Middle School* | *1991* |
| | The Rockefeller University | 2003 |
| | State University of New York, Purchase | 1989 |
| | State University of New York, Stony Brook | 1987–1990 |
| | Stuyvesant High School, New York | 1998–1999 |
| | *Titusville Middle School, Poughkeepsie* | *1991, 1993* |
| | Trudeau Institute, Lake Saranac | 2001 |
| | Union College, Schenectady | 2004 |
| | **U.S. Military Academy, West Point** | **1996** |
| | Wheatley School, Old Westbury | 1985 |
| NORTH CAROLINA | CIIT Center for Health Research, Triangle Park | 2003 |
| | North Carolina Agricultural & Technical State University, Greensboro | 2006–2007 |
| | North Carolina School of Science, Durham | 1987 |
| OHIO | Case Western Reserve University, Cleveland | 1990 |
| | Cleveland Clinic | 1987 |
| | North Westerville High School | 1990 |
| OKLAHOMA | **Oklahoma City Community College** | **2000** |
| | Oklahoma City Community College | 2006–2007 |
| | Oklahoma Medical Research Foundation, Oklahoma City | 2001 |
| | Oklahoma School of Science and Math, Oklahoma City | 1994 |
| OREGON | Kaiser Permanente-Center for Health Research, Portland | 2003 |
| PENNSYLVANIA | Duquesne University, Pittsburgh | 1988 |
| | Germantown Academy | 1988 |
| SOUTH CAROLINA | **Clemson University, Clemson** | **2004** |
| | Medical University of South Carolina, Charleston | 1988 |
| | **University of South Carolina, Columbia** | **1988** |
| TEXAS | Austin Community College-Rio Grande Campus | 2000 |

| | | |
|---|---|---|
| | Austin Community College-Eastview Campus | 2007 |
| | J.J. Pearce High School, Richardson | 1990 |
| | Langham Creek High School, Houston | 1991 |
| | Southwest Foundation for Biomedical Research, San Antonio | 2002 |
| | Taft High School, San Antonio | 1991 |
| | Texas A&M, AG Research and Extension Center, Weslaco | 2007 |
| | **Trinity University, San Antonio** | **1994** |
| | **University of Texas, Austin** | **1999, 2004** |
| UTAH | University of Utah, Salt Lake City | 1993 |
| | **University of Utah, Salt Lake City** | **1998, 2000** |
| | **Utah Valley State College, Orem** | **2007** |
| VERMONT | University of Vermont, Burlington | 1989 |
| VIRGINIA | Eastern Mennonite University, Harrisonburg | 1996 |
| | Jefferson School of Science, Alexandria | 1987 |
| | Mathematics and Science Center, Richmond | 1990 |
| | Mills Godwin Specialty Center, Richmond | 1998 |
| | **Virginia Polytechnic Institute and State University, Blacksburg** | **2005** |
| WASHINGTON | Fred Hutchinson Cancer Research Center, Seattle | 1999, 2001 |
| | **University of Washington, Seattle** | **1993, 1998** |
| WASHINGTON, D.C | **Howard University** | **1992, 1996** |
| WEST VIRGINIA | Bethany College | 1989 |
| WISCONSIN | Blood Center of Southeastern Wisconsin, Milwaukee | 2003 |
| | **Madison Area Technical College** | **1999** |
| | Marquette University, Milwaukee | 1986, 1987 |
| | University of Wisconsin, Madison | 1988, 1989 |
| | **University of Wisconsin, Madison** | **2004** |
| WYOMING | University of Wyoming, Laramie | 1991 |

---

| | | |
|---|---|---|
| AUSTRALIA | Walter and Eliza Hall Institute and University of Melbourne | 1996 |
| **AUSTRIA** | **Vienna Open Lab** | **2007** |
| CANADA | Red River Community College, Winnipeg, Manitoba | 1989 |
| ITALY | Porto Conte Research and Training Laboratories, Alghero | 1993 |
| | International Institute of Genetics and Biophysics, Naples | 1996 |
| PANAMA | **University of Panama, Panama City** | **1994** |
| PUERTO RICO | University of Puerto Rico, Mayaguez | 1992 |
| | **University of Puerto Rico, Mayaguez** | **1992** |
| | **University of Puerto Rico, Rio Piedras** | **1993** |
| | University of Puerto Rico, Rio Piedras | 1994 |
| RUSSIA | Shemyakin Institute of Bioorganic Chemistry, Moscow | 1991 |
| SINGAPORE | National Institute of Education | 2001–2005 |
| SWEDEN | Kristineberg Marine Research Station, Fiskebackskil | 1995 |
| | Uppsala University, Uppsala | 2000 |
| **THE NETHERLANDS** | **International Chromosome Conference, Amsterdam** | **2007** |

DOLAN DNA LEARNING CENTER GRANTS

| Grantor | Program | Duration of Grant | 2007 Funding+ |
|---|---|---|---|
| **FEDERAL GRANTS** | | | |
| National Institute of Health | Science Education Partnership Award: Nationwide Dissemination of Inside Cancer Internet Site | 8/07-7/09 | $ 19,753 |
| National Science Foundation | Course, Curriculum, and Laboratory Instruction Progam: Nationwide Dissemination of RNAi Curriculum | 9/07-8/09 | 10,973 |
| National Science Foundation | Plant Genome Initiative Educational Outreach: Minority Fellows and Regional Plant Genomics Footlockers | 9/04-8/07 | 58,517 |
| National Science Foundation | Plant Genome Initiative Educational Outreach: Construction and Nationwide Dissemination of Dynamic Gene Internet Site | 12/05-11/07 | 141,111 |
| AAAS/NSF | National Science Digital Library: Meta-tagging DNALC Internet Content for BiosciEdNet | 10/05-9/09 | 50,868 |
| Washington University/NSF | Plant Genome Initiative Educational Outreach: Multimedia Materials on Maize Genome Sequencing | 11/05-10/08 | 17,705 |
| Cornell University/NSF | Plant Genome Initiative Educational Outreach: Minority Fellows and Regional Plant Genomics Footlockers | 9/05-8/08 | 52,382 |
| USDA | Systematic Determination of the Maize Gene Set: Educational Outreach | 2/06-1/07 | 3,178 |
| **NONFEDERAL GRANTS** | | | |
| Amgen Foundation | Amgen *Leadership Symposium* | 4/05-12/08 | $ 85,233 |
| Clemson University | DNALC Licensing | 2007 | 50,000 |
| Dana Foundation | *Genes to Cognition* (G2C) Online Internet Site Development | 10/04-9/08 | 239,986 |
| Dialog Gentechnik | DNALC Licensing | 2007 | 24,975 |
| Goldman Sachs Foundation | *Harlem DNA Lab* Planning | 2007 | 50,000 |
| Hewlett Foundation | *Genes to Cognition* (G2C) Online Internet Site Evaluation | 10/05-10/09 | 68,983 |
| HHMI Foundation | Pre-College Science Education Initiative: NYC Teacher Training | 9/07-8/08 | 21,878 |
| Jerome L. Greene Foundation | *Harlem DNA Lab* Equipment | 2007 | 100,000 |
| North Shore-LIJ Health System | DNALC *West* Operating Support | 2007 | 50,000 |
| Porter Foundation | Scholarships for Minority and Disadvantaged Students | 2007 | 30,000 |

The following schools each contributed $1,000 or more for participation in the ***Curriculum Study Program***:

| | |
|---|---|
| Bellmore-Merrick Central High School District | 1,250 |
| Fordham Preparatory School | 1,250 |
| Garden City Union Free School District | 1,250 |
| The Green Vale School | 2,750 |
| Half Hollow Hills Central School District | 1,250 |
| Harborfields Central School District | 1,500 |
| Huntington Union Free School District | 1,250 |
| Island Trees Union Free School District | 1,500 |
| Jericho Union Free School District | 1,500 |
| Lawrence Union Free School District | 1,250 |
| Levittown Union Free School District | 2,750 |
| Locust Valley Central School District | 1,500 |
| Massapequa Union Free School District | 1,500 |
| North Shore Central School District | 1,250 |
| North Shore Hebrew Academy | 1,500 |
| Oceanside Union Free School District | 1,500 |

| | |
|---|---|
| Oyster Bay-East Norwich School District | 1,250 |
| Plainedge Union Free School District | 1,500 |
| Plainview-Old Bethpage Central School District | 1,250 |
| Portledge School | 1,500 |
| Port Washington Union Free School District | 1,500 |
| Ramaz School | 2,750 |
| Roslyn Union Free School District | 2,750 |
| South Huntington Union Free School District | 1,500 |
| Syosset Central School District | 2,750 |
| Yeshiva University High School for Girls | 1,500 |

The following schools each contributed $1,000 or more for participation in the ***Genetics as a Model for Whole Learning Program***:

| | |
|---|---|
| Allen Christian School | $ 1,150 |
| Bay Shore Union Free School District | 4,675 |
| Bellmore Union Free School District | 5,400 |
| Bellmore-Merrick Central School District | 16,600 |
| Bethpage Union Free School District | 1,950 |
| Deer Park Union Free School District | 1,080 |
| Eastern Middle School | 4,950 |
| East Meadow Union Free School District | 2,297 |
| East Williston Union Free School District | 2,700 |
| Elwood Union Free School District | 3,820 |
| Floral Park – Bellerose Union Free School District | 5,400 |
| Friends Academy | 2,550 |
| Garden City Union Free School District | 7,005 |
| Great Neck Union Free School District | 13,380 |
| The Green Vale School | 1,200 |
| Half Hollow Hills Central School District | 7,125 |
| Herricks Union Free School District | 1,650 |
| Huntington Union Free School District | 6,925 |
| Jericho Union Free School District | 15,625 |
| Lawrence Union Free School District | 14,100 |
| Locust Valley Central School District | 8,587 |
| Mamaroneck Union Free School District | 3,600 |
| Mattituck-Cutchogue Union Free School District | 1,375 |
| Merrick Union Free School District | 1,200 |
| Mott Hall V Middle School | 2,000 |
| North Bellmore Union Free School District | 2,750 |
| Northport-East Northport Union Free School District | 1,187 |
| Oceanside Union Free School District | 1,125 |
| Old Westbury School of the Holy Child | 5,575 |
| Oyster Bay - East Norwich Central School District | 2,515 |
| Park City Prep Charter School | 1,350 |
| Plainview-Old Bethpage Central School District | 3,830 |
| Port Washington Union Free School District | 5,350 |
| Roberto Clemente Middle School | 1,000 |
| Rockville Centre Union Free School District | 11,100 |
| Scarsdale Union Free School District | 1,325 |
| St. Dominic Elementary School | 3,900 |
| St. Edward the Confessor School | 1,820 |
| Syosset Central School District | 29,625 |
| Yeshiva Darchei Torah | 1,900 |

+ Includes direct and indirect costs.


**Dolan DNA Learning Center**
Cold Spring Harbor Laboratory
One Bungtown Road
Cold Spring Harbor, New York 11724

Located at 334 Main Street (Route 25A) in Cold Spring Harbor Village

Phone 516-367-5170
Fax 516-367-5182
Email dnalc@cshl.edu

Visit us on the Internet at **www.dnalc.org**