



# DOLAN DNA LEARNING CENTER EXECUTIVE DIRECTOR'S REPORT

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

## ADMINISTRATION

Lauren Correr  
Mary Lamont  
Valerie Meszaros  
David Micklos  
Karen Orzel  
Carolyn Reid

## INSTRUCTION

Elna Carrasco  
Jennifer Cutillo  
Natalia Hanson  
Malissa Hewitt  
Amanda McBrien  
Erin McKechnie

Bruce Nash  
Ileana Rios  
Tedi Setton  
Jermel Watkins  
Jason Williams

## BIOMEDIA

Steven Blue  
John Connolly  
Cornel Ghiban  
Uwe Hilgert  
Eun-Sook Jeong  
Susan Lauter  
Chun-hua Yang

The Dolan DNA Learning Center's 20<sup>th</sup> birthday, on September 18, inevitably sparked some reverie about our origins. It all actually began in 1984 with an innocent enough phone call from Fran Roberts, the new superintendent of Cold Spring Harbor School District, inquiring how we might join forces to do something to improve local science education. That conversation led to a proposal to the National Science Foundation (NSF) to develop a course to train high school teachers to do recombinant DNA experiments. Dejected when our proposal was turned down, I turned to Mike Glennon, principal, and Ed Tronolone, science chairman, of the Wheatley School in East Williston. They had a simple solution: Just ask several local school districts to fund the project!

I doubt that this tactic could have worked anywhere except on Long Island's North Shore, but by January 1985, eight local districts had contributed \$10,000 apiece to purchase supplies and equipment. During the next several months, I spent spare moments in Rich Roberts' lab, working with postdoctoral fellow Greg Freyer to develop a simple set of experiments that would allow high school students to get their hands dirty with recombinant DNA. The experiments, which were the basis of our *DNA Science* lab text, were first tested in summer 1985 at a teacher-student workshop at the Wheatley School.



The first *DNA Science* Workshop spanned two weeks and included nearly 40 participants. Greg Freyer (l) and Dave Micklos pose in the front row.





Dave Micklos, Christine Bartels, and Jeff Mondschein before the *Vector Van*'s maiden voyage across the U.S.



The *Vector Van* approaching the Golden Gate Bridge in San Francisco.

In 1986, we obtained funding from Citibank to develop a mobile “Vector Van”—a Ford Econoline with a silver paint job and loaded to the ceiling with pipettes, centrifuges, and water baths. With independent funding from small foundations and biotech start-ups, we took our DNA show on the road, conducting week-long teacher workshops at six sites across the United States. On the last leg of the trip—from Milwaukee, Wisconsin, to Davis, California—the *Vector Van* was piloted by a German graduate student who had just received her driver’s license, with a high school intern as copilot. That same year, we initiated a cooperative agreement with Carolina Biological Supply Company to develop reagents and kits to accompany the *DNA Science* curriculum.

It is worth mentioning that I was hired by Jim Watson to start the CSHL public affairs and development efforts, so I regarded the burgeoning education program as an advanced form of public relations. Jim supported my moonlighting because he knew it was time for the Laboratory to take the lead in fostering “DNA literacy” among the general public—just as it had led the way with professional scientists. This was a bold move at a time when high-level scientists, here and elsewhere, were expected to concentrate solely on their research.

By fall of 1986, four staff members—myself, Sue Lauter, Ellen Skaggs, and Mark Bloom—were crammed into two offices on the main floor of Grace Auditorium (now the Meetings and Courses office), from which we ran a frenetic fusion of public affairs, development, and educational outreach. Our modicum of success was not lost on Jim, who concluded that the time had quickly come for the education program to conform to his dictum of organizational evolution: “You get bigger, or you get smaller.” He determined that we should take over an excessed elementary school on Main Street and convert it into a DNA museum. Of course, none of us really understood what this might entail, and I braced to answer tough questions when a proposal was brought to the Board of Trustees for discussion. But then Dave Botstein, outspoken chairman of biochemistry at Stanford University, rose to champion the proposal—and the scientific trustees

fell in strongly behind him. However, the notion of a stodgy museum was roundly disdained, and all felt much better with the friendlier concept of a learning center.

With Fran Roberts paving the way with the Board of Education, we forged ahead with a lease/option to buy the neo-Georgian-style building from the Cold Spring Harbor School system. Beautiful on the outside, it had been subdivided into a warren of temporary offices. It charmingly retained all of the original features from its construction in 1925, including pint-sized toilets and a multipurpose auditorium with a proscenium stage and two basketball hoops. One small problem: We had no hard cash to pay the rent, let alone to convert this antique building into a habitat for high-level science.

With the help of CSHL Trustees, our luck turned in the spring of 1987. Mary Jeanne and Henry Harris called from a golf outing to say that they would make a major gift to help pay for the first six month's rent. Dave Luke worked behind the scenes to help us obtain core support from the Josiah Macy Foundation. We also achieved our first National Science Foundation (NSF) grant, acquired a second *Vector Van*, and conducted summer workshops at 14 locations around the country.

In the fall of 1987, we began to renovate the building. Emblematic of our goal to be a “hands-on” science center, a 32-seat lab was the first space renovated. In the spring of 1988, we conducted the first lab field trips during which students cut and separated viral DNA or inserted an antibiotic resistance gene into bacteria. Soon, I was driving a 24-foot truck back and forth between Washington, D.C., loading and unloading pieces of an exhibit, “The Search for Life,” which we had borrowed from the Smithsonian Institution's National Museum of American History. The exhibit's intricate system of aluminum trusses and theatrical lights occupied the entire front hall, gym/auditorium, and two of four original classrooms. For a time, I had to crawl on all fours under exhibitry to get to my office. Then, there were artifacts ranging from Audrey, the man-eating plant from the *Little Shop of Horrors*, to a recreation of the lab bench at which Stanley Cohen constructed the first recombinant DNA molecule. Against all odds, everything was in place for the official opening of the DNA Learning Center on September 18, 1988.

The rest, as they say, is history. Since that initial grant in 1987, we have maintained continuous NSF support, and we have been lucky to have had the help of numerous prestigious funders—including the National Institutes of Health (NIH), Howard Hughes Medical Institute (HHMI), William Randolph Hearst Foundation, Dana Foundation, William & Flora Hewlett Foundation, Burroughs-Wellcome Fund, Amgen Foundation, OSI Pharmaceuticals, and Pall Corporation. Major private donors—notably Helen and Charles Dolan, Claire and Ralph Landau, Laurie Landeau, Edward Chernoff, Doris and Peter Tilles, Sandra and Stephen Lessing, and Joan and Arthur Spiro—provided funds to reconstruct every corner of our fine old building and to assemble our first endowment. Together, these people and institutions have provided more than \$30 million in support.

During the last 20 years, the DNALC has conducted experiments with a third of a million students—without fanfare or incident—proving the safety of DNA manipulation methods. Our *DNA Science* curriculum and kits provided by the Carolina Biological Supply Company brought modern DNA manipulation to millions more high school and college students. The DNALC's model for hands-on learning, *Vector Vans*, and local equipment-sharing have been replicated by numerous science centers, mobile vans, and “footlocker” programs in the United States and elsewhere. Thus, like its parent, Cold Spring Harbor Laboratory, the DNALC has projected a reputation that is considerably larger than its absolute size.

In retrospect, it seems improbable that we would have so successfully negotiated the risks of infancy and adolescence to emerge as a mature organization. Frankly, I doubt we could have reproduced this success elsewhere. Like others at CSHL, we clung tightly to the coattails of Jim Watson in the whirlwind of excitement he created for DNA, and we learned from Liz Watson that proper houses of science are rooted in our own history. Much of our success has flowed from the minds of Cold Spring Harbor Laboratory's scientists, who have shared with us their labs, their methods, and their infectious optimism. With their continued help, I suppose that our little center will survive another 20 years.

## **BioMedia Studio**

A two-storey addition, completed in spring 2001, more than doubled the size of the DNALC. Included in the addition is the *BioMedia Center*, on the second floor, which has provided a purpose-built space to develop internet materials for biology education. Unfortunately, money ran out on the construction project, so for 7 years the western end of the addition remained an unfinished “attic” clogged with broken computers, excess lab equipment, exhibit parts, and even a life-size model of a New Guinea tribesman. A gift from CSHL trustee Laurie Landeau has allowed us to clear out the attic and finally complete this 1000-square-foot studio space as originally intended. On November 1, we celebrated our 20<sup>th</sup> anniversary with the opening of the *Laurie J. Landeau Multimedia Studio*.

The DNALC internet sites are already distinguished from many other science content sites by their extensive use of video, totaling nearly 20 hours of interviews with more than 200 scientists. Two new internet projects—*Genes to Cognition (G2C) Online* and the *iPlant Collaborative*—incorporate an equal volume. Equipped with theatrical lighting and high-definition digital cameras, the *Landeau Studio* will increase the professionalism of the DNALC’s internet multimedia and allow us to embark on new productions. Two Sony XD-Cam high-definition video cameras record on a flash memory card and eliminate the time-consuming step of digitizing recordings made on digital video tape. A camera-mounted LiteRing and Chromatte are the latest advancements of “green-screen” technology, which allows us to edit a new background into the existing video recording. The studio provides three separately lit shooting locations: a desk for news productions, a coffee table and easy chairs for talk formats, and a lab table for experiment demonstrations.

With this infrastructure in place, we can now work with other CSHL departments to take fullest advantage of our unparalleled scientific resource—the more than 8,000 scientists who visit each year to attend meetings and courses. These thought leaders in basic and applied genetics research can be efficiently shuttled for interviews from the main campus or Banbury Center. In addition to adding high-quality video to DNALC and other CSHL internet sites, the studio will provide video-conferencing capability that can keep us in touch with the thousands of teachers who use DNALC methods. It also offers the potential to expand our *DNA Today* concept to provide regular podcasts, vodcasts, and news feeds for the cable industry.

The *Landeau Studio* also includes a video/sound editing room and a conference/green room. This reconfiguration allowed us to redevelop the former conference area as a “living room” for DNALC staff. This stylish space, with a central free-form concrete lunch counter, was conceived by DNALC multimedia designer Eun Sook Jeong, who also has a master’s degree in interior design. Together with the existing design bays and staff offices, the living room and *Landeau Studio* present a unified vision of a multimedia production facility for the 21<sup>st</sup> century.

## ***iPlant Collaborative***

During the past several years, the DNALC has worked with CSHL plant scientists to provide outreach components for a number of research projects funded by the NSF. Several of these projects came under the National Plant Genome Initiative to determine the entire sequence of corn and rice chromosomes. In February, this work culminated in the receipt of a \$2.1 million subaward of a \$50 million consortium grant with the University of Arizona. The project will develop a national computer infrastructure to support plant research. In an allusion to Apple’s success in making computing more personal, the *iPlant Collaborative* aims to develop tools and interfaces that will place large-scale plant data sets and high-powered informatics tools on any scientist’s computer desktop.



Bruce Stillman (left) and James Watson (right) look on as Laurie Landeau cuts the ribbon at the dedication of the *Laurie J. Landeau Multimedia Studio*.



Biosphere II in Arizona made a stunning backdrop to the *iPlant Collaborative Grand Challenge* workshops.

After a spring kickoff symposium at Cold Spring Harbor Laboratory, the *iPlant Collaborative* hosted a series of six workshops for plant and computation researchers to brainstorm “grand challenges” in plant science. These workshops were hosted at Biosphere II, in Arizona, and drew together a multidisciplinary group of computational scientists and researchers working at all levels of plant function and organization: molecular biology, genetics, genomics, biochemistry, cell biology, physiology, plant breeding, systematics, ecology, and evolutionary biology. Beginning in 2009, *Grand Challenge* Teams will work with computer scientists at the University of Arizona and CSHL to develop a cyberinfrastructure of *Discovery Environments*, where plant researchers can share and analyze data in an unprecedented fashion. As a member of the *iPlant* Education, Outreach, and Training (EOT) component, the DNALC will work with each project team to create educational interfaces to the scientific tools and databases. In this way, students and teachers can work with the same data, using the same tools, and at the same time as high-level plant researchers. This will enable students to literally look over the shoulders of plant researchers as they, for example, understand the mechanisms that could enable crop plants to rapidly respond to global climate changes.

DNALC multimedia staff embarked on an ambitious project to help publicize the *iPlant* project and to document the *Grand Challenge* development process. We set up a mini-video studio at the *iPlant* meeting at Cold Spring Harbor Laboratory, at each of six *Grand Challenge* workshops at Biosphere II, and at the American Society of Plant Biology Meeting in Merida, Mexico, conducting a total of 143 interviews with plant and computational biologists. From these, we extracted 538 video clips that present a range of viewpoints on challenges in plant biology, cyberinfrastructure, and education. A video header on the *iPlant* Internet site ([www.iplantcollaborative.org/](http://www.iplantcollaborative.org/)) randomly loads clips or allows one to select specific interviews.

At year’s end, we received approval from *iPlant* management to embark on an EOT demonstration project to develop an educational platform for gene annotation and comparison. Annotation is the process of discovering the biological information in a DNA sequence, viewing genes in the context of a chromosome, and relating them to other organisms. The analysis of DNA sequence entails a number of cumulative steps—assembling short sequences into “contigs,” predicting genes and other functional elements, and merging gene evidence from RNA and other species—which is termed a “pipeline” or “workflow.” Although masses of free DNA and gene data are available, each step of the workflow requires a different tool, and various tools and data sources often are not compatible. Our objective is to develop an easy-to-use interface that will allow students to easily find DNA data and seamlessly move it through several key stages of the annotation pipeline. We envision a desktop object that merges



The video interface at the *iPlant Collaborative* website includes interview clips of 143 plant and computer scientists.



attributes of our *BioServers* ([www.bioservers.org](http://www.bioservers.org)) and *Gene Boy* ([www.dnai.org/geneboy/](http://www.dnai.org/geneboy/)) applications. Sarah Elgin (Washington University in St. Louis), Sue Wessler (University of Georgia), and Steve Slater (University of Wisconsin) are key collaborators on this project.

### ***Genes to Cognition (G2C) Online***

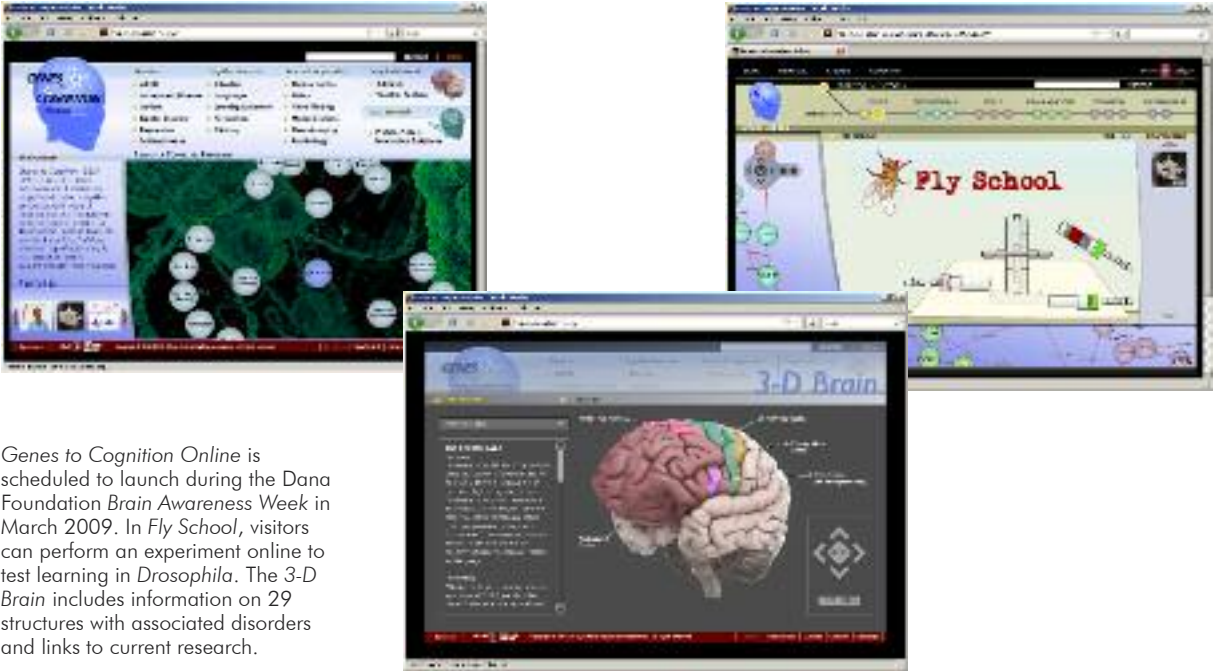
During the year, we pushed to complete *Genes to Cognition (G2C) Online*, our site on modern neuroscience research ([www.g2conline.org](http://www.g2conline.org)). This site allows students to explore how thinking and disorders of thinking result from interactions at various levels of biological function—from genes, to biomolecules, cells, physiology, behavior, and environment. We completed 40 video interviews and demonstrations with neuroscience researchers from the United States and Europe, creating more than 300 new video clips and animations for launch in March 2009. A major goal of *G2C Online* is to increase understanding of the process of science. To this end, we collaborated with researchers at the National Institute of Mental Health to develop three video modules on neuroimaging based on fMRI, MEG, and PET technologies. In these demonstrations, researchers introduce the techniques, guide users through an experiment, and discuss data.

We continued to develop touchstone animations to highlight key concepts of brain science. Following up a recommendation from our Advisory Panel, we collaborated with AXS-3D, a Toronto-based animation studio, to develop a *G2C 3-D Brain*. This interface allows one to rotate a three-dimensional model to explore the structure and function of 29 parts of the human brain. Each structure or region includes information on associated disorders, brain damage, case studies, and links to contemporary research. *Molecules for Memory* was developed to supplement an interview with Nobel Laureate Eric Kandel. In this animation, users can trace the formation of a long-term memory from the generation of presynaptic action potentials, through protein–protein interactions in the postsynaptic neuron, to the formation of new synapses. This animation joins a series of high-value pieces, including the *Neural Code*, a proteomics demonstration; *Memory Lanes*, a demonstration of how cab drivers remember routes; *Gene Knockout*, an explanation of how to alter genes in mice; and the *Fly School* and *Swimming Mice* interactive experiments. In addition to animations and video clips, we have harvested an extensive library of articles from the Dana Foundation and a 300-word glossary.

We also collaborated with Seth Grant’s group at the Wellcome Trust Sanger Institute to develop a protein–protein interaction database (PPID) browser. This is a map tool that allows one to explore a network of 105 proteins involved in synaptic transmission. Clicking on any one of the proteins calls up a customized abstract with links to *G2C Online* content and detailed information (the Allen Brain Atlas, NCBI gene information, and *Ensembl* homology links). The browser bridges the gap between science and education, allowing researchers and students to toggle between technical and popular information about a particular protein.

*G2C Online*’s unique site architecture extends networking software developed at MIT’s *Media Lab*, which displays content as an interlinked network of dimensional content “atoms.” One can browse the network by zooming in and out, following links between adjacent atoms, and clicking on any atom to call up multimedia items. Our three-dimensional network is based on two-dimensional concept maps that were developed from interviews with leading neuroscience researchers. In 2008, we redeveloped our browser software as *Simple Mapper*, which allows users to build their own network maps and then link atoms to online content from *G2C* or other sources. In addition to creating striking network maps, *Simple Mapper* can also be used to generate concept maps to assess student learning.

In the spring, Amy Niselle, a doctoral student from the University of Melbourne, joined the *G2C Online* project to assist with program evaluation. She worked extensively with Danielle Sixsmith to conduct a detailed usability study with 48 Advanced Placement (AP) biology and psychology students. Data were collected on how students interacted with the site, how they accessed relevant content, and how the site helped or hindered learning. Insights from this study led to several important changes in site design and navigation. Notably, we enabled our Flash interface to be controlled by browser back/forward buttons (not a trivial project), and we streamlined text for easy browsing and skim reading.



*Genes to Cognition Online* is scheduled to launch during the Dana Foundation *Brain Awareness Week* in March 2009. In *Fly School*, visitors can perform an experiment online to test learning in *Drosophila*. The *3-D Brain* includes information on 29 structures with associated disorders and links to current research.

### ***Inside Cancer***

With Phase I funding from an NIH Science Education Partnership Award (SEPA), we developed *Inside Cancer* ([www.insidecancer.org](http://www.insidecancer.org)), a multimedia internet resource for understanding the molecular genetic basis of cancer. By focusing on how researchers gain insights into the unseen world of genes and signaling molecules, *Inside Cancer* provides examples of the science process. With Phase II funding, we are implementing a number of improvements that support and extend syllabus-centered teaching. Notably, we disaggregated *Inside Cancer* content by breaking it into individual content “atoms.” Each atom was then entered into a content management system and annotated with metatags, including alignment with national and state educational standards. Using this system, a teacher can identify sets of atoms that illustrate particular content standards or, conversely, collect items that respond to various standards as they browse the site.

We also developed a companion *Teacher Center* that includes standards alignments, as well as a tool that allows teachers to create custom presentations with *Inside Cancer* content, and a wiki for developing and exchanging lesson plans. Faculty Fellows Naomi Cook (Horace Greeley High School), Sue Holt (Life Sciences Learning Center, University of Rochester), and Glen Cochrane (lead biology teacher, Half Hollow Hills High School) developed sample lessons to “seed” the wiki. Naomi spent an extended period at the DNALC adapting multimedia elements from other DNALC sites to expand content at *Inside Cancer*.

### **Maize Internet Sites**

During the year, we collaborated with CSHL researchers Dick McCombie and Doreen Ware, and Rick Myers of Washington University in St. Louis to develop a mini-website describing the NSF-funded Maize Genome Sequencing Project ([www.dnalc.org/maize/maize.html](http://www.dnalc.org/maize/maize.html)). The site features interviews with scientists involved in deciphering the information in the maize genome, a tour of the genome sequencing center at Washington University, an animation of the sequencing and assembly process, and a video tutorial for using the online maize sequence browser.

In the fall, our work in plant education was further bolstered with receipt of an outreach grant from the maize meristem collaboration between CSHL faculty member Marja Timmermans and





The *Weed to Wonder* site will explore how humans change corn and how corn changed human society.

scientists at Cornell University. Under this project, the DNALC will develop a multimedia internet site, *Weed to Wonder*. We will tell the remarkable story of the corn plant's amazing rise—from a common weed, to staple food and religious icon of Native Americans, to modern hybrid cultivar, to versatile and ubiquitous component of processed food, to precursor of clothing and motor fuels, to pharmaceutical factory. *Weed to Wonder* will celebrate this uniquely American success story and provide a case study of the interaction among science, technology, and society (STS). The site will open an internet window on modern research on plant genomes, as well as a time machine back into the social and scientific history of agricultural breeding. The goal will be to show the continuity of research on corn—from Native American agriculturalists to agricultural breeders, corn geneticists,

plant physiologists, and molecular biologists—that has culminated in the Maize Genome Sequencing Project. In parallel with the story of human impact on the evolution of the corn plant, we will also tell the story of corn's impact on human culture.

*Weed to Wonder* will capitalize on the internet's capacity to juxtapose different media, providing options to engage people with different interests and learning styles ("intelligences"). The major site will be complemented by serialized podcasts in audio and video formats. Video interviews will provide contrasting vignettes of people involved with corn at various levels. Researchers will provide understanding of the process of science, and interviews with farmers, historians, and ethnographers will portray corn's role in society. Animations will be especially effective in describing experiments and bringing to life unseen molecular events. Multimedia content will be integrated with online experiments and bioinformatics tools primarily developed by the DNALC with previous NSF funding. A continuum of practical experiments will allow middle school, high school, and beginning college students to progress from classical genetic analysis of kernel traits, through molecular genetic and bioinformatic analysis of mutations, to the examination of genome structure and evolution.

### Internet Visitation

Visits to the DNALC's family of internet sites decreased to 6.06 million in 2008—84% of the previous year's traffic. Although there were fewer visitors, those who came spent more time and accessed more content than in the previous year. Ten of 12 sites saw increases in the average viewing time and served nearly 4,000 gigabytes (4 terabytes) of data, a 23% increase over 2007. *DNA Interactive*, our richest multimedia site, alone served a total of 1.3 terabytes.

As part of a concerted effort to improve visitation, we employed LunaMetrics, a company that specializes in search engine optimization. After analyzing a representative internet site (*Inside Cancer*), the consultants suggested ways to improve our metadata descriptions to make it easier for search engines to index content. Because search engines give preferred rankings to sites with frequent updating, the consultants also suggested adding blogs or news feeds to provide fresh content. We have been using these and other insights to renovate older sites and to guide development of new sites. Many of our popular sites have a linear story line, which makes it difficult for users to find particular multimedia atoms (animations and videos) to answer a specific question or instructional need. We are in the midst of a major project to disaggregate linear content and provide improved metadata so that individual videos and animations can be retrieved via a search, such as *Google* or *Yahoo*. Our new *G2C Online* site was specifically developed as a nonlinear network of atoms with associated metadata.

We continue to get a boost from a grant from Google AdWords, a free advertising program that displays sponsored links on *Google's* search results page. Our AdWords account contains a set of keywords for each DNALC website. A search for one of the keywords displays an ad for a DNALC site as a user "impression," and a "click-through" is logged when a link is followed. *DNA*

	Average visit length	Change from 2007	Average monthly bandwidth (gigabytes)	Visits in 2008	Change from 2007 (percent)
<b>Content-based sites</b>					
<i>Gene Almanac</i>	9:13	+0:40	94.77	1,629,334	-15.28
<i>DNA from the Beginning</i>	9:32	+1:00	37.09	1,302,136	-10.29
<i>Your Genes, Your Health</i>	8:12	+0:32	41.45	805,683	-16.26
<i>DNA Interactive &amp; myDNAi</i>	10:26	+2:02	111.56	1,151,103	-21.15
<i>Image Archive on the American Eugenics Movement</i>	17:46	+1:18	11.55	607,973	-16.93
<i>Inside Cancer</i>	7:18	+0:09	31.35	239,942	+22.33
<i>Inside Cancer Teacher Center</i>	14:45	n.a.	3.03	22,251	n.a.
<b>Laboratory/bioinformatics sites</b>					
<i>BioServers</i>	24:07	+7:57	2.56	135,955	-45.97
<i>Genetic Origins</i>	7:28	+0:24	1.57	102,738	-22.61
<i>Greenomes</i>	3:15	-0:12	0.54	13,312	+40.97
<i>Dynamic Gene</i>	7:18	+0:58	0.34	11,277	+41.21
<i>Silencing Genomes</i>	12:45	+4:34	0.55	29,461	+142.12
<i>DNALC Kits/ Carolina Collaboration</i>	15:18	-0:08	2.34	5,425	+23.41
<b>All sites</b>	<b>9:27</b>			<b>6,059,590</b>	<b>-15.17%</b>

*from the Beginning* is our most successful site on AdWords, logging 5,587,424 impressions and 103,294 click-throughs. In total, DNALC sites registered 13,441,908 impressions and 175,161 click-throughs, valued at \$113,224.

## Faculty Training

During the year, more than 800 educators participated in professional development activities conducted at sites around the United States and Europe. With funding from the NSF, NIH, and the Hewlett Foundation, we collaborated with 14 host institutions to conduct 17 one- to five-day workshops on plant genomics, bioinformatics, cancer biology, RNA interference, and neurobiology. Five of these workshops were conducted at institutions with high proportions of underrepresented minorities, where 19% of participants were African American or Hispanic. Through our HHMI-sponsored collaboration with the New York City Department of Education, 105 teachers participated in workshops at the *Harlem DNA Lab*. An additional 428 educators attended workshops at professional meetings in the United States and Europe that covered topics including neurobiology, bioinformatics, the molecular genetics of taste and smell, detecting genetically modified foods by PCR, DNALC online tools for education, and DNA forensics.

At the end of July, 18 teachers from ten states attended the *Amgen Leadership Symposium in Human and Genomic Biology*. The first two weeks of the symposium included experiments and bioinformatics exercises on RNA interference (RNAi) and genetic modification of plants. Participants explored human genetics by genotyping polymorphic sites in their own DNA: (1) An *Alu* “jumping gene” insertion on chromosome 16 and single-nucleotide polymorphisms (SNPs) in the mitochondrial chromosome were used to study theories of human origins and ancient migration. (2) SNPs in a taste receptor were correlated with the ability to taste the bitter chemical phenylthiocarbamide (PTC). (3) Variations in a repeat region and analysis on a DNA chip illustrated state-of-the-art methods in forensic identification. In the final week, participants worked independently or in groups to develop lesson plans, optimize experimental methods for classroom instruction, screen supermarket foods for genetic modifications, expand bioinformatics exercises, and observe DNALC methods for instructing middle school students.

*Leadership Symposium* educators and DNALC staff pose for a traditional class photo.



We continued to provide leadership training under our long-term collaboration with the Singapore Ministry of Education. Initiated in 2000 with a visit by Minister Teo Chee Hean, the collaboration established licensed DNA learning centers at the Singapore Science Center and National Institute of Education. Two junior college teachers and one high school teacher participated in the summer *Leadership Symposium*, and three elementary school teachers came in November for a 2-week stay. Besides hands-on lab work and preclass preparation, the November contingent observed and co-taught labs alongside DNALC instructors and visited a local elementary school. Each teacher developed a plan for translating their experience into hands-on instruction for Singaporean students.

### **Concluding Two Plant Outreach Projects**

We concluded our collaboration with CSHL researcher Marja Timmermans and Cornell University's Mike Scanlon to encourage underrepresented minorities to teach and study plant genomics. In past summers, two Faculty Fellows spent two weeks working in plant genome labs at CSHL or Cornell and one week working with us at the DNALC. In 2008, we conducted 1.5-day follow-up workshops hosted by Faculty Fellows Gokhan Hacisalihoglu and Diomedee Buzingo at their home institutions—Florida Agricultural & Mechanical University (Tallahassee) and Langston University (Oklahoma). Of the 25 high school and college educators who participated in these workshops, 24% were African American or Hispanic, mirroring their proportion among American residents (2005 census figures). Building on previous three-day workshops at these sites, the follow-ups introduced educators to mobile “footlockers” that include PCR and electrophoresis equipment. Experiments use this equipment to test for genetically modified foods or analyze transposon polymorphisms in maize and Arabidopsis. Participants can borrow the equipment from host institutions for use in their classes, removing a major barrier to the implementation of modern experiments in plant molecular genetics. This project was summarized in an article written by Dr. Hacisalihoglu entitled *An Innovative Plant Genomics and Gene Annotation Program for High School, Community College, and University Faculty* (CBE Life Sci. Educ. 7: 310–316).

We also completed work with Lincoln Stein and Doreen Ware on their NSF-funded *Gramene* project, which provides informatics tools for analyzing and comparing grain genomes. During the project, we developed the internet site *Dynamic Gene* ([www.dynamicgene.org](http://www.dynamicgene.org)) and trained 304 high school and college faculty to use the site to annotate rice genes in their classes. Animated tutorials in the site explain how DNA sequences encode 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 sections of rice chromosomes, annotate predicted genes, and upload their results to compare with classmates or share with researchers. This provides powerful opportunities for students to contribute to science by analyzing up-to-date biological data. This became evident during the fall of 2008, when we used the site with Cold Spring Harbor High School students enrolled in *Genomic Biology*, an advanced course offered at the DNALC. After five hours of instruction using *Apollo* and other online bioinformatics tools, student groups were charged with the task of identifying and evaluating genes in different regions of rice chromosome 1. By analyzing the available evidence, the 17 students were able to improve on the majority of computer-generated gene predictions and many previously annotated genes in a 400,000 base pair region. Remarkably, students were also able to identify four putative genes that had not previously been identified. Thus, we feel that certain novice high school and college students can contribute to our knowledge of gene structure, while gaining first-hand experience in modern bioinformatics.

### Three New Teacher Training Workshops

RNA interference (RNAi) provides a powerful tool to move directly from DNA sequence to the analysis of gene function in living organisms. With Phase II funding from NSF's Course, Curriculum, and Laboratory Improvement (CCLI) program, we expanded our efforts to bring compelling RNAi experiments into college classrooms. Five-day *Silencing Genomes* Workshops were conducted in summer 2008 at Rust College (Holly Springs, Mississippi), Austin Community College (Texas), and the Fralin Biotechnology Center at Virginia Tech (Blacksburg, Virginia). Sixty-three college instructors were trained to perform RNAi in the model eukaryotic organism *Caenorhabditis elegans*. After observing mutant phenotypes and learning basic worm "husbandry," faculty used simple methods to induce RNAi and "single-worm PCR" to examine the mechanism of RNAi—comparing the DNA of worms with identical phenotypes induced by either RNAi or a mutation. They also learned open-ended methods to support student projects, using bioinformatics to identify a target gene and then develop their own RNAi reagents "from scratch."

Using these methods, workshop participants collaborated to develop new targeting vectors designed to silence 40 *C. elegans* genes; these will be supplemented by another 60 vectors to be developed in workshops planned for the summer of 2009. Each vector has been entered into the *Silencing Genomes* Projects page and includes its own evolving record of how it was developed and how it is used by other students and teachers. A collection of bacterial and *C. elegans* strains, including these newly developed reagents, are freely available through our online strain order system. In 2008, 88 strains were sent to teachers in the United States, Thailand, Brazil, Poland, Singapore, and Spain to support teaching the *Silencing Genomes* curriculum, reaching an estimated 2,600 students.

Ninety-two high school and college faculty learned to use internet content on cancer cell biology in health, general biology, and AP biology classes at six *Inside Cancer* workshops. One-day workshops supported through the NIH SEPA program were held at Stowers Institute for Medical Research (Kansas City, Missouri), Midland College (Texas), Fred Hutchinson Cancer Research Center (Seattle, Washington), and Kimmel Cancer Center (Philadelphia, Pennsylvania). Two workshops were also conducted in conjunction with teacher professional conferences: National Association of Biology Teachers (Memphis, Tennessee) and Biolink Southwest Region (Albuquerque, New Mexico).

With the support of the Hewlett Foundation, we instituted a nationwide workshop program to disseminate *G2C Online*.



John Connolly (standing) leads a *G2C Online* educator workshop.

Workshops were held at the DNALC, the Stowers Institute (Kansas City, Missouri), Fred Hutchinson Center (Seattle, Washington), and St. Louis Science Center (Missouri); 61 high school and college educators participated in 1.5-day workshops introducing up-to-date neuroscience research, our library of multimedia items, and interactive experiments. Of these participants, 97% rated workshop content as excellent or good, and mean scores on pre- and post-knowledge tests rose from 6.57 to 8.91.

### ***Harlem DNA Lab***

In 2008, we fulfilled our long-held goal of developing a base of operations to provide underserved schools in New York City (NYC) enrichment opportunities identical to those offered to Long Island's affluent schools. In 2007, NYC Schools Chancellor Joel Klein provided us exclusive use of a 1200-square-foot classroom in the John S. Roberts Educational Complex (JHS 45) in East Harlem. Then, in winter 2007–2008, the Division of School Facilities renovated the space according to our specifications, including our signature student lab desks. With a \$100,000 grant from the Jerome L. Greene Foundation, we purchased equipment for elementary through advanced experiments—from dissecting and compound microscopes to a fast PCR machine and three Agilent Bioanalyzers that allow us to type student polymorphisms in a single 3-hour lab. One area of the lab is specifically designed for assembling footlockers and restocking reagent kits to be used in NYC schools.

Lab field trips began in the spring, and *Harlem DNA Lab* was dedicated on September 23<sup>rd</sup> by NYC Schools Chancellor Joel Klein, Howard Hughes Medical Institute (HHMI) Vice President Peter Bruns, and CSHL President Bruce Stillman. The event was covered in the *New York Post*, and a video piece on NY1 featured students from the Emily Carey School.

Located at John S. Roberts Middle School, at First Avenue and 120<sup>th</sup> Street, *Harlem DNA Lab* offers the same range of high school lab field trips as offered at our Cold Spring Harbor and Lake Success facilities: bacterial transformation, DNA restriction analysis, forensic DNA profiling, and human mitochondrial DNA sequencing. Just over 1,400 students participated in lab field trips in 2008. We extended our popular *Genetics as a Model for Whole Learning* (GMWL) to every John S. Roberts student, providing three labs for each of 375 students in grades 6–8. A grant from the William T. Porter Foundation provided scholarships for John S. Roberts students, as well as 812 students participating in field trips and summer camps.

The capstone event for *Harlem DNA Lab* was the two-week New York State Excelsior Scholars Program, which involved 39 8<sup>th</sup> graders from Manhattan, Queens, and the Bronx. Excelsior Scholars were selected based on standardized test scores that placed them in the top 10% of their science/math



Above: Chancellor Joel Klein was a featured speaker at the *Harlem DNA Lab* opening in September. Right top: Bruce Stillman and Dave Micklos talk with students at the *Harlem DNA Lab* opening. Right bottom: CSHL Trustee Mary Lindsay watches as students spool DNA in a test tube.



classes, teacher recommendations, and personal statements. A week-long *DNA Science* camp provided intensive lab experience for 16 high school students from around New York City.

### **HHMI Teacher Professional Development**

*Harlem DNA Lab* is also the site for a city-wide professional development program funded by HHMI. The goal is to develop a base of teachers who can competently introduce science students to six “targeted” experiments highlighting key techniques in genetics and biotechnology. The experiments embody key concepts and process skills of the New York City *Scope and Sequence for Science*, New York State Science Core Curriculum, AP Biology, and National Science Education Standards.

During the first year of the project, we developed a strong working group composed of DNALC and Department of Education staff, key advisors, and six Faculty Fellows: Greg Borman, lecturer in middle/secondary science education, City University of New York and former science coordinator, Henry Street Middle School, Manhattan; Caren Gough, New York State Science Mentor, consultant, and adjunct faculty, Stony Brook University; Dr. Dahlia McGregor, biology teacher, South Shore High School, Brooklyn; Adrienne Rubin, biology teacher, Eleanor Roosevelt School, Manhattan; Kathleen Rucker, biology teacher, Brooklyn International High School; Jerry Watkins, retired science teacher, Central Islip Union Free School District (UFSD), Long Island.

During the week of August 4–8, the Fellows convened at the DNALC to help develop *Lab Center*, an internet site that specifically supports instruction of the six “targeted labs.” *Lab Center* represents a virtual classroom into which a DNALC staff member enters to make a video introduction to each lab. By clicking on objects on the whiteboard and desk, students can access (1) interactive and PDF versions of each experiment, (2) follow-up activities, (3) scientist interviews, (4) animations, and (5) selected links. Fellows developed formatted lesson plans that include prelab student work, detailed teacher tips, a timeline to complete the lab in 40-minute periods, and creative postlab activities. Their input helps to ensure that each lab builds logical connections between concepts and anticipates use in a variety of classroom settings.

The HHMI project has the aggressive goal of providing 24 hours of certificate training to 200 teachers per year. Thus, in 2008, we devoted considerable effort to developing relationships with key individuals and networks that can help us to recruit teachers. Through our collaboration with the Department of Education, our training schedule and registration materials are posted on major NYC registries for teacher development activities.

### **Visitation and Student Instruction**

Annual visitation reached a new high of 40,485 in 2008. This included 20,043 students who conducted experiments at the DNALC, *DNALC West*, or the *Harlem DNA Lab*, and 8,235 students who received in-school instruction by DNALC staff members. More than half of all experiments were conducted by middle school students under the banner of *GMWL*, which continues to offer quality field trip and in-school programs for students in grades 4–8. In 2008, more than 70 public and private schools were involved in the *GMWL* program.

Summer camps conducted at the DNALC, *DNALC West*, *Harlem DNA Lab*, Central Islip High School, and SUNY Old Westbury drew 921 students. We continued our collaboration with *Project Grad Long Island*, a nonprofit organization that works within economically disadvantaged students to increase high school graduation rates. *Project Grad* provided daily bussing for 22 high school students from the Westbury UFSD to attend a week-long camp at the SUNY Old Westbury campus. This course, which included hands-on experiments on advanced topics in DNA science and human and plant genomics, was supported by a grant from the Keyspan Foundation. Arrow Electronics provided scholarships for four 5<sup>th</sup> grade students from the Westbury UFSD to attend *Fun with DNA* camps at the DNALC. As part of a continuing collaboration with Central Islip School District, Bank of America Long Island funded a *Fun with DNA* camp for 18 students from the Charles Mulligan Elementary School.



In 2008, we continued the *Great Moments in DNA Science* tradition with 425 high school student participants. Dr. Lloyd Trotman talked about the impact of varying PTEN expression levels in mouse models for prostate cancer. Dr. Bill Tansey explained how proteolysis contributes to important events in the cell and how abnormal proteolysis contributes to cancer. Dr. Doreen Ware described her work in understanding plant genome organization, evolution, and diversity. *Saturday DNA!* drew 272 student and adult participants for workshops such as *Survival of the Fittest*, *Cancer: Inside Out*, and *How to Solve a Crime*.

Our collaboration with the Watson School of Biological Sciences continued in 2008 with a large class of 14 graduate students. This rotation provided the graduate students an opportunity to learn skills for communicating with nonbiologists. During 12 half-day sessions, pairs of students worked with expert DNALC instructors to develop presentation methods that can help convey unfamiliar ideas to people of any age or background. In the first phase of training, each student pair “shadowed” a DNALC instructor as he/she taught a middle or high school lab and then developed a lesson plan that integrated their perspectives. In the second phase, each pair worked closely with DNALC instructors to co-teach several labs, developing communication skills and preparing them for independent instruction. During the final phase, each pair was responsible for teaching an entire lab, under the close observation of a DNALC staff member.

### **DNA Sequencing Service**

A unique aspect of the DNALC’s educational portfolio is the free DNA *Sequencing Service* and bioinformatics tools that allow students to analyze a 440-nucleotide portion of their own mitochondrial chromosome. The mitochondrion, the organelle that produces energy for the cell, contains several copies of its own genome; moreover, there are hundreds to thousands of mitochondria per cell. This amplification and the fact that the noncoding (control) region of the mitochondrial genome accumulates mutations quickly make the control region ideal for studies of human evolution and diversity.

Using a kit distributed by Carolina Biological Supply Company, students isolate DNA from cheek cells and then use PCR to amplify the mitochondrial control region. The student samples are then sent by overnight mail to the DNALC, where they are prepared for sequencing by college interns Alina Duvall (Hofstra University) and Jennifer Aiello (Long Island University, C.W. Post Campus). The student samples then go to the CSHL Sequencing Shared Resource Facility in Woodbury, where they are sequenced on an Applied Biosystems 3730xi Genetic Analyzer. Finally, the sequences are uploaded to the *Sequence Server* database at our *BioServers* site (<http://www.bioservers.org>). There, students can view their sequences and use software to align them with mitochondrial sequences from modern humans, ancient humans, primates, and other animals. In this way, they can use their own DNA as a starting point to discover what DNA says about how humans evolved and migrated around the globe.

In 2008, we sequenced 7003 student DNA samples—a 10% increase from 2007. Samples were received from 145 high schools, 36 community colleges, and 71 universities. On average, results were posted on the *BioServers* site within 20 days of receipt. The free service is made possible by the donation of sequencing reagents by Applied Biosystems of Foster City, California.

### **Staff and Interns**

In August, we said goodbye to high school instructor Brian Lang and middle school instructor Lauren Weidler. We will miss them both and wish them continued success as they teach biology—Brian in the North Shore School District and Lauren in the Plainview School District. Instructional vacancies were filled by Jason Williams and Tedi Setton, two Long Island natives. Jason has a bachelor’s degree in biology from SUNY Stony Brook. He worked at CSHL’s main campus, involved in the molecular genetics of plant development in *Arabidopsis* and cancer research. Tedi brings a wealth of knowledge from her undergraduate degree in biological sciences

from Wellesley College and her studies in forensic pathology at the Suffolk County Medical Examiner's Office. Having participated in a *DNA Science* summer workshop as a high school student, Tedi's education came full circle when she led DNA Science as an instructor!

In the fall, we were lucky to recruit Dr. Ileana Rios to head our new *Harlem DNA Lab*. Ileana brings an informed perspective to our effort to bring high-level science to underrepresented students in New York City. Born in Spanish Harlem, only a few blocks from the *Harlem DNA Lab* site, she went on to receive a B.A. in biology from Barnard, a B.S. in cytology from SUNY Health Science Center, and a Ph.D. in molecular biology from CUNY. Her work history spans research in cellular senescence and HIV vaccine development, as well as teaching at the elementary, secondary, and undergraduate levels.

We also welcomed back Dr. Uwe Hilgert after a year's assignment as Assistant Dean of the Watson School of Biological Sciences, where he eased a transition between Deans. Uwe returned to spearhead the DNALC component of the *iPlant* Collaborative and to resume his role as scheduling tsar, maintaining our increasingly complex schedule of teacher training workshops. As a microbiologist, Uwe brings to the *iPlant* position formal training in plant pathology/physiology from the Max-Planck Institute for Plant Breeding and the University of Arizona. He has practical expertise in bioinformatics education, having worked on high school and teacher training under HHMI and NSF grants. He had a key role in developing the DNALC's *Dynamic Gene* Internet site, an interface that allows students to annotate the rice genome sequence. He also knows many of the players in the *iPlant* leadership, having spent his postdoctoral period at the University of Arizona before coming to CSHL in 2000.

Lauren Corrieri, our new Administrative Assistant, is a native Long Islander. After graduating from Adelphi University and working toward a master's degree at Sarah Lawrence College, she gained administrative experience at First Advantage, a firm specializing in insurance investigations. Her duties at the DNALC include greeting visitors, overseeing scheduling, collecting fees, and tracking visitation.

The internship program continues to draw some of Long Island's most talented high school and college students, engaging them in science research and providing practical laboratory experience. We were pleased to accept a large group of new high school interns this year: Dylan Assael (Syosset), Michelle Bobrow (Great Neck South), Nancy Desai (Hicksville), Utkarsh Sahay (North Shore), Yasmina Macer (Portledge), Andrew Malmgren (Massapequa), Anastasia Minkin (Oyster Bay), Emily Troge (Our Lady of Mercy), Kaitlin Watrud (Commack), and Kevin Wu (Jericho). Returning interns were Charmaine Brown (Westbury), Rachel Gellerman (Cold Spring Harbor), Stephanie Parascandolo (Half Hollow Hills), and Arielle Scardino (Kings Park). Many of our interns continued to invest their DNALC experience in their own research. Arielle Scardino (Kings Park) worked with Jermel Watkins to explore how a decreased expression of certain mitochondrial genes can be used as a biomarker for neuromuscular dysfunction.

We bid farewell to interns Seth Schortz, who started at Emory University, and Benjamin Blond, who started at Yale University. Former high school interns Nick Wilkin (Ithaca College) and Janice Yong (Boston University) returned to help out during college breaks. Lauren Thompson (Barnard College) again returned to assist with summer workshops at DNALC *West*.

College intern Jennifer Aiello (C.W. Post University) continued to effectively manage our free *DNA Sequencing Service*. She also called on her major in forensic science to help create a popular family workshop for *Saturday DNA! Dig This!*, a hands-on introduction to forensic anthropology.



New staff at the DNALC in 2008 (left to right): Lauren Corrieri, Tedi Setton (standing), Ileana Rios, and Jason Williams

*David A. Micklos, Executive Director*

## 2008 GRANTS

<i>Grantor</i>	<i>Program</i>	<i>Duration of Grant</i>	<i>2008 Funding+</i>
<b>FEDERAL GRANTS</b>			
National Institutes of Health	Science Education Partnership Award (SEPA): Nationwide Dissemination of <i>Inside Cancer</i>	8/07-7/09	\$140,653
National Science Foundation	Course, Curriculum, and Laboratory Instruction (CCLI) Program: Nationwide Dissemination of RNAi Curriculum	9/07-8/09	132,740
National Science Foundation	Plant Genome Initiative Educational Outreach: Construction and Nationwide Dissemination of <i>Dynamic Gene</i> Internet Site	12/05-11/08	3,939
AAAS/NSF	National Science Digital Library: Meta-tagging DNALC Internet Content for BiosciEdNet	10/05-9/09	71,469
Washington University/NSF	Plant Genome Initiative Educational Outreach: Multimedia Materials on Maize Genome Sequencing	11/05-10/08	15,611
Cornell University/NSF	Plant Genome Initiative Educational Outreach: Minority Fellows & Regional Plant Genomics Footlockers	9/08-8/09	13,114
University of Arizona	Cyberinfrastructure for the Biological Sciences	2/08-1/09	237,904
<b>NONFEDERAL GRANTS</b>			
Amgen Foundation	Amgen Leadership Symposium	4/05-12/08	\$106,469
Dana Foundation	<i>Genes to Cognition (G2C) Online</i> Internet Site Development	10/04-12/08	265,552
Dialog Gentechnik	DNALC Licensing	2008	24,975
Hewlett Foundation	<i>Genes to Cognition (G2C) Online</i> Internet Site Evaluation	10/05-10/09	86,702
HHMI Foundation	Pre-College Science Education Initiative: NYC Teacher Training	9/07-8/09	136,971
New York State Education Department	Excelsior Scholars Program for 7 <sup>th</sup> grade Math & Science students	5/08-10/08	42,794
North Shore-LIJ Health System	DNALC West Operating Support	2008	50,000
Porter Foundation	Scholarships for Minority and Disadvantaged Students	3/08-3/10	425

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

Bellmore-Merrick Central High SD	1,500	Locust Valley Central SD	1,500
Bethpage Union Free SD	1,500	Long Beach City SD	1,500
Commack Union Free SD	3,000	Massapequa Union Free SD	1,500
East Meadow Union Free SD	1,500	North Shore Central SD	1,500
Elwood Union Free SD	1,500	Oyster Bay-East Norwich SD	3,000
Fordham Preparatory School	1,500	Plainview-Old Bethpage Central SD	1,500
Garden City Union Free SD	1,500	Port Washington Union Free SD	1,500
Great Neck Union Free SD	1,500	Ramaz School	1,500
Half Hollow Hills Central SD	3,000	Sachem Central SD	1,500
Harborfields Central SD	1,500	South Huntington Union Free SD	1,500
Herricks Union Free SD	3,000	Syosset Central SD	1,500
Huntington Union Free SD	1,500	West Hempstead Union Free SD	1,500
Island Trees Union Free SD	1,500	Yeshiva University High School for Girls	1,500
Jericho Union Free SD	1,500		

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

Amityville Union Free SD	1,200	Mott Hall V, NYC	2,400
Bay Shore Union Free SD	5,100	North Bellmore Union Free SD	3,300
Bellmore Union Free SD	2,000	North Shore Hebrew Academy	1,000
Bellmore-Merrick Central HS District	17,000	Northport-East Northport Union Free SD	1,600
Commack Union Free SD	5,875	Oceanside Union Free SD	1,500
Deer Park Union Free SD	1,200	Old Westbury School of the Holy Child	3,250
East Meadow Union Free SD	2,550	Oratory School of Summit	1,200
Elwood Union Free SD	4,200	Oyster Bay – East Norwich Central SD	2,500
Floral Park – Bellerose Union Free SD	6,750	Plainview- Old Bethpage Central SD	3,500
Friends Academy, Locust Valley	2,350	Roberto Clemente Middle School, MD	3,740
Garden City Union Free SD	3,700	Rockville Centre Union Free SD	5,400
Great Neck Union Free SD	16,500	Roslyn Union Free SD	3,600
Grover Cleveland Middle School, NJ	1,200	Scarsdale Union Free SD	9,600
Half Hollow Hills Central SD	7,125	St. Dominic Elementary School, Oyster Bay	4,050
Herricks Union Free SD	2,400	St. Edward the Confessor School, Syosset	2,025
Holy Family Regional School, Commack	1,500	St. Isidore School, Riverhead	1,200
Huntington Union Free SD	6,800	St. Joseph School, Garden City	1,000
Kings Park Central SD	1,137	Syosset Central SD	33,100
Lindernhurst Union Free SD	1,000	Three Village Central SD	6,000
Locust Valley Central SD	11,650	Trinity Lutheran School, Northport	1,000
Long Beach City SD	1,200	United Federation of Teachers School, NYC	2,000
Merrick Union Free SD	2,700	Yeshiva Darchei Torah	1,600
MS 447 Math and Science Exploratory School, NY	5,000	Yeshiva of Flatbush	1,100



## 2008 Workshops, Meetings, and Collaborations

January 4	Site visit by Debra Berhans, Canisius College, Buffalo, New York
January 7	Site visit by Leo Brizuela, Agilent Technologies, Inc., Melville, New York
January 10	Watson School Orientation and Welcome Reception, DNALC
January 12	<i>Saturday DNA!</i> , "Survival of the Fittest" and "Blame it on the Brain," DNALC
January 14	Meeting with Steve Barkanic, Gates Foundation, Washington, D.C.
January 16	Site visit by William Fair, Juliette Morgan, and Connie Hildesley, Alexandria Real Estate Equities, New York
January 17	Site visit by Scott Bronson, Mel Morris, and Ken White, Brookhaven National Laboratory, Upton, New York
January 18–19	NSF <i>Dynamic Gene</i> Workshop, Salk Institute for Biological Studies, San Diego, California
January 26	American Museum of Natural History Workshop, "Discovering the Tree of Life," New York
February 5	DNALC Education Committee Meeting, DNALC
February 6	Site visit by David Widmer, Long Island Radio Group, Farmingdale, New York
February 6	Site visit by Lorraine Aycok and Monica Cavallo, Bank of America, Melville, New York
February 7	Site visit by Katherine Charleston Colgate, Callisto Pharmaceuticals, New York
February 7–8	BEN Collaborators Meeting, AAAS Headquarters, Washington, D.C.
February 9	<i>Saturday DNA!</i> , "Superbugs Uncovered" and "Immuno Exploration," DNALC
February 11	Site visit by G2C Online Fellow Laura Maitland, AP psychology Consultant
February 19	Site visit by G2C Online Fellow Laura Maitland, AP psychology Consultant
February 21	Site visit by G2C Online Fellow Caren Gough, Education Consultant
February 27	Human DNA Fingerprinting Laboratory, members of DNALC Corporate Advisory Board, DNALC
March 5	Science Fair at John S. Roberts Educational Complex, East Harlem, New York
March 5	PBS filming of DNALC instructors for documentary, WLIW Teaching and Learning Celebration, <i>Harlem DNA Lab</i> , East Harlem, New York
March 5	Site visit by Marilyn Simons and staff, Simons Foundation, New York
March 6	Site visit by Gail Bennington, Garden City Science Curriculum Coordinator; Adele Cacotti, AP Teacher, Garden City High School; Steve Gordon, Science Research Teacher; and 25 Singaporean research students
March 7	Meeting with Bill Fair and Connie Hildesley, Alexandria Real Estate Equities, New York
March 7–8	WNYC and WLIW Teaching and Learning Celebration, New York
March 11	Meeting with Phillip Griffiths, Carnegie Corporation of New York and Institute for Advanced Study Commission on Math and Science Education, New York
March 12–13	Hewlett Foundation Grantee Meeting, Carnegie Mellon University, Pittsburg, Pennsylvania
March 13	New York Department of Education Science Leadership Team Meeting, CUNY, New York
March 15	<i>Saturday DNA!</i> , "Living in the Gene Age: Chronicles & Frontiers" and "Gram-tastic!," DNALC
March 19	Presentation for Science Supervisors' Association of New York City, American Museum of Natural History, New York
March 19	Meeting with Richard Kahan, Urban Assembly, and Mort Slater, Gateway Institute for Higher Education, New York
March 19	Meeting with Jose Maldonado and Sam Silverstein, Columbia Secondary School for Math, Science, and Engineering, New York
March 19	Site visit by Babylon High School science faculty
March 21	Site visit by G2C Online Fellow Caren Gough, Education Consultant
March 21	Site visit by Bob Wheeler, Pine Creek High School, Colorado Springs, Colorado, and Brenda Dempsey, Castle View High School, Castle Rock, Colorado
March 21–22	NSF <i>Plant Molecular Genetics and Genomics</i> Follow-up Workshop, Florida Agricultural & Mechanical University, Tallahassee, Florida
March 25	Westbury School District teacher training, DNALC
March 26	Site visit by Alister Jones and Bronwen Cowie, School of Education, University of Waikato, New Zealand
March 27	Open House, <i>Harlem DNA Lab</i> , East Harlem, New York
March 27–29	National Science Teachers Association Workshops, Boston, Massachusetts
April 7–9	NSF <i>iPlant Collaborative</i> interviews at the iPlant Inaugural Conference: Bringing Plant and Computing Scientists Together to Solve <i>Grand Challenges</i> , CSHL
April 7–June 13	Internship by Amy Niselle, graduate student, Melbourne, Australia, <i>DNA Interactive</i> & G2C Online, DNALC
April 11	NIH <i>Inside Cancer</i> Workshop, Biolink Southwest Regional Meeting, Albuquerque, New Mexico
April 12	<i>Saturday DNA!</i> , "The Mystery of Anastasia Romanov" and "Inside Cancer," DNALC
April 12	Science Council of New York City Conference, Stuyvesant High School, Brooklyn, New York
April 15	Open House, <i>Harlem DNA Lab</i> , East Harlem, New York
April 14–16	Westbury School District teacher training, Westbury, New York
April 17	G2C Online interview with Josh Dubnau, CSHL
April 18	Site visit by Lucio Pinto, Director, Tronchetti Foundation, Milan, Italy
April 22	Wellcome Trust Sanger Institute review of National Science Learning Center, York, United Kingdom
April 24	Site visit to Wellcome Trust Sanger Institute, Cambridge, United Kingdom
April 25	Site visit by Long Island Pulse magazine science fantasy contest winner, Gloria Schramm
April 29	<i>Great Moments in DNA Science</i> Honors Seminar: "Mutate Me Once, Permit a Tumor; Mutate Me Twice, Inhibit," Lloyd Trotman, CSHL
May 1	Site visit by Hisao Izawa, President, Nikon Instruments Worldwide; Lee Shuett, CAB Board Member, Executive VP Nikon; and Yoichi Kasahara, Planning General Manager, Nikon
May 8	Site visit by Ann McDermott-Kave, Director, OSI Foundation; Morgan Browne, Chairman, OSI Foundation; and David Epstein, DNALC CAB member and OSI vice president of oncology

May 8 G2C Online Interview with Josh Dubnau, CSHL  
 May 8–9 NSF *Dynamic Gene* Workshop in Gene Annotation, *Harlem DNA Lab*, East Harlem, New York  
 May 10 *Saturday DNA!*, “Survival of the Fittest” and “A Billion Little Pieces,” DNALC  
 May 13 *Great Moments in DNA Science Honors Seminar: “Protein Demolition: Taking Control by Taking Apart,”* Bill Tansey, CSHL  
 May 17 Oyster Bay Health and Science Fair, Oyster Bay, New York  
 May 19–21 NIH SEPA Principal Investigators Meeting, Rockville, Maryland  
 May 27 *Great Moments in DNA Science Honors Seminar: “Genotype to Phenotype: A Closer Look at Plant Genomics,”* by Doreen Ware, CSHL  
 May 27 Site visit by Amy Sanders, Project Manager, Darwin 200, Wellcome Trust  
 May 28 Site visit by Vinford Mentar, JP Morgan Chase Global Philanthropy, New York  
 June 2–6 NSF *Silencing Genomes* Workshop, Rust College, Holly Springs, Mississippi  
 June 4 Site visit by Grey Ruegamer, New York Giants football team  
 June 7 Howard Hughes Medical Institute Fellows Meeting, DNALC  
 June 9 Site visit by Kidgie Williams, Hospitality Committee for United Nations Delegations, Inc., and United Nations delegates’ family members, New York  
 June 9–13 Site visit by G2C Online Fellow Caren Gough, Education Consultant  
 June 11 Site visit by Rut Premsrirut, CSHL, and Michael Rialdy, Indonesia  
 June 12 Site visit by G2C Online Fellow Laura Maitland, AP psychology Consultant  
 June 12 Site visit by Tom Burrish, Provost, University of Notre Dame; William Doyle, Sr., Director of Development; Tom Gibbons, Regional Director of Development, New York Metro; and John Passarelli, Notre Dame Alumni and Board Member, DNALC  
 June 14 *Saturday DNA!*, “Cancer: Inside Out” and “Human Evolution and mtDNA,” DNALC  
 June 17 Fifteenth Annual Golf Tournament, Piping Rock Country Club, Locust Valley, New York  
 June 20–21 NSF *Plant Molecular Genetics and Genomics* Follow-up Workshop, Langston, Oklahoma  
 June 26 Site visit by Alfred Goldberg, Professor, Harvard Medical School and former CSHL URP (1961), of the Porter Foundation  
 June 27–July 2 American Association of Plant Biologists, Plant Biology 2008, Mérida, Mexico  
 June 30–July 3 *Fun with DNA* Workshop, DNALC  
*Fun with DNA* Workshop, DNALC West  
*Fun with DNA* Workshop, Central Islip  
*World of Enzymes* Workshop, DNALC  
*Plant Genomics* Workshop, DNALC  
 July 1 Site visit by Miriam Cortes-Caminero, Director of Marketing, Laboratory Technologies, Inc., Maple Park, Illinois  
 July 2–8 G2C Online interviews with Jeff Lichtman, Harvard University; Ken Kotic, University of California, Santa Barbara; James Eberwine, University of Pennsylvania; Rusty Lansford, California Institute of Technology; and Pierre Marie Lledo, Pasteur Institute, Paris, France, CSHL  
 July 7–11 *Fun with DNA* Workshop, DNALC  
*Green Genes* Workshop, DNALC  
*DNA Science* Workshop, DNALC  
*DNA Science* Workshop, *Harlem DNA Lab*  
*World of Enzymes* Workshop, DNALC West  
*Genomic Biology* Workshop, Central Islip  
 July 11–15 International Congress of Genetics, Berlin, Germany  
 July 14 G2C Online interviews with Anil Malhotra, North Shore Long Island Jewish Hospital, and David Skuse, University College, London, England, CSHL  
 July 14–18 *World of Enzymes* Workshop, DNALC  
*Genetic Horizons* Workshop, DNALC  
*DNA Science* Workshop, DNALC West  
 July 14–August 1 Amgen *Leadership Symposium*, DNALC  
 July 15 G2C Online interview with Sarah Blakemore, University College, London, United Kingdom, CSHL  
 July 17 Site visit by Molloy College students, Pat Mason, Group Leader  
 July 17 Site visit by Coleman Fung, Founder, Open Link Financial Inc., Uniondale, New York  
 July 17–18 G2C Online interviews with Allen Moore, University of Exeter, England; Christian Keyzers, BCN Neuroimaging Center, Groningen, The Netherlands; and Larry Young, Emory University, Atlanta, Georgia, CSHL  
 July 19 G2C Online interview with Thomas Insel, National Institute of Mental Health, Bethesda, Maryland  
 July 21–25 *Fun with DNA* Workshop, DNALC  
*Human Genomics* Workshop, DNALC  
*DNA Science* Workshop, United Way/Project Grad with Westbury Public Schools, Hofstra University, Westbury, New York  
*Green Genes* Workshop, DNALC West  
*DNA Science* Workshop, Central Islip, New York  
 July 24 G2C Online interview with Wayne Drevets, National Institute of Mental Health, Bethesda, Maryland  
 July 24 G2C Online interviews with Kay Redfield Jamison and James Potash, Johns Hopkins University, Baltimore, Maryland  
 July 25 G2C Online interviews with Johan Jansma, Richard Coppola, and Wayne Drevets, National Institute of Mental Health, Bethesda, Maryland

July 28–August 1 *Fun with DNA Workshop, DNALC West*  
*World of Enzymes Workshop, DNALC*  
*Green Genes Workshop, DNALC*

August 4–8 *Fun with DNA Workshop, DNALC*  
*World of Enzymes Workshop, DNALC West*  
*Genetic Horizons Workshop, DNALC*  
*DNA Science Workshop, DNALC*

August 4–8 Site visit by HHMI Fellows Caren Gough, Jerry Watkins, Greg Borman, Dahlia McGregor, Kathleen Rucker, and Adrienne Rubin for Harlem Professional Development

August 4–8 NSF *Silencing Genomes Workshop*, Fralin Biotechnology Center, Virginia Tech, Blacksburg, Virginia

August 7 Site visit by Zaven Khachaturian, Ph.D., President and CEO, and Ara Khachaturian, Ph.D., Chief Program Officer, Lou Ruvo Brain Institute & Keep Memory Alive, Las Vegas, Nevada

August 7 Site visit by 17 math and science teachers, The New York Center for Teacher Development, Inc.

August 11–15 *World of Enzymes Workshop, DNALC*  
*Green Genes Workshop, DNALC*  
*DNA Science Workshop, DNALC*  
*DNA Science Workshop, DNALC West*  
*Excelsior Scholars Workshop, Harlem DNA Lab*

August 13–15 NSF Course, Curriculum, and Laboratory Improvement Program, Principal Investigators Conference, Washington, D.C.

August 15 *G2C Online Presentation*, American Psychological Association, Boston, Massachusetts

August 18–22 *Fun with DNA Workshop, DNALC*  
*Genetic Horizons Workshop, DNALC*  
*DNA Science Workshop, DNALC*  
*Human Genomics Workshop, DNALC West*  
*Excelsior Scholars Workshop, Harlem DNA Lab*

August 18–22 NSF *Silencing Genomes Workshop*, Biolink Texas (Austin Community College), Austin, Texas

August 22 Site visit by Taiwan Delegation: Fuh-Sheng Shieu, Huann-Shyang Lin, Sue-Joan Chang, Horn-Jiunn Sheen, Ching-Yang Chou, Yu-Chie Wang, Tzong-Ming Wu, Sung-Tao Li, Ching-Mei Tang, Yen-Hung Pan, and Ching-Jiun Lee

August 25–29 *World of Enzymes Workshop, DNALC*  
*Green Genes Workshop, DNALC*  
*Genetic Horizons Workshop, DNALC West*  
*DNA Science Workshop, DNALC*  
*DNA Science Workshop, Harlem DNA Lab*

August 26 Site visit by Adele Smithers-Fornaci, President, The Christopher D. Smithers Foundation, Inc., Mill Neck, New York

August 29 Site visit by Richard Gelfond, President of IMAX; Pamela Gelfond, Yale graduate; and Claudia Gelfond, Dalton School graduate

August 29 Site visit by William Mak, Hong Kong Biotechnology Education Resource Center, Hong Kong University

September 4–5 NSF Review, Research Coordination Network, Arlington, Virginia

September 14–15 Site visit to Genome Sequencing Center, Washington University, St. Louis, Missouri

September 17–18 Site visit by Martha Narro and Lisa Howells, NSF *iPlant* Collaborative

September 18–19 *G2C Online Workshop*, Stowers Institute for Medical Research, Kansas City, Missouri

September 20 NIH *Inside Cancer Workshop*, Stowers Institute for Medical Research, Kansas City, Missouri

September 23 Dedication of *Harlem DNA Lab*, East Harlem, New York

September 24 *G2C Online* interviews with Ellen Leibenluft, Danny Pine, Judy Rapaport, and Phil Shaw, National Institute of Mental Health, Bethesda, Maryland

September 25 Site visit and presentation of grant award by Lorraine Aycok, Vice President, Market Development Manager, and Monica Cavallo, Market Development Specialist, Bank of America of LI

September 25 Presentation of *Harlem DNA Lab* programs, NYC Department of Education's Citywide Science Leadership Team, Wave Hill, Bronx, New York

September 26 Site visit by *G2C Online* Teaching Fellow Bob Keltos

September 27 HHMI Professional Development Program for NYC DOE Teachers, seminar on "DNA Structure and Isolation," *Harlem DNA Lab*, East Harlem, New York

Sept 30–Oct 3 NSF *iPlant* Collaborative *Grand Challenge Workshops* Mechanistic Basis of Plant Adaptation and Impact of Climate Change on Plant Productivity Biosphere 2, University of Arizona, Tucson

October 3–4 *G2C Online Workshop, DNALC*

October 4 HHMI Professional Development seminar "Transformation and Protein Isolation," *Harlem DNA Lab*, East Harlem, New York

October 8 Cold Spring Harbor High School Partnership Program commences

October 9 Public School meeting, McMain Secondary School, New Orleans, Louisiana

October 10–11 *G2C Online* Fellows Meeting, DNALC

October 14 HHMI Professional Development seminar, "Transformation and Protein Isolation," *Harlem DNA Lab*, East Harlem, New York

October 15 NIH *Inside Cancer Workshop*, National Association of Biology Teachers Professional Development Conference, Memphis, Tennessee

October 16 Site visit by Piero Beneditti and 18 students, Natural Science Museum, Sardinia, Italy



- October 16 G2C *Online* Presentation, National Association of Biology Teachers Professional Development Conference, Memphis, Tennessee
- October 18 NIH *Inside Cancer* Workshop, Midland College, Midland, Texas
- October 24 Site visit and tour for Dorota Koczevska, Director of Mathematics and Science, District 75/Citywide Program, New York
- October 25 HHMI Professional Development Seminar, "DNA Analysis and Forensics," *Harlem DNA Lab*, East Harlem, New York
- October 25 *Saturday DNA!*, "How to Solve a Crime," DNALC
- October 29 NY1 Interview by health reporter Kafi Drexel of Emily Carey School of students visiting *Harlem DNA Lab*, East Harlem, New York
- Oct 31–Nov 1 G2C *Online* Workshop, Fred Hutchinson Cancer Research Center, Seattle, Washington
- November 1 Dedication of The Laurie J. Landeau Multimedia Studio and DNALC 20th Anniversary Celebration, DNALC
- November 2 NIH *Inside Cancer* Workshop, Fred Hutchinson Cancer Research Center, Seattle, Washington
- November 4 HHMI Professional Development Seminar, "Using Genetics to Engage and Accelerate Student Learners," *Harlem DNA Lab*, East Harlem, New York
- November 6 Site visit by Caren Gough, Teaching Fellow, G2C *Online*
- November 7 NIH *Inside Cancer* Workshop, Kimmel Cancer Center, Philadelphia, Pennsylvania
- November 7–8 Forensic DNA Workshop, for Biology Teachers of New Jersey, NABT, DNALC
- November 7–10 NSF *iPlant Collaborative Grand Challenge* Workshop, Developing Common Mechanistic Models for the Plant Sciences, Biosphere 2, University of Arizona, Tucson
- November 8 HHMI Professional Development Seminar, "Variability & Inheritance," *Harlem DNA Lab*, East Harlem, New York
- November 10 HHMI Professional Development Seminar, "DNA Analysis & Forensics," *Harlem DNA Lab*, East Harlem, New York
- November 14 HHMI Professional Development Seminar, "PCR and Human DNA Variations, Part One," *Harlem DNA Lab*, East Harlem, New York
- November 14–15 G2C *Online* Workshop, St. Louis Science Center, St. Louis, Missouri
- November 15 *Saturday DNA!*, "GMO IQ," DNALC
- November 16–18 G2C *Online* Interviews with Rene Anand, Ohio University; Brian Bacskai, Harvard University; Randy Blakely, Vanderbilt University; Kalanit Grill-Spector, Stanford University; Todd Sacktor, State University of New York Downstate Medical Center, Brooklyn; Donna Wilcock, Duke University; Abraham Zangen, Weismann Institute of Science, Israel; Tallie Z. Baram and Nicole Gage, University of California, Irvine; John J. Mann, Columbia University; Lisa Monteggia, University of Texas Southwestern Medical Center; Dennis Selkoe, Harvard University; Gul Dolen, Massachusetts Institute of Technology; Helen Myberg, Emory University; Bruce McEwen, The Rockefeller University; and Simona Spinelli, National Institute of Health, at The Society for Neuroscience Annual Meeting, Washington, D.C.
- November 19–23 NSF *iPlant Collaborative Grand Challenge* Workshop, Assembling the Tree of Life to Enable the Plant Sciences, Biosphere 2, University of Arizona, Tucson
- November 20 G2C *Online* Presentation, National Science Teachers Association Meeting, Portland, Oregon
- November 22 HHMI Professional Development Seminar, "PCR and Human DNA Variations, Part One," *Harlem DNA Lab*, East Harlem, New York
- November 24 Team Temasel, Singapore, hosted by Briarcliff Manor High School, *Harlem DNA Lab*, East Harlem, New York
- Nov 30–Dec 13 Singapore Primary Teachers Attachment, DNALC
- December 1 G2C *Online* Advisory Panel Meeting, DNALC
- December 4 G2C *Online* Presentation, National Science Teachers Association Meeting, Cincinnati, Ohio
- December 4 Site visit by Andrew Tasker, Champalimaud Foundation, Lisbon, Portugal
- December 6 HHMI Professional Development Seminar, "Transformation and Protein Isolation," *Harlem DNA Lab*, East Harlem, New York
- December 8 HHMI Professional Development Seminar, "PCR and Human DNA Variations, Part Two," *Harlem DNA Lab*, East Harlem, New York
- December 8 Site visit by Belgian Delegation: Geert Schelstraete, Jo Decuyper, Sofie Stoop, Jo De Wachter, Imke Debecker, Ann Van Gysel, and Jan Wauters
- December 8 Cold Spring Harbor High School Partnership Program Student Debate, DNALC
- December 10 Northern Manhattan Coalition for Math and Science, *Harlem DNA Lab*, East Harlem, New York
- December 12 HHMI Professional Development Seminar, "Engaging Level One and Level Two Student Learners," *Harlem DNA Lab*, East Harlem, New York
- December 13 *Saturday DNA!*, "Dig This," DNALC
- December 15–17 NSF *iPlant Collaborative Grand Challenge* Workshop, Computational Morphodynamics, Biosphere 2, University of Arizona, Tucson
- December 15 Site visit by Mike Scanlon, Cornell University, Ithaca, New York
- December 18 NYC DOE Science Specialists, *Harlem DNA Lab*, East Harlem, New York
- December 20 HHMI Professional Development Seminar, "DNA Analysis and Forensics," *Harlem DNA Lab*, East Harlem, New York
- December 30 Site visit by NAACP ACT-SO (Afro-Academic, Cultural, Technological, and Scientific Olympics)

## Sites of Major Faculty Workshops 1985–2007

Key:	<i>Middle School</i>	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		<b>California State University, Fullerton</b>	<b>2000</b>
		<b>California Institute of Technology, Pasadena</b>	<b>2007</b>
		Canada College, Redwood City	1997
		City College of San Francisco	2006
		Contra Costa County Office of Education, Pleasant Hill	2002
		<b>Foothill College, Los Altos Hills</b>	<b>1997</b>
		Harbor-UCLA Research & Education Institute, Torrance	2003
		<b>Los Angeles Biomedical Research Institute (LA BioMed), Torrance</b>	<b>2006</b>
		Laney College, Oakland	1999
		Lutheran University, Thousand Oaks	1999
		<b>Pierce College, Los Angeles</b>	<b>1998</b>
		Salk Institute for Biological Studies, La Jolla	2001, 2008
		<b>San Francisco State University</b>	<b>1991</b>
		<b>San Jose State University</b>	<b>2005</b>
		University of California, Davis	1986
		<b>University of California, Northridge</b>	<b>1993</b>
COLORADO		Aspen Science Center	2006
		Colorado College, Colorado Springs	1994, 2007
		<b>United States Air Force Academy, Colorado Springs</b>	<b>1995</b>
		University of Colorado, Denver	1998
CONNECTICUT		Choate Rosemary Hall, Wallingford	1987
FLORIDA		Armwood Senior High School, Tampa	1991
		Florida Agricultural & Mechanical University, Tallahassee	2007–2008
		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
		<b>Morehouse College, Atlanta</b>	<b>1991, 1996–1997</b>
HAWAII		Kamehameha Secondary School, Honolulu	1990
IDAHO		University of Idaho, Moscow	1994
ILLINOIS		Argonne National Laboratory	1986–1987
		<b>University of Chicago</b>	<b>1992, 1997</b>
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
		Jefferson Parish Public Schools, Harvey	1990
LOUISIANA		John McDonogh High School, New Orleans	1993
		Bates College, Lewiston	1995
MAINE		Foundation for Blood Research, Scarborough	2002
		Annapolis Senior High School	1989
MARYLAND		Frederick Cancer Research Center, Frederick	1995
		McDonogh School, Baltimore	1988
		Montgomery County Public Schools	1990–1992
		National Center for Biotechnology Information, Bethesda	2002
		<i>St. John's College, Annapolis</i>	1991
		<b>University of Maryland, School of Medicine, Baltimore</b>	<b>1999</b>
		Beverly High School	1986
		Biogen, Cambridge	2002
MASSACHUSETTS		<b>Boston University</b>	<b>1994, 1996</b>
		CityLab, Boston University School of Medicine	1997
		Dover-Sherborn High School, Dover	1989

MASSACHUSETTS (cont)	Randolph High School	1988
	The 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	2006–2008
MISSOURI	St. Louis Science Center, St. Louis	2008
	Stowers Institute for Medical Research, Kansas City	2002, 2008
	<b>Washington University, St. Louis</b>	<b>1989, 1997</b>
NEVADA	University of Nevada, Reno	1992
NEW HAMPSHIRE	<b>New Hampshire Community Technical College, Portsmouth</b>	<b>1999</b>
	St. Paul's School, Concord	1986–1987
NEW JERSEY	Coriell Institute for Medical Research, Camden	2003
NEW MEXICO	Biolink Southwest Regional Meeting, Albuquerque	2008
NEW YORK	Albany High School	1987
	American Museum of Natural History, New York	2007
	Bronx High School of Science	1987
	Canisius College, Buffalo	2007
	Cold Spring Harbor High School	1985, 1987
	<b>Columbia University, New York</b>	<b>1993</b>
	<b>Cornell University, Ithaca</b>	<b>2005</b>
	<i>DeWitt Middle School, Ithaca</i>	1991, 1993
	DNA Learning Center	1988–1995, 2001–04, 2006–2008
	<b>DNA Learning Center</b>	<b>1990, 1992, 1995, 2000</b>
	<i>DNA Learning Center</i>	1990–1992
	DNA Learning Center West	2005
	<i>Fostertown School, Newburgh</i>	1991
	<i>Harlem DNA Lab, East Harlem</i>	2008
	Huntington High School	1986
	Irvington High School	1986
	<i>Junior High School 263, Brooklyn</i>	1991
	<i>Lindenhurst Junior High School</i>	1991
	Mt. Sinai School of Medicine, New York	1997
	New York City Department of Education	2007
	<b>New York Institute of Technology, New York</b>	<b>2006</b>
	New York Institute of Technology, New York	2006
	<i>Orchard Park Junior High School</i>	1991
	<i>Plainview-Old Bethpage Middle School</i>	1991
	State University of New York, Purchase	1989
	State University of New York, Stony Brook	1987–1990
	Stuyvesant High School, New York	1998–1999
The Rockefeller University, New York	2003	
<i>Titusville Middle School, Poughkeepsie</i>	1991, 1993	
Trudeau Institute, Saranac Lake	2001	
Union College, Schenectady	2004	
<b>United States Military Academy, West Point</b>	<b>1996</b>	
Wheatley School, Old Westbury	1985	
NORTH CAROLINA	CIIT Centers for Health Research, 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
	Langston University, Langston	2008
OKLAHOMA	North Westerville High School	1990
	<b>Oklahoma City Community College</b>	<b>2000</b>
	Oklahoma City Community College	2006–2007
OREGON	Oklahoma Medical Research Foundation, Oklahoma City	2001
	Oklahoma School of Science and Math, Oklahoma City	1994
	Kaiser Permanente Center for Health Research, Portland	2003



PENNSYLVANIA	Duquesne University, Pittsburgh	1988
	Germantown Academy	1988
SOUTH CAROLINA	Kimmel Cancer Center, Philadelphia	2008
	<b>Clemson University, Clemson</b>	<b>2004</b>
	Medical University of South Carolina, Charleston	1988
TENNESSEE	<b>University of South Carolina, Columbia</b>	<b>1988</b>
	NABT Professional Development Conference, Memphis	2008
TEXAS	Austin Community College—Eastview Campus, Austin	2007–2008
	Austin Community College—Rio Grande Campus	2000
	J.J. Pearce High School, Richardson	1990
	Langham Creek High School, Houston	1991
	Midland College, Midland	2008
	Southwest Foundation for Biomedical Research, San Antonio	2002
	Taft High School, San Antonio	1991
	Texas A&M, Agricultural Research and Extension Center, Weslaco	2007
	<b>Trinity University, San Antonio</b>	<b>1994</b>
	<b>University of Texas, Austin</b>	<b>1999, 2004</b>
UTAH	University of Utah, Salt Lake City	1993
	<b>University of Utah, Salt Lake City</b>	<b>1998, 2000</b>
	<b>Utah Valley State College, Orem</b>	<b>2007</b>
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
	<b>Virginia Polytechnic Institute and State University, Blacksburg</b>	<b>2005, 2008</b>
	Fred Hutchinson Cancer Research Center, Seattle	1999, 2001, 2008
WASHINGTON	<b>University of Washington, Seattle</b>	<b>1993, 1998</b>
WASHINGTON, D.C	<b>Howard University</b>	<b>1992, 1996</b>
WEST VIRGINIA	Bethany College	1989
WISCONSIN	Blood Center of Southeastern Wisconsin, Milwaukee	2003
	<b>Madison Area Technical College</b>	<b>1999</b>
	Marquette University, Milwaukee	1986–1987
	University of Wisconsin, Madison	1988–1989
	<b>University of Wisconsin, Madison</b>	<b>2004</b>
WYOMING	University of Wyoming, Laramie	1991
AUSTRALIA	Walter and Eliza Hall Institute and University of Melbourne	1996
AUSTRIA	<b>Vienna Open Lab</b>	<b>2007</b>
CANADA	Red River Community College, Winnipeg, Manitoba	1989
GERMANY	Urania Science Center, Berlin	2008
ITALY	Porto Conte Research and Training Laboratories, Alghero	1993
	International Institute of Genetics and Biophysics, Naples	1996
MEXICO	ASPB Plant Biology, Mérida	2008
PANAMA	<b>University of Panama, Panama City</b>	<b>1994</b>
PUERTO RICO	University of Puerto Rico, Mayaguez	1992
	<b>University of Puerto Rico, Mayaguez</b>	<b>1992</b>
	<b>University of Puerto Rico, Rio Piedras</b>	<b>1993</b>
	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	
	Uppsala University, Uppsala	2000

## **Expert Advisors and Corporate Support**

We are lucky to have high-level support from two advisory bodies: the Education 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 conducted its annual fund campaign and golf tournament, raising \$275,000.

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*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](mailto:dnalc@cshl.edu)

Visit us on the Internet at **[www.dnalc.org](http://www.dnalc.org)**