

Cold Spring Harbor Laboratory's

DNA Learning Center

Annual Report 1996



ANNUAL REPORT 1996

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In 1989, we first brought local 5th and 6th grade students into our *Bio2000* Teaching Laboratory for a summer genetics camp, entitled *Fun With DNA*. That educational experiment tested the notion of whether or not young students are capable of understanding the Gene Age that they will inherit. The answer can be found in our 1996 visitation statistics – for the first time, middle school students (grades 5-8) replaced high school students as the DNALC's largest clientele for lab instruction.

A 1990 grant from the National Science Foundation supported our first organized effort to train middle-school faculty. A 1991 grant from the Hearst Foundation allowed us to recruit elementary educators Jane Conigliaro and Diane Jedlicka and to begin to rigorously implement programs for Long Island schools. Our first goal was to establish a substantial summer camp program – including *Fun With DNA* and its follow-up, *World of Enzymes*. Portledge School was added as a summer camp site to provide easier access for students from Nassau County. With later support from the Howard Hughes Medical Institute and the Barker Welfare Foundation, summer camps were conducted for minority students from Manhattan at the American Museum of Natural History and A. Philip Randolph High School.

Genetics as a Model for Whole Learning was initiated in 1992 as the umbrella for our middle school activities. The program provides DNALC staff support to help school systems implement a selection of laboratories from the *Fun With DNA* and *World of Enzymes* camps. The object is to train 5th and 6th grade classroom teachers to use genetics as the hub of an across-discipline network to link science with math, social studies, current events, and language arts. *Genetics as a Model for Whole Learning* incorporates numerous educational features that are compatible with national and local science standards:

- age-appropriate instruction according to cognitive development
- principles from current research on learning and memory
- progressive sequencing of activities (constructivism)
- discovery approach accommodates a variety of learning styles (visual, auditory, tactile)
- interdisciplinary approach accommodates multiple intelligence types
- cooperative learning and problem solving
- active learning and creative behaviors

- metaphorical and associative learning
- science as a way of looking at the world and solving problems
- skills and strategies for life-long learning
- the museum as a school
- research technology and equipment
- applying content expertise to analysis of current issues and ethical decision-making
- introducing new career opportunities

Thus far, we have implemented the program in 12 member districts of the Curriculum Study Program. The logistics of setting up and running independent *Genetics as a Model for Whole Learning* programs at so many distant sites is extremely complex. DNA Learning Center staff meet with the district administrators and classroom teachers to design a customized program – ranging from intensive instruction for several classes to a briefer exposure for all students in a grade level. DNA Learning Center staff then provide 10-15 days of faculty training and in-school instruction. Over a 2-3 year period, teachers become comfortable with the curriculum and implement their own customized units – typically culminating with a laboratory field trip to the DNALC. Equipment and supplies for several different laboratories are transported between schools. Logistics became even more complex this year, when we added 10 elementary/middle schools in Community School District 29, near Kennedy Airport, and Corlears Junior High School in Chinatown. All tolled, the 1996 program involved 5,045 students and 138 teachers in 38 schools.



Above: Andrew Morotti instructs students in the *Genetics as a Model for Whole Learning* Program. Right: Students examine fruit fly mutations with a compound microscope.



An Historic Opportunity to Resynthesize Early Biology Education

The response to *Genetics as a Model for Whole Learning* has been almost overwhelming. Word of the program is now spreading in the New York metropolitan area, and we have a waiting list of districts interested in joining the program when space becomes available. The program is also attracting the interest of educators in other parts of the country. With donations from Tom White, Research Vice President of Roche Molecular Systems, Jane Conigliaro has conducted *Fun With DNA* and *World of Enzymes* camps for the Point Arena School District in Mendocino County, California. High school faculty trained through our National Science Foundation *Leadership Institute* (1993-95) have provided in-service training in genetics for approximately 1,000 elementary/middle school faculty and initiated summer camp programs in several states.

The demand for high quality science instruction for younger students was further accelerated by the long-awaited publication this year of the National Science Education Standards. This document challenges school districts nationwide to provide all precollege students with hands-on, minds-on experiences that encourage critical thinking in science. The Science Standards, in combination with two educational trends, should specifically focus attention on the 6th grade as the major objective in the battle to build a genetically literate populace. First, school restructuring is moving 6th-grade classes out of the elementary school and into the middle school. With this move, 6th-grade teachers, accustomed to teaching all subjects with the same class all day, now are forced to specialize by content area. Some must make the conversion to science teacher, even though the typical K-6 certification received by most teachers has virtually no science requirements. Second, the New York City School Board recently decreed that life science should be moved to the 6th grade, followed by physical science in the 7th grade and earth science in the 8th.

Thus, in the nation's largest metropolitan area, we are seeing a whole generation of 6th-grade teachers who need retraining for their new roles as life science teachers. This is an historic opportunity to start afresh with an entirely new curriculum that views life processes through the lens of genetics. This would immediately bring early biology education into line with modern research. Students rising into high school with higher expectations in biology would, in turn, force more sweeping changes in entrenched high school curricula. *Genetics as a Model for Whole Learning* takes a large step in this direction, and at the same time builds upon former classroom teachers' strengths in reading and across-discipline integration.

Renewed Support from the Hearst Foundation

With this opportunity ahead of us, we were pleased to receive news at year's end of a \$100,000 grant from the Hearst Foundation to support the further expansion of *Genetics as a Model for Whole Learning*. Hearst support will be used to take the curriculum from its current photocopied, notebook form to a published text. In addition to hands-on laboratories and supporting discussion, the formalized curriculum will include a fully elaborated "case study" of human growth hormone, based on our exhibit, *Story of a Gene*. A teacher's guide will include student learning objectives, content connections, lab prep, and answers to questions. The lab text will be augmented by multimedia learning materials –

including the Genetic Computer Arcade and Internet-accessible support. The DNA Learning Center's track record for producing articulate, well-timed, and user-friendly texts – plus established contacts in the publishing industry – should help us identify a suitable publishing partner.

With formalization of the curriculum, we will be prepared to initiate a national training program based upon dissemination methods developed with National Science Foundation support over the last decade. Teacher training will utilize our nationwide network of university and precollege collaborators with whom we have organized teacher training in the past and who are committed to modeling new approaches to genetics instruction. We will especially target institutions that have received precollege education grants from the Howard Hughes Medical Institute, which encourages collaborations between grantees. Piggybacking onto established precollege programs makes cost-effective use of existing infrastructures for reaching teachers, interacting with school decision-makers, and providing ongoing teacher follow-up and support. Hearst support will also be used to foster linkages between high schools with existing laboratory programs and elementary/middle schools that are implementing *Genetics as a Model for Whole Learning*. In this way, elementary through high school faculty can collaborate to establish sequenced instruction that incorporates hands-on learning about genetics at several stages in child and adolescent development.

Strategic Alliances to Reach to Minority and Disadvantaged Students

We have always been honest about our efforts to contribute solutions to the problems of providing excellent science education for minority and disadvantaged students. Our location among wealthy villages of Long Island's "Gold Coast" puts the the largest numbers of needy students at least a half-hour commute from our center. To defeat this distance problem, we have attempted to develop strategic alliances that allow us to have a presence in less affluent areas of metropolitan New York. In 1996, we initiated key collaborations to better reach minority and disadvantaged students in Brooklyn and Queens – the two boroughs of New York City that are physically located on Long Island.

Especially satisfying has been the development of a close collaboration with Dr. Mort Slater, who directs Gateway to Higher Education, a program of the City University of New York Medical School to stimulate minority achievement in science. Dr. Slater operates student science enrichment programs serving 1,500 students at five New York City High Schools: Brooklyn Technical, Erasmus Hall, Jamaica, Fort Richmond, Queens Gateway, and John F. Kennedy. Dr. Slater's uncanny ability to find ways around the arcane bureaucracy of New York City Public Schools is the perfect complement to our content expertise in modern biology. Thus, working together with Principal Lee McCaskill, Assistant Principal Andrea Canner, and Science Teacher Judy Cohen, we have been able to establish a modern DNA Laboratory at Brooklyn Tech. One of New York City's three specialized science high schools with competitive admission, Brooklyn Tech has recently begun to broaden its scope beyond its traditional engineering emphasis. The DNA Laboratory will immediately upgrade biology instruction, allowing implementation of the recommended molecular genetics laboratories in seven Advanced Placement Biology classes in spring 1997 and a molecular genetics elective in the 1997-98 academic year.

Equally important has been a growing collaboration with Community

School District 29, a public school system in Queens serving 25,000 students in grades K-8. Located immediately to the north of Kennedy Airport, District 29 serves a population that is 95% minority, where two-thirds of students are eligible for lunch assistance and 31% have limited English proficiency. Working closely with Superintendent Celestine Miller, Director of Funded Programs Ellen Schlesinger, and Supervisor of Science Diane Erhlich, we began the large-scale implementation of *Genetics as a Model for Whole Learning*. The initial year's program involved 24 days of in-school instruction and 30 field trips to the DNALC that involved 1,000 students. Again joining forces with Dr. Slater, we intend to establish a genetics laboratory at the district's new Gifted and Talented Academy for Arts and Sciences at Intermediate School 59. The new laboratories at Brooklyn Tech and IS 59 will provide a large-scale test of integrated genetics instruction developed and tested in the mini-districts of Long Island's north shore. The laboratories will serve as satellite learning centers from which we can extend student enrichment and faculty development to schools throughout Brooklyn and Queens.

Students from Community School District 29 during a visit to the Learning Center.



We have devoted considerable resources to Central Islip School District, located in the middle of Long Island. With a population composed of equal parts Black, Hispanic, and White students, Central Islip represents the changing face of urban America. Here, we have assisted science teacher Jerry Watkins to develop an advanced biology program that mirrors those offered by larger or wealthier districts. Jerry offers a molecular genetics elective during the academic year and a summer research program. In 1996, he also taught two sessions of *DNA Science* at the American Museum of Natural History. At the middle school level, Lynn Casdia continues to teach summer camps based on *Fun With DNA* and *World of Enzymes*.

Our *Bio2000* Laboratory Has Reached Capacity

We have always considered the *Bio2000* Laboratory the heart of our operation. It was the first space renovated and opened for student instruction in spring 1988, six months in advance of our official opening. It has remained in continuous operation since that time – even during major building renovations that closed the remainder of public facilities in 1993-94. We began operation with a morning lab session for high school students, which became fully booked within a year. An afternoon session was added for middle school students in 1991. This year, a 30% increase was achieved by adding a second afternoon session

on Monday and Friday. Now, with double or triple booking virtually every school day between October 1 and June 15, we can honestly say that the *Bio2000* Laboratory has reached saturation. Although, we can likely increase in-school instruction considerably over the next year, this will be extremely hard on staff and will also increase demand for field trips to the DNALC. Thus, further significant expansion of laboratory experiences must await the hoped-for *BioMedia* Addition to the south of our building.

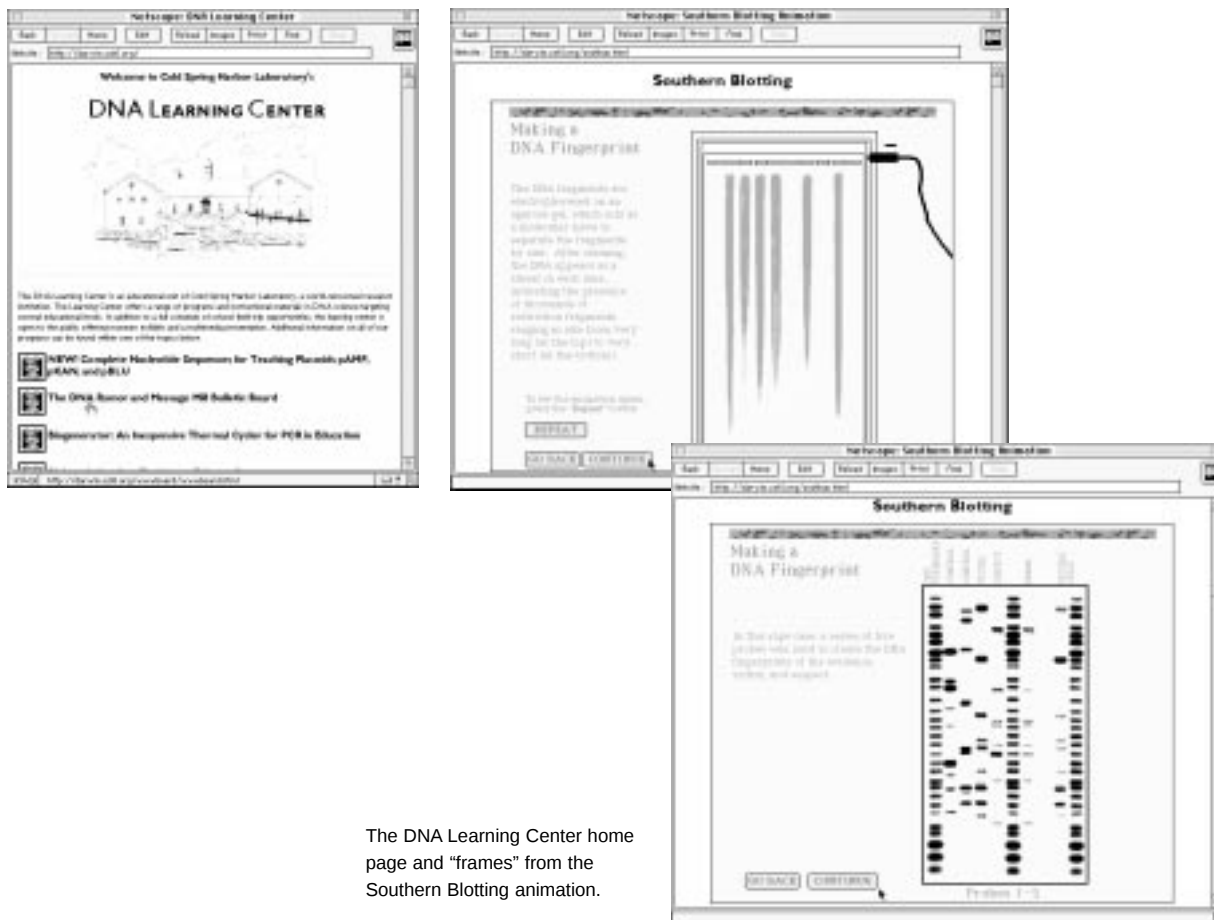
The DNALC teaching facilities were also fully occupied throughout the summer months. Laboratory workshops were offered at four levels: *Fun With DNA* (5th-8th grade), *World of Enzymes* (6th-8th grade), *DNA Science* (9th-12th grade), and *Advanced DNA Science* (10th-12th grade). Sue Lauter initiated a new course, *Introduction to Computer Design*, held in the *BioMedia* Laboratory. Demand for summer instruction remained high, with 338 students participating at courses held at the DNALC, as well as in the Beckman teaching labs on the main CSHL campus and at Portledge School in Locust Valley. Support from the Howard Hughes Medical Institute and the Barker Welfare Foundation allowed us to extend opportunities for 99 students to attend courses conducted at venues in New York City: the American Museum of Natural History and A. Philip Randolph High School. Significantly, minority students composed 40% of summer workshop participants.

It is also worth noting that during 1996 we saw our 100,000th visitor. While this would be a yearly or even quarterly statistic for a large science center, the numbers alone don't tell the whole story. We are extremely proud of the fact that more than half of our clientele has received an intensive laboratory experience that goes well beyond the standard museum visit. A student lab exposure at the DNALC averages two hours, while off-site instruction averages six hours per student. Workshops average 30 hours of instruction.

With the opening of our own World Wide Web site (<http://darwin.cshl.org>), we can now count "virtual" visitors among our clientele. By year's end the site was receiving about 10,000 "hits" per month, including visitors from over 50 countries. We quickly deployed substantial animations of molecular genetic processes, using newly-released Shockwave compression software. The current animations, showing DNA analysis by polymerase chain reaction and Southern blotting, are the most popular stops at our site. These animations are a unique resource for understanding dynamic molecular events and cannot be found elsewhere. We intend to greatly expand our animation gallery in 1997.

DNA Learning Center Visitation 1988-1996

	1988	1989	1990	1991	1992	1993	1994	1995	1996	Total
Student Labs (on-site)	2,031	3,753	3,758	4,248	4,624	3,422	3,961	4,682	6,088	36,567
Student Labs (off-site)				291	435	1,305	1,434	2,328	5,045	10,838
Teacher Labs	58	278	270	234	270	254	302	379	302	2,357
Student Workshops	32	13	24	176	234	351	361	503	437	2,131
Teacher Workshops	<u>496</u>	<u>285</u>	<u>314</u>	<u>333</u>	<u>441</u>	<u>249</u>	<u>177</u>	<u>101</u>	<u>151</u>	<u>2,547</u>
Lab Subtotal	2,617	4,329	4,366	5,282	6,004	5,581	6,235	7,993	12,023	54,430
Student Lectures	553	449	660	600	1,000	734	575	520	575	5,666
Exhibit/LI Discovery	<u>3,231</u>	<u>2,547</u>	<u>2,964</u>	<u>1,480</u>	<u>848</u>	<u>6,416</u>	<u>9,943</u>	<u>10,366</u>	<u>10,122</u>	<u>47,917</u>
Total	6,401	7,325	7,990	7,362	7,852	12,731	16,753	18,879	22,720	108,013



Cablevision's multimedia production, *Long Island Discovery*, continued as a popular attraction, drawing over 10,000 viewers. The 12th annual *Great Moments in DNA Science* Honors Student Seminar Series drew 575 local students and teachers. Speakers and topics were:

- Jan Witkowski, Cold Spring Harbor Laboratory, "The New Human Genetics."
- Robert DeSalle, American Museum of Natural History, "The Science of Jurassic Park."
- Scott Lowe, Cold Spring Harbor Laboratory, "Cancer and Cell Suicide."

Teacher Training Workshops Bear Brunt of Shift in NSF Funding

With support from the National Science Foundation (NSF) and the Howard Hughes Medical Institute, we continued our effort to make human DNA fingerprinting by polymerase chain reaction (PCR) practical for widespread use in biology classes. The *Human Genome Diversity - Student Allele Database* is a mini-lab unit based on an experiment from our *Laboratory DNA Science* book that allows students to examine their own DNA polymorphisms. During the academic year, Mark Bloom and collaborator John Kruper (now at Allegheny College) introduced the unit to 98 college faculty through a series of four NSF-

sponsored workshops held at the United States Military Academy (West Point, NY); Howard University (Washington, DC); CityLab (Boston University, MA); and Morehouse College (Atlanta, GA).

The program is based on an *Alu* insertion polymorphism, an example of a “jumping gene” that has amplified itself to over 500,000 copies in the human genome. A small subset of *Alu* insertions have occurred recently in our evolutionary past and can be used as biological clocks to study human origins. Students can use their own allelic data to conduct a case study in population genetics. The data can be manipulated using *Student Allele Database* software developed by the DNALC and the University of Chicago. Accessible via the Internet, the *Student Allele Database* allows students to tabulate *Alu* insertion data, test Hardy-Weinberg equilibrium and compare two populations by contingency chi-square and genetic distance. The database includes *Alu* allele frequencies from relic populations around the world and from nearly 900 students who have performed the experiment at the DNALC. Additional data sets are being added by the classes of faculty trained through the NSF program.

The DNALC continued its international leadership in 1996, conducting teacher workshops in Australia and Italy. In January, Dave Micklos traveled to Melbourne to conduct a *DNA Science* Workshop that drew 50 secondary teachers from throughout Victoria, Australia. The course was jointly organized by Suzanne Cory, director of the Walter and Eliza Hall Institute, and James Pittard, Chairman of the Microbiology Department at the University of Melbourne. A May course on “DNA Amplification and Genetic Diversity,” sponsored by the Porto Conte Foundation, introduced the *Student Allele Database* project to 20 secondary teachers from the Naples area. The workshop was organized by our collaborator Marcello Siniscalco and Giuseppe Martini, of the International Institute of Genetics and Biophysics.

It was with some nostalgia that Dave Micklos conducted *DNA Science* Institutes at Eastern Mennonite University (Harrisonburg, VA) and the University of Alaska (Fairbanks), concluding a 10-year NSF training program for high school biology teachers. *DNA Science* is the nation’s longest-running training program in molecular genetics for high school faculty, and has been in continuous operation since its founding in 1985. DNALC staff have instructed more

The precursor of the published text, *DNA Science*. The Vector Van, pictured “on-the-road,” transported all equipment and supplies necessary to instruct the *DNA Science* curriculum.



than 1,500 faculty at institutes in 38 states and Puerto Rico, and an estimated 2,000 additional faculty nationwide have been trained by other academic groups using the *DNA Science* curriculum. Thus, there is good reason to believe that the *DNA Science* curriculum has been the major training mechanism to introduce precollege biology teachers to DNA manipulation techniques. But this achievement seemed for naught when we received word at year's end that, after two successive proposal attempts, NSF would not renew support for the *DNA Science* program. We were very lucky to have maintained NSF support over an entire decade, considering that 3-5 year funding is the norm. The DNALC's high school training was always an anomaly in the NSF portfolio – we were the only program funded explicitly to take faculty training to distant sites in other states. In that sense we always led a fragile existence.

The DNALC's training programs developed in an era when NSF supported training programs were operated by individual investigators at major universities and research institutions. However, several years ago NSF initiated a major program of "systemic initiatives" – multi-million dollar awards to state and urban education authorities. While the theory of improving science education within a whole school system is attractive, many see these as essentially redundant entitlement funding to educational bureaucracies that have shown little ability to innovate or improve themselves. By year's end, NSF had even gone to the extreme measure of rescinding funds for initiatives in the District of Columbia, Florida, and North Carolina. NSF cited a "crisis in leadership" in these school systems, but many see the systemic program as a leadership failure at NSF.

However history ultimately judges the systemic initiatives, the net effect has been to virtually eliminate funding of innovative, independent programs. Furthermore, representatives from systemic initiatives have become the dominant voice in NSF panels that review prospective grant proposals. The tenor of current reviews is antipathetic to programs, such as ours, that deal with advanced topics or appeal to well-prepared teachers. Even so, we are among the few genetics education programs in the nation that has managed to maintain a reasonable level of federal funding during this difficult period.

Corporate Advisory Board is Key to Our Continued Success

Five years ago, funding from the National Science Foundation (NSF) and other federal agencies contributed nearly half of DNALC operating revenues. Federal funding dropped to 25% of 1996 costs. Thankfully, over the last several years, the DNALC has expanded funding from its local educational activities and from Long Island contributors to cover about half of annual operating costs. This strong base of local support allows us to weather periodic changes in federal funding and explore new grant opportunities. The Corporate Advisory Board (CAB) has become the key element of our local funding picture, involving an ever-growing number of local companies in the DNALC's mission to educate local students. CAB members include individual philanthropists and business leaders representing a range of Long Island companies.

The year began with the good news that John Leahy had assumed the CAB chairmanship. John is Senior Vice President at Chase Manhattan Bank, a long-time supporter of CSHL. Under the leadership of John and CSHL Special Projects Coordinator Laura Hundt, the DNALC annual fund drive reached \$147,000, a 10% increase over 1995. Horst Saalbach and golf committee



John Leahy addresses CAB members and guests at Long Island Business Night in October.

members organized the third annual golf tournament, held at Piping Rock Club on June 18th, which contributed \$83,500 toward the annual fund goal. The golf committee included Vincent Adimando, Andrew Ackerman, Howard Blankmann, Gerald Brennan, G. Morgan Browne, Richard Catalano, Clark Gillies, Arthur Herman, John Kean, and William Keen. Long Island Business Night, on October 6th, was another highlight of the calendar – as CAB members and guests were entertained by CSHL President James Watson and his wife Elizabeth at their home, Ballybung.

Opening of McClintock Exhibit Completes DNALC Renovation

On September 20th, we opened a new exhibit, “World of Barbara McClintock,” to commemorate the life and work of Cold Spring Harbor Laboratory’s most celebrated female scientist. The opening marked the completion of our long-term effort to remodel our 1925 school building as a modern science center.

The exhibit recreates Barbara’s laboratory in the basement of Demerec Building at the time of her death in 1992. Since she was frugal and she relied on little scientific equipment other than a microscope, her laboratory contained items that spanned her entire career at Cold Spring Harbor. Many articles date to her first laboratory in the Mouse House (now McClintock Laboratory), in which she worked until 1953. A timeline chronicles her childhood in Hartford and Brooklyn, her education at Cornell, and her scientific work at the California Institute of Technology and the University of Missouri, as well as Cold Spring Harbor. Her Nobel-winning discovery of transposable genetic elements is described in a computer animation. Her 1983 Nobel prize is displayed, along with her Nobel Lecture – one of the few videotapes of her available.



The McClintock gallery is painted to simulate the cinder block walls in the Demerec Building laboratory in which she worked. The life model was commissioned from Third Dimension, Ltd., in Vancouver.



The most eye-catching, and controversial, part of the exhibit is a life model of Barbara, based on a photograph from 1947 – six years after she came to Cold Spring Harbor as a summer guest. She is portrayed at work in front of her microscope, which was, in a real sense, her world: “You know, when I look at a cell, I get down in that cell and look around. I found that the more I worked with them, the bigger and bigger [the chromosomes] got. And when I was working with them, I wasn’t outside, I was down there. I was part of the system. I was right down there and everything got big. I was even able to see the integral parts of the chromosome – actually, everything was there. It surprised me, because I actually felt as if I were right down there and these things were my friends.”

Staff and Interns

In summer, we were sorry to say good-bye to part-time laboratory instructor Flavio Della Seta, who finished his postdoctoral stay in Kim Arndt’s lab and returned to his faculty position at the University of Nancy. With the expansion of off-site instruction under the *Genetics as a Model for Whole Learning* Program, Diane Jedlicka and Malissa Hewitt had to cease instructing high school classes in the *Bio2000* Laboratory. To fill this void, we were lucky to obtain the assistance of three additional part-time Laboratory Instructors – Joan Alexander, Scott Bronson, and Michael Greenberg. Joan, who has worked in several CSHL labs, is presently an associate scientist at Amplicon, a new biotechnology company concerned with identifying genes involved in human breast tumors. Scott is a research associate and Mike is a postdoctoral fellow in the laboratory of Jacek Skowronski, which investigates the role of the *nef* protein in HIV pathogenesis.

Andrew Morotti joined the full-time staff in September as Laboratory Instructor, providing key support to the rapidly-growing laboratory program. Andrew was a natural choice for the position, having worked all summer as an instructional intern for the *Fun With DNA* and *World of Enzymes* summer camps. In addition to teaching middle-school labs, both at the DNALC and at participating schools, he also aided Mark Bloom in managing our growing number of high school interns. Andrew has a biology degree from SUNY Plattsburgh. Amy Cross began a part-time position as Program Assistant in August – helping with the complicated scheduling of visits to the DNALC and introducing students to the multimedia program *Long Island Discovery* and the *Story of a Gene* Exhibit. A 1996 graduate of SUNY Geneseo, Amy previously worked for Friends Academy in Locust Valley as a counselor and assistant office manager. Andrew and Amy also helped fill the large administrative hole left when Sue Lauter took maternity leave in September. Sue gave birth to twins, Casey and Martin, on November 14th.

Intern Trevor Carlson (Central Islip High School) contributed heavily to the development of the DNALC home page on the World Wide Web – including Shockwave animations and an interactive bulletin board. The laboratory instructional staff was ably assisted by high school interns Stacey Trotter (Walt Whitman High School), Salley Ann Gibney (Cold Spring Harbor High School), Rachael Neumann (Syosset High School), and Trevor Sammis (Huntington High School). Jermel Watkins, now the senior intern, continued to work part-time at the DNALC while studying pre-med at the New York Institute of Technology. In

fall, we bid farewell to Stacey who began her freshman year at Cornell University and to Salley, who began her freshman year at Johns Hopkins University. Newcomers Hana Mizuno (Cold Spring Harbor High School), Mera Goldman (Walt Whitman High School), Karin Glaizer (Portledge School), Gerry DeGregoris (Chaminade High School), and Dan Gibson (Cold Spring Harbor High School) joined the staff in the fall and assisted with the laboratory instruction program. The new interns, together with Rachael and Trevor, began to formulate plans for carrying out independent research projects in addition to their intern work. Assisting at *Fun With DNA* camps were lab aides Ali Chaudry (Walt Whitman High School), Todd Rebori (Walt Whitman High School), Jennifer Kosinski (Roslyn High School), Paul Tanck (Massapequa High School), and Kim Bronson (who is married to Laboratory Instructor, Scott Bronson).

Staff Associates Jerry Watkins, of Central Islip High School, and Twana Adams, of Bronx Alternative School, instructed minority workshops hosted at the American Museum of Natural History in Manhattan and at A. Philip Randolph High School in Harlem. Jerry Watkins, father of DNALC intern Jermel, is a graduate of the *DNA Science* Workshop and the NSF *Leadership Institute*. In addition to instructing two *DNA Science* Workshops at the Museum of Natural History, Jerry also taught student workshops in his home district, Central Islip. A resident and community organizer, Twana taught *Fun With DNA* summer camps at A. Philip Randolph High School, with support from Michael Gordon, a teacher at Choir Academy of Harlem.

DNA Learning Center Corporate Advisory Board, 1996

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DNA Learning Center 1996 Grants

Federal Grants		Term of Grant	1996 Funding
National Science Foundation	A Two-part Program to Develop and Support a Nationwide Corps of Human & Molecular Genetics Resource Teachers at the Secondary Level, David Micklos	4/93-6/97	\$124,417
	A Novel Mechanism for Introducing Human Genome Research in Freshman Biology Classes, Mark Bloom	4/95-4/98	\$73,261
Non-Federal Grants			
Barker-Welfare Foundation	Middle School Biology Camp/American Museum of Natural History	6/95-6/97	\$8,650
Genentech, Inc.	Story of a Gene Exhibit	4/95-4/97	\$14,047
Howard Hughes Medical Institute	Precollege Science Education Initiative for Biomedical Research Institutions	7/94-8/99	\$82,681
Porto Conte Foundation	DNA Amplification and Genetic Diversity	2/96-2/97	\$20,000*

The following schools each awarded a grant for the *Genetics as a Model for Whole Learning*

Program:

China Town School District 1	\$5,500
Community School District 29	\$18,400
Great Neck Union Free School District	\$8,900
Half Hollow Hills Central School District	\$5,000
Plainedge Union Free School District	\$900
South Huntington Union Free School District	\$9,600
Syosset Central School District	\$9,900

The following schools each awarded a grant for Curriculum Study of \$950:

Commack Union Free School District	North Shore Central School District
East Meadow Union Free School District	Oyster Bay-East Norwich Central School District
Garden City Union Free School District	Plainedge Union Free School District
Great Neck Public Schools	Plainview-Old Bethpage Central School District
Half Hollow Hills Central School District	Portledge School
Harborfields Central School District	Port Washington Union Free School District
Herricks Union Free School District	Ramaz School
Island Trees Union Free School District	Roslyn Public School
Jericho Union Free School District	Sachem Central School District
Lawrence Union Free School District	South Huntington Union Free School District
Locust Valley Central School District	Syosset Central School District
Massapequa Union Free School District	

of \$1,500:

West Hempstead

of \$2,000:

Hicksville Union Free School District
Long Beach School District

*New grant awarded in 1996.

1996 Workshops, Meetings and Collaborations

January 15-19	<i>DNA Science</i> Workshop, Walter and Eliza Hall Institute and University of Melbourne, Australia
January 17	Laboratory for <i>Women In Science and Engineering</i> Program, SUNY Stony Brook, DNALC
January 19	Corporate Advisory Board Meeting, Banbury Center
February 10	Laboratory for Corporate Advisory Board and Cold Spring Harbor Laboratory Association Directors, DNALC
February 23-25	National Science Foundation Workshop, <i>Human Genome Diversity-Student Allele Database</i> , USMA, West Point, New York
March 2-3	National Science Foundation Follow-up Workshop, <i>DNA Science</i> , Bates College, Lewiston, Maine
March 15-16	National Science Foundation Grant Review, Washington D.C.
March 16-17	National Science Foundation Follow-up Workshop, <i>DNA Science</i> , University of Kansas, Lawrence
March 20	Meeting at American Philosophical Society, Philadelphia, Pennsylvania
March 22	Benjamin/Cummings <i>Strategies</i> Workshop, Valencia Community College, Orlando, Florida
March 28-29	National Science Teachers Association Meeting, Philadelphia, Pennsylvania
March 30	Benjamin/Cummings <i>Strategies</i> Workshop, Pasadena Community College, California
April 2	Meeting at The Center for Occupational Research and Development, Waco, Texas
April 10	Community School District 29 Meeting, Rosedale, New York
April 11	Site visit by Rob Kelly, Computer Associates, and Peter Goldsmith, Long Island Association
April 17	Corporate Advisory Board Meeting, DNALC
April 18	<i>Great Moments in DNA Science Honors</i> Students Seminar, CSHL
April 23	<i>Great Moments In DNA Science</i> Honors Students Seminar, CSHL
April 25	Biotech Conference, Harrisonburg High School, Harrisonburg, Virginia
April 27-29	National Science Foundation Workshop, <i>Human Genome Diversity-Student Allele Database</i> , Howard University, Washington D.C.
May 2	Site Visit by BBC Photographers, Great Britain
May 6	<i>Great Moments in DNA Science</i> , Honors Students Seminar, CSHL
May 10	Site Visit by Bruce Curtis, <i>National Geographic</i>
May 15	Computer Associates Meeting, Islandia, New York
May 20-21	Corporate Advisory Board Meeting, Chase Bank Regional Headquarters, Melville, NY <i>DNA Amplification and Genetic Diversity</i> Workshop, International Institute of Genetics and Biophysics, Naples, Italy
May 28	Site Visit by Ellen Potter, Salk Institute
June 6	Site Visit by John Reiher, The Center for Occupational Research and Development
June 8	Seminar at Southern Mississippi University, Hattiesburg
June 10	Brooklyn Technical High School Meeting, Brooklyn, New York
June 14	Site Visit by Anika Rohl, Swedish Medical Research Council
June 17	National Science Foundation Workshop, <i>DNA Science</i> , University of Alaska, Fairbanks
June 24-28	Access Excellence Summit, San Francisco, California <i>Fun With DNA</i> Workshop, Portledge School, Locust Valley, New York <i>DNA Science</i> Minority Workshop, Central Islip, New York
June 24-July 2	<i>Advanced DNA Science</i> Workshop, DNALC
June 27	Corporate Advisory Board Meeting, DNALC
July 1-12	<i>Advanced DNA Science</i> Minority Workshop, Central Islip, New York
July 8-12	<i>DNA Science</i> Workshop, DNALC
July 12	Site Visit by Keith McKenney, The Institute for Genomic Research
July 15-19	National Science Foundation Workshop, <i>DNA Science</i> , Harrisonburg, Virginia Howard Hughes/Barker Welfare Foundation Minority Workshop, <i>DNA Science</i> , American Museum of Natural History, New York, New York

July 15-19, cont. *Fun With DNA* Workshop, DNALC
Fun With DNA Workshop, Portledge School, Locust Valley, New York

July 22-26 *DNA Science* Workshop, DNALC
Howard Hughes/Barker Welfare Foundation Minority Workshop, *DNA Science*,
American Museum of Natural History, New York, New York
Introduction to Computer Design Workshop, DNALC
Howard Hughes/Barker Welfare Foundation Minority Workshop, *Fun With DNA*, A.
Philip Randolph High School, New York, New York

July 29-Aug 1 *World of Enzymes* Workshop, DNALC

July 29-Aug 2 Howard Hughes/Barker Welfare Minority Workshop, *DNA Science*, American Museum
of Natural History, New York, New York

August 1 Site Visit by Robert Frehse, Hearst Foundation

August 5-9 *Fun With DNA*, DNALC

August 5-13 Howard Hughes/Barker Welfare Foundation Minority Workshop, *Advanced DNA*
Science, American Museum of Natural History, New York, New York

August 8 Site Visit by New York Senator Kemp Hannon

August 12-15 *Fun With DNA* Workshop, DNALC

August 19-23 *DNA Science* Workshop, DNALC
Howard Hughes/Barker Welfare Foundation Minority Workshop, *World of Enzymes*,
American Museum of Natural History, New York, New York

August 19-27 *Advanced DNA Science* Workshop, Beckman Neuroscience Center, CSHL

August 26-29 *World of Enzymes* Workshop, DNALC

August 26-30 *Introduction to Computer Design* Workshop, DNALC

September 5 Site Visit by Dorothy Dart and Ray Gesteland, University of Utah Genome Center

September 17 Community School District 29 Meeting, DNALC

September 20 *World of Barbara McClintock* Exhibit Opening, DNALC

September 25 Site Visit by Steven Olson, Howard Hughes Medical Institute

October 7 Site Visit by Lorraine LaFemina, Long Island Business News

October 12-14 Seminar for Federal Judicial Center, DNALC and Banbury Center

October 16 Corporate Advisory Board Meeting, DNALC

October 18 Site Visit by Agneta Levinovitz, Nobel Forum

October 18-19 National Association of Biology Teachers Convention, Charlotte, North Carolina

October 21 Site Visit by Dr. Nancy Douzines and Brooke Mahoney, The Rauch Foundation, and
Linda Franciscovitch, US Trust Company

October 22 Meeting at The Institute of Genomic Research, Rockville, Maryland

October 23-25 Howard Hughes Medical Institute Program Directors' Meeting, Bethesda, Maryland

October 26 Association of Science and Technology Centers Conference, Pittsburgh, Pennsylvania

Oct 30-Nov 1 National Science Teachers Association Meeting, Atlanta, Georgia

November 2 Seminar for Metropolitan Association of College and University Biologists, Paramus,
New Jersey

November 9 Laboratory for *Journalists Workshop-Genetics of Human Behavior*, DNALC

November 9-11 National Science Foundation Workshop, *Human Genome Diversity-Student Allele*
Database, Boston University, Massachusetts

November 13 Seminar for Cornell University Medical College Program in Regional Genetics, CSHL

November 14 Corporate Advisory Board Meeting, DNALC

November 14 Site Visit by Nancy Hutchison, Fred Hutchinson Cancer Center

November 20 Site Visit by Frederica Jarco, Greenwall Foundation

November 25 National Marfan Foundation Meeting, DNALC

December 6 Site Visit by Paul Fethers, Howard Hughes Medical Institute

December 10 *Introduction to Forensic Uses of DNA Fingerprinting*, seminar for law enforcement and
legal communities, DNALC

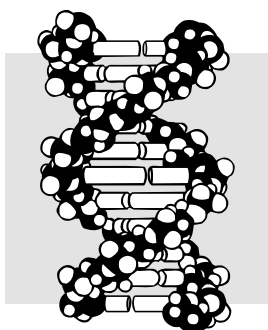
December 13-15 National Science Foundation Workshop, *Human Genome Diversity-Student Allele*
Database, Morehouse College, Atlanta, Georgia

December 16 Site Visit by Jane Block, Pall Corporation and Jim Shaw, *Newsday*

Sites of Major Faculty Workshops 1985-96

Key:	High School	College	Middle School
ALABAMA		University of Alabama, Tuscaloosa	1987-90
ALASKA		University of Alaska, Fairbanks	1996
ARIZONA		Tuba City High School	1988
ARKANSAS		Henderson State University, Arkadelphia	1992
CALIFORNIA		University of California, Davis	1986
		San Francisco State University	1991
		University of California, Northridge	1993
COLORADO		Colorado College, Colorado Springs	1994
		United States Air Force Academy, Colorado Springs	1995
CONNECTICUT		Choate Rosemary Hall, Wallingford	1987
DISTRICT OF COLUMBIA		Howard University	1992, 1996
FLORIDA		North Miami Beach Senior High School	1991
		University of Western Florida, Pensacola	1991
		Armwood Senior High School, Tampa	1991
GEORGIA		Fernbank Science Center, Atlanta	1989
		Morehouse College, Atlanta	1991, 1996
HAWAII		Kamehameha Secondary School, Honolulu	1990
ILLINOIS		Argonne National Laboratory	1986, 1987
		University of Chicago	1992
INDIANA		Butler University, Indianapolis	1987
IDAHO		University of Idaho, Moscow	1994
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
MARYLAND		Annapolis Senior High School	1989
		Frederick Cancer Research Center, Frederick	1995
		McDonogh School, Baltimore	1988
		Montgomery County Public Schools	1990-92
		<i>St. John's College, Annapolis</i>	<i>1991</i>
MASSACHUSETTS		Beverly High School	1986
		Dover-Sherborn High School, Dover	1989
		Randolph High School	1988
		Winsor School, Boston	1987
		Boston University	1994, 1996
MICHIGAN		Athens High School, Troy	1989
MISSISSIPPI		Mississippi School for Math & Science, Columbus	1990, 1991
MISSOURI		Washington University, St. Louis	1989
NEW HAMPSHIRE		St. Paul's School, Concord	1986, 1987
NEVADA		University of Nevada, Reno	1992
NEW YORK		Albany High School	1987
		Bronx High School of Science	1987
		Columbia University, New York	1993
		Cold Spring Harbor High School	1985, 1987
		<i>DeWitt Middle School, Ithaca</i>	<i>1991, 1993</i>
		DNA Learning Center	1988-95
		DNA Learning Center	1990, 1992, 1995

NEW YORK, cont.	<i>DNA Learning Center</i>	1990-92
	<i>Fostertown School, Newburgh</i>	1991
	Huntington High School	1986
	Irvington High School	1986
	<i>Junior High School 263, Brooklyn</i>	1991
	<i>Lindenhurst Junior High School</i>	1991
	<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	1987-90
	<i>Titusville Middle School, Poughkeepsie</i>	1991, 1993
	Wheatley School, Old Westbury	1985
	US Military Academy, West Point	1996
NORTH CAROLINA	North Carolina School of Science, Durham	1987
OHIO	Case Western Reserve University, Cleveland	1990
	Cleveland Clinic	1987
	North Westerville High School	1990
OKLAHOMA	School of Science and Mathematics, Oklahoma City	1994
PENNSYLVANIA	Duquesne University, Pittsburgh	1988
	Germantown Academy	1988
SOUTH CAROLINA	Medical University of South Carolina, Charleston	1988
	University of South Carolina, Columbia	1988
TEXAS	J.J. Pearce High School, Richardson	1990
	Langham Creek High School, Houston	1991
	Taft High School, San Antonio	1991
	Trinity University, San Antonio	1994
UTAH	University of Utah, Salt Lake City	1993
VERMONT	University of Vermont, Burlington	1989
VIRGINIA	Eastern Mennonite University, Harrisonburg	1996
	Jefferson School of Science, Alexandria	1987
	Mathematics and Science Center, Richmond	1990
WASHINGTON	University of Washington, Seattle	1993
WEST VIRGINIA	Bethany College	1989
WISCONSIN	Marquette University, Milwaukee	1986, 1987
	University of Wisconsin, Madison	1988, 1989
WYOMING	University of Wyoming, Laramie	1991
AUSTRALIA	Walter and Eliza Hall Institute and University of Melbourne	1996
CANADA	Red River Community College, Winnipeg, Manitoba	1989
ITALY	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
SWEDEN	Kristineberg Marine Research Station, Fiskebackskil	1995



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