

Cold Spring Harbor  
Laboratory's

# DNA Learning Center



Annual Report 1995

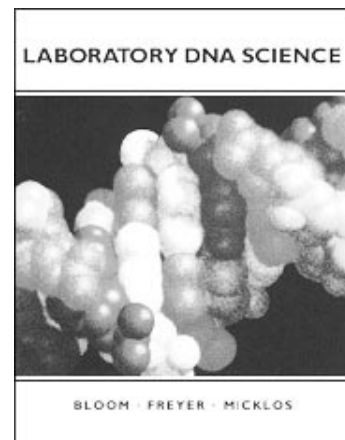
# ANNUAL REPORT 1995

**David A. Micklos**, Director  
**Mark V. Bloom**, Assistant Director  
**Susan M. Lauter**, Creative Director  
**Judy Cumella Korabik**, Program Coordinator  
**Jane P. Conigliaro**, Education Manager  
**Malissa A.G. Hewitt**, Laboratory Instructor  
**Diane S. Jedlicka**, Laboratory Instructor  
**Diane Esposito**, Laboratory Instructor  
**Flavio Della Seta**, Laboratory Instructor

Einstein's comment to the effect "God is subtle but not malicious," applies equally well to molecular genetics. On the face of it, this field must seem almost maliciously abstract to even bright and motivated students. Doing experiments is probably the only way to reduce this abstraction and give students a feeling for the subtle beauty of molecular mechanics. For better or worse, bands on gels, colonies on plates, and dots on filter paper are the major methods of inference in molecular genetics – the ways of knowing molecules. Only when these methods can be used to obtain predictable results, can students begin to believe that experiments, indeed, offer a window on the unseen molecular world. Teachers sometimes try to put the best spin on a failed experiment by saying that students can learn as much from failure as success. In fact, in students' eyes, a failed experiment can mean a failure of that mode of inference. A failed experiment throws students back into the abstractive quandary in which they began. We believe that experiments should work for students. Therefore, we have made it our *raison d'etre* to adapt and refine molecular genetics laboratories to increase the probability of success in student hands.

The publication in November of *Laboratory DNA Science: An Introduction to Recombinant DNA Techniques and Methods of Genome Analysis* marked another high point in our effort to bring reproducible and high-level molecular genetics laboratories into the biology classroom. The text incorporates the basic cloning sequence (10 laboratories) from our original *DNA Science* course, plus 13 new laboratories that cover gene library construction, hybridization, and polymerase chain reaction. The author team, Mark Bloom, Dave Micklos, and Greg Freyer (of Columbia University) believe these to be the most thoroughly tested labs available today for teaching molecular genetics at the college level. Each experiment incorporates insights from our own instruction of 2,000 teaching faculty at training workshops across the country and from the 30,000 students taught in our *Bio2000* Teaching Laboratory. The entire lab sequence is supported by quality-assured reagents and kits available from Carolina Biological Supply Company.

Nothing has been left to chance. Greg even engineered the teaching plasmids, pAMP, pKAN, and pBLU, specifically for the course. These plasmids transform well, give consistently high yields in plasmid preparations, simplify colorimetric screening for recombinant plasmids, and yield restriction products that are easily interpreted on agarose mini-gels. The laboratories also incorporate insights drawn from extensive contacts within the biological research





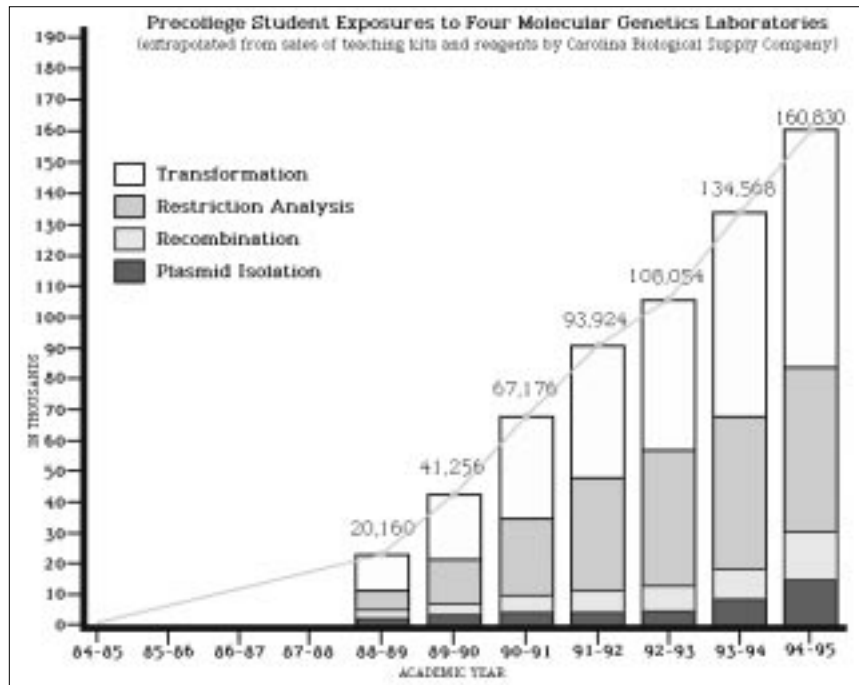
Dave Micklos, Mark Bloom, and Greg Freyer on the release of *Laboratory DNA Science*.

community. Prescott Deininger and Mark Batzer, of the LSU Medical Center, introduced us to the *Alu* insertion polymorphisms – which proved to be ideal for educational demonstrations of human DNA typing. Collaborations with scientists at Cetus, Perkin-Elmer, and Roche Molecular Systems were key to the development of the PCR experiments, while scientists at Boehringer Mannheim aided with colorimetric detection used in hybridization experiments.

We are all thankful to our editor, Cathy Pusateri, for keeping her promise to produce *Laboratory DNA Science* in only 10 months! The 434-page book features extensive prelab notes, flowchart diagrams, marginal notes, results and discussion, and for further research sections. Appendices include lists of needed equipment, supplies, and reagents; recipes for media, stock solutions, and reagents; restriction maps for plasmids; and complete sequence data for all DNAs used in the course. A 99-page Instructor's Preparation Guide includes hints on lab prep and answers to results and discussion questions. *Laboratory DNA Science* has gotten off to a good start, selling 1,000 copies in its first month.

### Tracing the Rise of Precollege Laboratory Instruction in Molecular Genetics

We hope that *Laboratory DNA Science* will encourage college instructors to increasingly bring molecular genetics labs into freshman biology and sophomore electives. This echoes the DNALC's original effort to bring student laboratories on molecular genetics into American high schools. In the summer of 1985, we were among the very first academic groups to initiate teacher training in recombinant-DNA techniques. It is fair to say that prior to 1985 there was essentially no precollege lab instruction in molecular genetics. Thus taking the 1984-85 academic year as the zero point – and using sales data for needed reagents and teaching kits as an indicator of student exposures – one can trace the rise



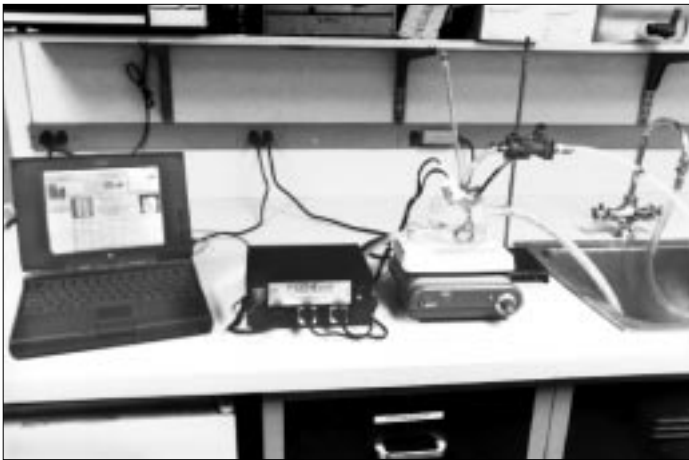
of an entirely new era in science education. The notion that recombinant-DNA techniques are an important basis for student understanding was legitimized in 1989, when the Educational Testing Service recommended two DNA-manipulation labs for students who take its nationally-administered Advanced Placement (AP) Biology curriculum. As shown in the figure following, the AP "mandate" helped to catalyze the rapid adoption of several "core" techniques of recombinant DNA: bacterial transformation, DNA restriction analysis, DNA recombination, and plasmid isolation.

Our studies of teacher innovation suggest that the estimated 3,500 teachers nationwide who have been trained using the *DNA Science* syllabus account for at least half of 160,000 student exposures to molecular genetics laboratories in the 1994-95 academic year. In addition to experimentation in the context of AP courses, half- and full-year electives in molecular genetics/biotechnology are being instituted in growing numbers of American high schools. In some schools, it is filling the niche formerly occupied by anatomy & physiology or biology II, in other schools it is filling the new "tech-prep" niche. For example, 14 of 23 participants in the 1995 *Leadership Institute* are currently teaching molecular genetics/biotechnology electives at their high schools.

### **Further Progress in Making PCR Widely Available to Biology Students**

With support from the Howard Hughes Medical Institute and the National Science Foundation (NSF), we continued our effort to make human DNA fingerprinting by PCR practical for widespread use in biology classes. In December, Mark Bloom and collaborator John Kruper taught the first of a series of NSF-supported workshops for college faculty, *Human Genome Diversity-Student Allele Database*. Held at the Air Force Academy in Colorado Springs, the workshop drew together 24 college educators for in-depth training to implement experiments on DNA fingerprinting in freshman and elective biology courses. The workshop revolves around experiments from *Laboratory DNA Science* that allow students to use polymerase chain reaction (PCR) to analyze two types of human DNA polymorphisms – *Alu* insertions and VNTRs. *Alu* is an example of a "jumping gene" that has successfully reproduced and inserted about 500,000 copies of itself throughout the human chromosomes. Some *Alus* inserted several million years ago, when humans were radiating out of Africa to populate the globe. These *Alu* insertions can be used as biological clocks to measure the genetic distance between populations and to study how humans have evolved. VNTRs (variable number of tandem repeats) are chromosome regions where a short DNA sequence is repeated numerous times. VNTRs are highly variable from person to person, making them especially useful in human identity. Several types of VNTR polymorphisms are used as evidence in rape, murder, and paternity cases.

Mark Bloom worked for several years to simplify the biochemical procedures for screening for *Alu* and VNTR polymorphisms. In collaboration with John Kruper's bioscience computing group at the University of Chicago, we also have made significant progress in developing computer programs and instrumentation to make the technology more accessible to students. During the year, the Chicago group developed a prototype Student Allele Database to run on their World Wide Web server (<http://http.bsd.uchicago.edu/hgd-sad/>) also reachable through a link on the DNALC server (<http://darwin.cshl.org/>). The



The working model of the BioGENERator, above, and the SAD web page at the University of Chicago, right.



program allows students to tabulate *Alu* insertion data, test Hardy-Weinberg equilibrium, and compare two populations by contingency chi-square and genetic distance. The database is seeded with *Alu* data from a number of isolated populations from around the world, which have been collected by researchers Prescott Deisinger and Mark Batzer, of LSU Medical School. Eventually, we hope the database will also contain data submitted by thousands of students from around the U.S. and Europe. In that way, students can participate in an evolving research project on human diversity.

By year's end, we also had a stable, working prototype of a programmable thermal cycler to control the PCR reaction. Commercial thermal cyclers cost several thousand dollars and have put automated cycling out of reach of most educators. Our Biogenerator, which will be available for about \$700 in 1996, should remove a major obstacle to the use of PCR in education. Water temperature in an acrylic reaction vessel is raised by activating heater coils, while temperature is lowered by activating a valve that controls cold water flow into the vessel. Heating and cooling are controlled by an analog-digital (A-D) interface that receives commands from a personal computer and temperature information from a thermocouple. In addition to its low cost, Biogenerator has several advantages over research-grade thermal cyclers that make it more suitable for the teaching laboratory:

- The simplicity of the apparatus helps students grasp the physical principles of thermal cycling. The open design allows students to observe the mechanisms of heating and cooling, as well as feedback between the computer and the thermocouple.

- Animated screen icons provide quick references to the cycling state (activation of heater coils or cold water valve) and PCR state (DNA denaturing, primer annealing, and primer extension).
- A computer "strip chart" plots temperature change in real time, allowing students to follow the course of the reaction, review the reaction profile, and calculate temperature ramping.

### Programs for Long Island Students Continue to Expand

The DNALC had its roots in the Cold Spring Harbor Curriculum Study, a teacher-training program initiated in 1985 in cooperation with eight local school districts. The *DNA Science* curriculum that arose from this collaboration achieved national prominence and was the basis for our nationwide teacher-training program. It also provided the template for the development of *Laboratory DNA Science* and its nationwide training program. While our commitment to curriculum development and dissemination continues, we devote increasing energy to developing the DNALC facility as a resource for local students. In this sense, we are returning to our roots in collaboration with Long Island and New York City schools.

The Curriculum Study continues as our major mechanism to work intensively with local school systems. Over the years, it has grown from the original eight members to 28 districts and private schools in 1995. As shown in the table below, our visitation has tripled since our opening in 1988. Cablevision's *Long Island Discovery* drew 10,366 visitors in 1995, while the *Story of a Gene* Exhibit drew 2,698 visitors. Of special importance, lab participation has contributed equally to our growth as exhibit visitation. While it is hard for a science center or museum to gauge the exposure received by an casual exhibit visitor, we know that each lab participant has had a 1-3 hour, hands-on experience conducted by a DNALC staff member; while workshop participants have had at least 20 hours of intensive instruction.

Over the past several years, we have devoted much effort to developing programs for middle-school students – including summer camps, academic-year lab field trips, and in-school instruction. Under the direction of our trio of middle school specialists – Jane Conigliaro, Diane Jedlicka, and Malissa Hewitt – these

### Visitors and Program Participants, 1988-95

<b>Visitors and Participants</b>	<b>1988</b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>
Student Labs (on-site)	2,031	3,753	3,758	4,248	4,624	3,422	3,961	4,682
Student Labs (off-site)				291	435	1,305	1,434	2,328
Teacher Labs	58	278	270	234	270	254	302	379
Student Workshops	32	13	24	176	234	351	361	503
Teacher Workshops	496	285	314	333	441	249	177	101
<b>Lab Subtotal</b>	<b>2,617</b>	<b>4,329</b>	<b>4,366</b>	<b>5,282</b>	<b>6,004</b>	<b>5,581</b>	<b>6,235</b>	<b>7,993</b>
Student Lecture Series	553	449	660	600	1,000	734	575	520
Exhibit Visitors	3,231	2,547	2,964	1,480	848	6,416	9,943	10,366
<b>Total Visitors/Participants</b>	<b>6,401</b>	<b>7,325</b>	<b>7,990</b>	<b>7,362</b>	<b>7,852</b>	<b>12,731</b>	<b>16,753</b>	<b>18,879</b>



Diane Jedlicka (standing) instructs students in the *BioMedia* Lab during a *Fun With DNA* Camp.

programs became the major source of growth in 1995. Eight school districts were members of the *Genetics as a Model for Whole Learning* Program – Half Hollow Hills, Lawrence, Great Neck, Jericho, Locust Valley, Roslyn, South Huntington, and Syosset – nearly doubling student participants to 2,328. Although each program is customized according to district needs, the typical program includes in-school instruction and teacher mentoring by DNALC staff, as well as a field trip to the DNALC for intensive use of the *Story of a Gene* Exhibit and experimentation in the *Bio2000* Laboratory. Science supervisors in these districts believe that they are already beginning to see increased interest in science courses, as graduates of our middle-school programs move on to high school. Fortunately, these high schools offer research and elective courses that will allow these gifted students to follow up on their interest in biology.

Student participation in lab field trips to the *Bio2000* Laboratory increased 18% to 4,682 students, thanks to excellent instruction offered by part-time instructors Flavio Della Seta, Diane Esposito, Diane Jedlicka, and Malissa Hewitt. High school students (2,894) performed labs on bacterial transformation, DNA restriction analysis, and human DNA fingerprinting, while middle school students (1,788) performed experiments on Mendelian genetics, cell study, and DNA extraction. The *Great Moments in DNA Science* Honors Student Seminar Series, now in its 11th year, continued as a popular element of our annual calendar of events, drawing the attendance of 520 local students and teachers. Speakers and topics were:

Syd Mandelbaum, Imagen Instrumentation, "Historical DNA Cases: The Solving of the Anastasia Mystery."

Dr. Michael Hengartner, CSHL, "Apoptosis: Why and How Cells Commit Suicide."

David Micklos, DNALC, "DNA and OJ."

Student participation in summer workshops increased dramatically from 361 in 1994 to 558 in 1995, due to collaborations that enabled us to hold additional workshops at four other sites in the New York metropolitan area. We continued our collaboration with Portledge School (Nassau County) to serve the great



Mark Bloom (center, top) discusses gel electrophoresis results with *Advanced DNA Science* Workshop participants.

demand for middle school workshops on the North Shore of Long Island. Central Islip School District (Suffolk County), Roslyn Middle School (Nassau County), and the American Museum of Natural History (AMNH, New York City) were sites for middle-school and high school workshops targeting primarily minority students. We were especially pleased with a new collaboration that was made possible through the support of AMNH President Ellen Futter and Chairman Anne Sidamon-Eristoff, and a two-year grant from the Barker Welfare Foundation. Eleven sessions of *Fun With DNA* (grades 5-6) served a total of 315 participants – including 202 minority students. Three sessions of the workshop, *World of Enzymes* (grades 7-8) attracted 77 participants, including 26 minority students. Four sessions of *DNA Science* (grades 10-12) drew 131 participants – including 83 minority students. New for 1995 were two sessions of *Advanced DNA Science* (Grade 12) held at Central Islip High School and the Beckman Neuroscience Center that served 36 participants, including 16 minority students.

### **Training Workshops Reach Faculty and Opinion Leaders Nationwide**

This year marked the ninth summer of NSF funding for our *DNA Science* Workshop. In keeping with our commitment to bring high-level training to teachers from rural and nonurban areas, workshops were held in Lawrence, Kansas and Lewiston, Maine – drawing the participation of 55 high school faculty. An additional 23 faculty, representing 17 states and Puerto Rico, attended the month-long *Leadership Institute in Human and Molecular Genetics*, held at the DNALC and Cold Spring Harbor Laboratory. Also known as "DNA Boot Camp," this intensive experience includes practical laboratory and computer work, as well as an array of seminars presented by CSHL scientists and visiting faculty:

Karen Buchavich, CSHL, "Telomeres, Cancer, and Aging."  
Xiaodong Cheng, CSHL, "X-ray Structures Solved at CSHL."  
Rob DeSalle, American Museum of Natural History, "Ancient DNA and Comparative Biology."  
Mike DeStio, Half Hollow Hills School District, "Sequenced Genetics Instruction-A District Perspective."  
Anil Dhundale, Oncogene Science, "Expression Screening for Drug Discovery." Bruce Futcher, Cold Spring Harbor Laboratory, "Cell Cycle Control."  
Fred Gillam, Sachem North High School, "Molecular Genetics Electives at the High School Level."  
Marvin Grubman, Plum Island Animal Disease Center, "Molecular Approaches to a Foot & Mouth Vaccine."  
Mike Hengartner, CSHL, "Apoptosis and Cell Suicide."  
Gerry Latter, CSHL, "2-Dimensional Electrophoresis."  
Rob Martienssen, CSHL, "Transposon Tagging in Arabidopsis."  
Dick McCombie, CSHL, "Sequencing Genomes."  
Bruce Stillman, CSHL, "Research Highlights at CSHL."  
Tim Tully, CSHL, "Creb, Memory and Intelligence."  
James Watson, CSHL, "Perspectives on the Gene Revolution."  
Jan Witkowski, CSHL, "Human Genetics."



DNA Boot Camp participants after a discussion led by Dr. Watson.



With funding from the Department of Energy, we continued our collaboration with Banbury Center to increase knowledge of advances in human genetics among influential "opinion leaders" in various fields. Continuing a shift in emphasis begun last year, the 1995 workshop drew 17 medical education directors representing hospitals in 10 states, with the expectation that they can help hospitals better appreciate how the molecular genetic perspective is changing modern medicine. In addition to hands-on experiments on gene mapping and DNA diagnosis, participants heard high-level seminars about topics on the interface of molecular genetics, medicine, and society:

Ted Brown, NY State Institute for Basic Research, "Molecular Genetics and Biology of Fragile-X Syndrome."

Jeffrey Friedman, The Rockefeller University, "Genetics of Obesity."

Ken Culver, OncorPharm, "Human Gene Therapy Trials."

Melvin McInnis, Johns Hopkins University, "Genetics of Psychiatric Disorders."

Philip Reilly, Shriver Center for Mental Retardation, "Future of Genetic Testing and Screening."

Tim Tully, Cold Spring Harbor Laboratory, "Genetics and Behavior."

Brian Ward, Integrated Genetics, "Cytogenetics in the Age of DNA."

Patricia Ward, Baylor College of Medicine, "DNA-based Diagnosis for Human Genetic Diseases."

### **We Open our First In-House Exhibit on Human Growth Hormone**

In 1987, when the decision was made to begin development of our facility, the Cold Spring Harbor Laboratory Trustees were adamant that we emphasize the active process of acquiring knowledge. Then and now, our primary mission is to develop and disseminate novel methods for students to actively experience the world of molecular genetics. Thus, museum exhibits have always been considered ancillary to the hands-on experience students receive in our *Bio2000* Biochemistry Laboratory and *BioMedia* Computer Laboratory.

For our opening in 1988, we were lucky enough to obtain loan of the Smithsonian Institution exhibit, *The Search For Life*, which allowed us effectively to dodge exhibit development during our first four years. Prior to dismantling the Smithsonian exhibit, in preparation for building renovations in 1993, we had

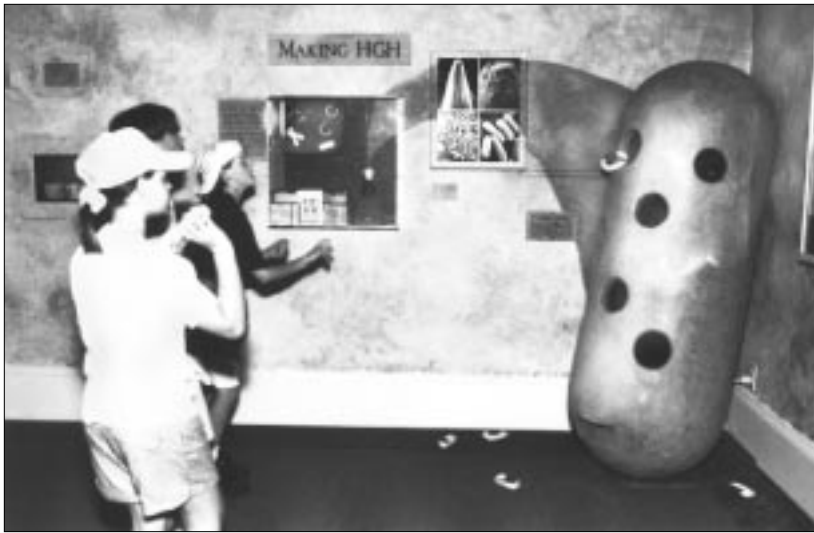
made ambitious plans to develop our first in-house exhibit on the technology of gene hunting used in the Human Genome Project. However, by the time we were ready to begin exhibit development in 1994, we were forced to reconsider our plans. Two new programs in 1993 – Cablevision's *Long Island Discovery* and *Genetics as a Model for Whole Learning* – had significantly changed our predominantly high school clientele to include large numbers of elementary students. It had become clear that our original exhibit concept was far too technical for younger students; we had to scrap our previous plan and find a friendlier approach to a difficult subject matter.

The solution we came upon was, simply, to tell the *Story of a Gene* – that is, to organize the entire exhibit around a single gene. This case study approach allowed us to cut a cross-section through modern biological research – touching upon the hard science topics of molecular genetics, cell biology, and physiology, as well as medical, personal, and social issues. This approach compelled us to tell the story of the human growth hormone (HGH), which is produced by the pituitary gland within the brain. This is the best single example of a gene affecting a visible human trait – HGH is largely responsible for a person's height. Problems with this gene most commonly cause short stature, which is not life-threatening and is treatable. The HGH gene was one of the first human genes isolated using modern gene-hunting technology, and HGH was among the first recombinant-DNA therapeutics approved for use in humans. At the same time, there is continuing controversy over the use of recombinant HGH for non-clinical purposes and to increase milk production in dairy cows. The exhibit blends art and science and juxtaposes both micro and macroscopic perspectives. A hand-painted mural covering the walls and ceiling of the main gallery creates the environment within a single pituitary cell. The Cellarium mural is the backdrop for sculptured molecular models, video displays, full-size human sculptures, and interactive games.

At the micro scale, visitors can follow the flow of genetic information from DNA to RNA to protein through which HGH is manufactured within a pituitary cell. In "The Walk of Life" visitors play the role of a cellular structure, the ribosome, with each step along a walkway activating computer-controlled lights

Dave Micklos and Malissa Hewitt place authentic Fore artifacts on sculpture of Fore tribesman. Educators preview *Story of a Gene* at the second of three exhibit openings in May.





Clockwise from left: middle-school students transform the giant *E. coli* in the *Plasmid Toss*; visitors take the *Walk of Life*, and Nicole Costa, who receives HGH therapy, stands by her likeness.

to illustrate the translation of the genetic code into the HGH protein. On the macroscopic level, visitors are asked consider their own stature by comparing themselves to life-size portraits of famous people, by placing themselves on a life-size growth chart, and by visualizing themselves taller/shorter using a video morph. The secretion of HGH by the pituitary and its stimulation of bone growth are traced by a digital circuit of light-emitting diodes within a see-through human model. Our long-time friends, Greg and Edna McLaughlin, of CBS News, produced an engaging, "MTV-like" video following a day in the life of Nicole Costa, a local elementary student being treated with HGH. A "ring-toss" game allows visitors to toss the HGH gene into a giant bacterium, illustrating the modern method for making HGH.

Leaving the main gallery – and its macro/micro worlds of the present – the visitor enters a small gallery with four scenes representing past and future issues of HGH. "Gruesome Treatment" is a horror-story parody about extracting HGH from cadaver brains – the medical source of HGH prior to recombinant methods. "The Kuru Connection" shows how a deadly brain disease, first discovered among cannibals in New Guinea, could contaminate HGH extract prepared from human brain tissue. "Who Should Take Growth Hormone," takes place in a family room, where a television set shows news videos that explore the growing use of HGH to increase athletic ability and counteract the aging process. "Milk and More Milk" allows one to eavesdrop on four cows as they

discuss the pros and cons of using HGH in the dairy industry.

The development timeline for *Story of a Gene* was condensed to only eight months -- from storyline brainstorming in September, 1994 to opening in May, 1995. At the same time, we are very proud that essentially all exhibit elements -- including three-dimensional models, digital control circuitry, video morphs, and casework -- were developed in-house by DNALC staff and the CSHL carpentry shop. Creative Director Sue Lauter worked tirelessly designing graphical and computer components, developing technical specifications, interfacing with subcontractors, and supervising staff and art interns. Her effort is all the more extraordinary in light of the fact that it occurred during her first year of motherhood. Our team of elementary educators -- Jane Conigliaro, Diane Jedlicka, and Malissa Hewitt -- carefully streamlined the narrative to improve readability for younger students. They also developed curriculum guides -- including vocabulary, questions/answers, and suggested readings -- to help students get the most out of their visit. The exhibit articulates seamlessly with our extensive program of hands-on laboratories and computer experiences for 5th-12th grade students. Development of *Story of a Gene* was supported by major grants from the Weezie Foundation and Genentech, Inc.

### **We Renovate the Last Available Space in Our 1925 School Building**

In the fall, we completed renovation of 500 square feet of space in the east basement to create a computer/design office, intern work area, and storage closets. The computer/design office provides a focus for our growing effort to develop and distribute multimedia programming in biology. The office is occupied by two senior staff members -- currently Sue Lauter and Dave Micklos -- and has four work stations for Macintosh, IBM, and Unix machines. The adjacent intern area has three additional computer work stations. In combination with the *BioMedia* Computer Laboratory and the Multitorium, the computer/design office gives us almost unmatched facilities for testing innovative, interactive methods for introducing students to modern biology. Our aim is to add additional staff in the areas of computation and video production that will increase our capability to integrate many types of audio and visual information into a modern learning system.

Through renovation, we also gained office and laboratory storage rooms. The lab storage space was critical, considering that we maintain the equivalent of four classrooms worth of laboratory equipment, as well as supplies for providing in-school instruction for approximately 5,000 elementary students. The east basement renovation also provided the impetus to renovate the west office, which had grown very cramped and had suffered water damage on several occasions. New carpeting and a more open plan gave an entirely new look. By reducing the number of work stations, we also gained room for an attractive library/meeting area.

### **Staff and Interns**

The DNALC continues to operate very cost-effectively. According to survey statistics published by the Association of Science-Technology Centers, the current DNALC staff of 8.5 full-time-equivalents (FTEs) is well below an average staff of 12-14 FTEs for science centers with similar budgets, square-footages, and visitation.



Before and after in the new east basement office.

In July, Susan Lauter was promoted to Creative Director in recognition of her long-term service to CSHL, her leadership in all phases of project design, and her managerial role in the daily operation of the DNALC. While still a student at the Cooper Union in 1985, Sue began work at CSHL as an intern in the Development and Public Affairs Department. She became designer at the DNALC in 1989. Over a 10-year period, Sue has proven herself a brilliant and adaptable "generalist" capable of doing whatever is required to get the job done. Beyond her obvious artistic talent, Sue is also a capable manager who knows virtually every aspect of day-to-day operation of the DNALC. Sue was assisted by Denise Sauer, an art student who graduated from SUNY Farmingdale in May with a Bachelor of Technology degree in Visual Arts. Denise is continuing her studies at the C.W. Post campus of Long Island University, pursuing a graduate degree in Art History.

Chris Como, a senior at Cold Spring Harbor High School and a veteran intern of the DNALC, continued to assist us as a computer intern. Michael Bellino, a student at the Rhode Island School of Design, interned at the Learning Center during the summer in a computational position. Newcomers Trevor Carlson, of Central Islip High School, and Michael Romanelli of Cold Spring Harbor High School, joined the DNA Learning Center staff late in 1995, filling the void left when Chris Como began his college studies at Cornell University and Michael Bellino resumed his degree program at the Rhode Island School of Design.

The laboratory instructional staff was ably assisted by high school interns Ken Bassett (Massapequa High School), Jermel Watkins (Central Islip High School), Salley Ann Gibney (Cold Spring Harbor High School), and Stacey Trotter (Walt Whitman High School). In fall we bid farewell to Ken, who began his freshman year at Drew College, while Jermel began a pre-med course of study at the New York Institute of Technology, continuing to work at the DNA Learning Center on a part time basis. Newcomers SooJin Kim (Syosset High School), Chun-Der Li (Half Hollow Hills High School), Rachael Neumann (Syosset High School) and Trevor Sammis (Huntington High School) joined the staff late in 1995. Assisting at *Fun With DNA* summer camps were lab aides Aaron Bronfman (Long Island School for the Gifted), Brian Herz (Cornell University), Todd Rebori (Walt Whitman High School), Matt Robbins (Jericho High School), Paul Tanck (Massapequa High School), Stacey Trotter, Kristy Wagner (Huntington High School) and Jermel Watkins.

Staff associates Twana Adams, of Bronx Alternative School, and Jerry Watkins, of Central Islip High School, assumed lead teaching responsibilities at seven minority workshops hosted at the American Museum of Natural History in Manhattan. A resident and community organizer in Harlem, Twana taught five *Fun With DNA* Camps – with support from Kofi Brown, of Farmingdale College; Shukrani Tyehemba, of Tuba City High School; and Sterling Brinson, of Aviation High School. In addition to instructing the workshop, Twana and her assistants handled the complicated arrangements to chaperone and transport the young students by public transport from 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 two student workshops in his home district, where he is currently offering an elective course in molecular genetics.

## Corporate Advisory Board

Although the DNALC's national curriculum efforts and programs for minority students are funded by federal and private grants, activities for Long Island children receive no foundation support. Tuition pays for the direct cost of lab field trips and summer camps, but is not enough to pay the true costs of maintaining a vital, innovative institution with an annual operating budget of approximately \$1 million. The Corporate Advisory Board was formed in 1992 to help close this funding gap and provide a sustainable level of unrestricted annual giving. The Annual Fund is essentially "think money," that pays for staff time needed to do the advance work on new curricula and programs. This flexibility allows us to move aggressively into new areas – in advance of specific funding. Thus, we were overjoyed to learn at year's end that the Annual Fund had met and surpassed its \$125,000 goal for 1995! This is incredible, considering that as few as five years ago we received virtually no annual giving from Long Island companies.

The great cheer of meeting the 1995 goal was tempered by news that Corporate Advisory Board Chairman Rick Clark left New York at year's end to become the chief financial officer of Insession, a computer software company based in Boulder, Colorado. The loss was a double blow to Cold Spring Harbor Laboratory, because we also lost the extremely capable services of Rick's wife Jill, associate development director at the main campus. A partner at Price Waterhouse, Rick was brought onto the Advisory Board by former Chairman Doug Fox. As a new member to the Advisory Board in 1994, he organized the first annual golf tournament at Piping Rock Club. This single event, which grew dramatically in 1995, has been successful beyond our wildest expectations – making up about half the Annual Fund. We will miss Rick and Jill tremendously. The Corporate Advisory Board draws strength from Vice-Chairman Gary Frashier, President and CEO of Oncogene Science, who is our link to the growing biotechnology industry on Long Island. Other members of the executive committee represent the gamut of Long Island businesses: Rocco Barrese, founding partner at the patent law firm Dilworth and Barrese; Howard Blankman, founder of the public relations firm Howard Blankman, Inc.; Tom Calabrese, managing director at NYNEX; Bob Diller, Vice President of the scientific equipment firm Brinkmann Instruments; Arthur Herman, chairman of A.D. Herman Construction; Pat Peterson, President of the realty company Daniel Gale Agency; and Peter Schiff, general partner of Northwood Ventures.

## Publication

Bloom, M., G. Freyer, and D. Micklos. *Laboratory DNA Science: An Introduction to Recombinant DNA Technology and Methods of Genome Analysis*. Benjamin/Cummings: Redwood, Ca., 1995

**DNA Learning Center Corporate Advisory Board, 1995**

Richard M. Clark, Chairman  
Gary E. Frasier, Vice Chairman

Michael Aboff  
Andrew D. Ackerman  
Rocco S. Barrese, Esq.  
Howard M. Blankman  
Thomas J. Calabrese  
Robert E. Diller  
Candido Fuentes, M.D.  
Arthur D. Herman  
Alberto Ibarguen  
John Kean  
John J. Lack  
Laurie J. Landeau, V.M.D.  
Ralf Lange  
Jack Leahy  
Lilo Leeds  
Patricia Petersen  
William Roche  
Wendy Vander Poel Russell  
Horst Saalbach  
Peter G. Schiff  
Charles R. Schueler  
Paul A. Vermylen, Jr.  
Lawrence J. Waldman  
Raymond A. Walters, Ph.D.

## 1995 DNA Learning Center Funding

Federal Grants		Term of Grant	1995 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	4/93-3/96	\$282,459
	Laboratory-based Instruction in Molecular & Human Genetics for Teaching Faculty, Mark Bloom	5/93-4/95	\$35,953
	A Novel Mechanism for Introducing Human Genome Research in Freshman Biology Classes, Mark Bloom	4/95-4/98	\$34,132
<b>Non-Federal Grants</b>			
Barker-Welfare Foundation	MS Biology Camp/AMNH	6/95-6/97	\$6,349
Genentech, Inc.	<i>Story of a Gene</i> Exhibit	4/95-4/96	\$35,231
Howard Hughes Medical Institute	Precollege Science Education Initiative for Biomedical Research Institutions	7/94-8/99	\$89,740
Stone Foundation	<i>Biomedica</i> Teaching Laboratory	7/92-6/96	\$92,580
Weezie Foundation	<i>Story of a Gene</i> Exhibit	12/91-12/95	\$13,600

**The following schools each awarded a grant of \$5,000 in 1995 for the *Genetics as a Model for Whole Learning* Program:**

Locust Valley Central School District  
Great Neck Public Schools  
Jericho Union Free School District

**The following schools awarded a grant for Curriculum Study in 1995 of \$950:**

Commack Union Free School District	Manhasset Union Free School District
East Meadow Union Free School District	Massapequa Union Free School District
East Williston Union Free School District	Northport-East Northport Union Free School District
Garden City Union Free School District	North Shore Central School District
Great Neck Public Schools	Oyster Bay-East Norwich Central School District
Half Hollow Hills Central School District	Plainedge Union Free School District
Harborfields Central School District	Portledge School
Herricks Union Free School District	Port Washington Union Free School District
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

**of \$1,500:**  
Ramaz School

**of \$2,000:**  
West Hempstead

**Annual Fund** **\$130,985**

The DNA Learning Center Corporate Advisory Board administers an Annual Fund which surpassed its goal of \$125,000. Details on the Annual Fund can be found in the Cold Spring Harbor Laboratory 1995 Annual Report.



## 1995 Workshops, Meetings and Collaborations

January 10	Advisory Committee Meeting, National Marfan Association, Port Washington, New York
January 13-14	National Science Foundation Follow-up Workshop, <i>DNA Science</i> , University of Idaho, Moscow
January 18	Corporate Advisory Board Meeting, DNALC
January 19-20	Laboratories for <i>Women In Science and Engineering</i> Program, SUNY Stony Brook, DNALC
January 20-21	National Science Foundation Follow-up Workshop, <i>DNA Science</i> , Colorado College, Colorado Springs
January 26	Intensive Enrichment Planning Meeting, DNALC
January 26-28	National Science Foundation Grant Review, Washington D.C.
January 28	Laboratory for 1 in 9 Breast Cancer Group, DNALC
February 2-4	National Science Foundation Grant Review, Washington D.C.
February 13	Corporate Advisory Board Meeting, DNALC
February 22	Presentation to New Orleans Public Schools, John McDonogh High School, New Orleans, Louisiana
March 11-12	National Science Foundation Follow-up Workshop, <i>Advanced DNA Science</i> , Trinity University, San Antonio, Texas
March 17-18	National Science Foundation Grant Review, Washington D.C.
March 23-25	National Science Teachers Association Meeting, Philadelphia, Pennsylvania
March 25-26	National Science Foundation Follow-up Workshop, <i>Advanced DNA Science</i> , Boston University, Massachusetts
March 30	Presentation to SEED Program, SUNY Westbury, DNALC
April 8	Laboratory for Corporate Advisory Board, DNALC
April 12	<i>Great Moments In DNA Science</i> Honors Student Seminar, DNALC
April 19	Corporate Advisory Board Meeting, DNALC
April 20	<i>Introduction To Biotechnology</i> Workshop, for Business Professionals, DNALC
April 25	<i>Great Moments In DNA Science</i> Honors Students Seminar, DNALC
April 26	Site Visit by Captain Craig Maki, United States Air Force Academy, Colorado Springs, Colorado
April 28	Student Laboratory at A. Philip Randolph High School, Harlem, New York
May 2	<i>Great Moments In DNA Science</i> Honors Students Seminar, DNALC
May 6	Seminar for Harvard-Radcliffe Club, DNALC
May 10	Site Visit by Claire Pillsbury and Adam Aaronsen, Tech Museum of Innovation, California
May 11	Long Island Business Association Meeting, DNALC
May 17, 19, 21	<i>Story of a Gene</i> Exhibit Openings, DNALC
May 22	Television Program, New York State Courts In The Community, Bellport, New York
May 30	Site Visit by Dr. Isadore Edelman, Columbia University, New York
May 31	Advisory Committee Meeting, American Association for the Advancement of Science, Washington D.C.
June 8	Seminar and Tour, Institute of Social Sciences, DNALC
June 12-16	<i>DNA Science</i> Workshop, Fiskbackskill and Jonkoping, Sweden
June 14	Award Presentation at BioPharm Conference, Boston, Massachusetts
June 26-30	Access Excellence Summit, San Francisco, California <i>DNA Science</i> Workshop, DNALC <i>Computational Biology</i> Workshop, DNALC Howard Hughes/Barker Welfare Minority Workshop, <i>DNA Science</i> , American Museum of Natural History, New York

July 3-28 National Science Foundation *Leadership Institute*, DNALC  
July 6 Site Visit by Dr. Susanna Benner, Museum of Technology and Work, Mannheim, Germany

July 10-14 *Fun With DNA* Workshop, Portledge School, Locust Valley, New York  
July 17-21 *Fun With DNA* Workshop, Portledge School, Locust Valley, New York  
Howard Hughes/Barker Welfare Minority Workshop, *Fun With DNA*, American Museum of Natural History, New York

July 24-28 *Fun With DNA* Workshop, Portledge School, Locust Valley, New York  
Howard Hughes/Barker Welfare Minority Workshop, *Fun With DNA*, American Museum of Natural History, New York  
*DNA Science* Minority Workshop, Central Islip, New York

July 31-Aug 4 National Science Foundation Workshop, *DNA Science*, University of Kansas, Lawrence  
*World of Enzymes* Workshop, DNALC  
Howard Hughes/Barker Welfare Minority Workshop, *Fun With DNA*, American Museum of Natural History, New York

August 7-11 National Science Foundation Workshop, *DNA Science*, Bates College, Lewiston, Maine  
*Fun With DNA* Workshop, DNALC  
*Fun With DNA* Minority Workshop, Central Islip, New York  
Howard Hughes/Barker Welfare Minority Workshop, *Fun With DNA*, American Museum of Natural History, New York

August 14-18 *DNA Science* Workshop, Frederick Cancer Research and Development Center, Maryland  
*Fun With DNA* Minority Workshop, Central Islip, New York  
Howard Hughes/Barker Welfare Minority Workshop, *Fun With DNA*, American Museum of Natural History, New York  
*Computational Biology* Workshop, DNALC

August 17-25 *Advanced DNA Science* Workshop, Beckman Neuroscience Center, CSHL  
August 21-25 *World of Enzymes* Workshop, DNALC  
Howard Hughes/Barker Welfare Minority Workshop, *DNA Science*, American Museum of Natural History

August 28-Sept 1 *DNA Science* Workshop, DNALC  
*Fun With DNA* Workshop, DNALC

September 6 Corporate Advisory Board Meeting, DNALC

September 11-13 Howard Hughes Precollege Director's Meeting, Chevy Chase, Maryland

September 26 Site Visit by Bonnie Kaiser, Rockefeller University, New York, New York

September 27-29 Brinkmann Business Meeting, Denver Colorado

October 6 Filming at DNALC by Alligator Films, Bergen, Norway

October 10 Seminar for Kiwanis Club, Huntington

October 20 Queens Gateway Project Meeting, DNALC

October 25-28 National Association of Biology Teachers Convention, Phoenix, Arizona

October 28 *Infectious Diseases: Ancient Plagues, New Epidemics* Laboratory for Business Executives, DNALC

November 4 Benjamin/Cummings Strategies Workshop, Sacramento, California

November 7 Queens Gateway Project Meeting, DNALC

November 11 Benjamin/Cummings Strategies Workshop, DNALC

November 16-18 Department of Energy Human Genetics and Genome Analysis Workshop, DNALC and Banbury Center

November 30 Cold Spring Harbor Laboratory Lecture, CSHL

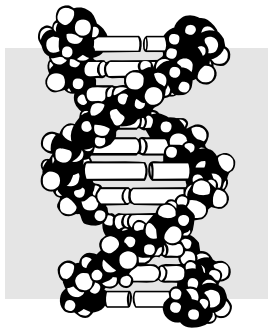
December 2 Benjamin/Cummings Strategies Workshop, University of Cincinnati, Ohio

December 2-4 National Science Foundation Workshop *Human Genome Diversity-Student Allele Database*, United States Air Force Academy, Colorado Springs, Colorado

## Sites of Major 3-10 Day Faculty Workshops 1985-95

Key: High School	College	Middle School
ALABAMA	University of Alabama, Tuscaloosa	1987, 1988, 1989, 1990
ARIZONA	Tuba City High School	1988
ARKANSAS	Henderson State University, Arkadelphia	1992
CALIFORNIA	University of California, Davis	1986
	<b>University of California, San Francisco</b>	<b>1991</b>
	<b>California State University, Northridge</b>	<b>1993</b>
COLORADO	Colorado College, Colorado Springs	1994
	United States Air Force Academy, Colorado Springs	1995
CONNECTICUT	Choate Rosemary Hall, Wallingford	1987
FLORIDA	North Miami Beach Senior High School	1991
	University of Western Florida, Pensacola	1991
	Armwood Senior High School, Tampa	1991
GEORGIA	Fernbank, Inc., Atlanta	1989
	<b>Morehouse College, Atlanta</b>	<b>1991</b>
HAWAII	Kamehameha Secondary School, Honolulu	1990
ILLINOIS	Argonne National Laboratory	1986, 1987
	<b>University of Chicago</b>	<b>1992</b>
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	1992
LOUISIANA	Jefferson Parish Public Schools, Harvey	1990
	John McDonogh High School, New Orleans	1993
MAINE	Bates College, Lewiston	1995
MANITOBA	Red River Community College, Winnipeg	1989
MARYLAND	Annapolis Senior High School	1989
	Frederick Cancer Research Center, Frederick	1995
	McDonogh School, Baltimore	1988
	Montgomery County Public Schools	1990-92
	St. John's College, Annapolis	1991
MASSACHUSETTS	Beverly High School	1986
	Dover-Sherborn High School, Dover	1989
	Randolph High School	1988
	Winsor School, Boston	1987
	<b>Boston University</b>	<b>1994</b>
MICHIGAN	Athens High School, Troy	1989
MISSISSIPPI	Mississippi School for Math & Science, Columbus	1990-91
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
	<b>Columbia University, New York</b>	<b>1993</b>
	Cold Spring Harbor High School	1985, 1987
	<b>DeWitt Middle School, Ithaca</b>	<b>1991, 1993</b>
	DNA Learning Center	1988-95
	<b>DNA Learning Center</b>	<b>1990, 1992, 1995</b>
	<b>DNA Learning Center</b>	<b>1990-92</b>
	Fostertown School, Newburgh	1991
	Huntington High School	1986
	Irvington High School	1986
	<b>Junior High School 263, Brooklyn</b>	<b>1991</b>
	<b>Lindenhurst Junior High School</b>	<b>1991</b>
	<b>Orchard Park Junior High School</b>	<b>1991</b>
	<b>Plainview-Old Bethpage Middle School</b>	<b>1991</b>
	State University of New York, Purchase	1989
	State University of New York, Stony Brook	1987, 1988, 1989, 1990
	<b>Titusville Middle School, Poughkeepsie</b>	<b>1991, 1993</b>
	Wheatley School, Old Westbury	1985
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
PANAMA	<b>University of Panama, Panama City</b>	<b>1994</b>
PENNSYLVANIA	Duquesne University, Pittsburgh	1988
	Germantown Academy	1988
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
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
	<b>Trinity University, San Antonio</b>	<b>1994</b>
UTAH	University of Utah, Salt Lake City	1993
VERMONT	University of Vermont, Burlington	1989
VIRGINIA	Jefferson School of Science, Alexandria	1987
	Mathematics and Science Center, Richmond	1990
WASHINGTON	<b>University of Washington, Seattle</b>	<b>1993</b>
WASHINGTON, DC	<b>Howard University</b>	<b>1992</b>
WEST VIRGINIA	Bethany College	1989
WISCONSIN	Marquette University, Milwaukee	1986, 1987
	University of Wisconsin, Madison	1988, 1989
WYOMING	University of Wyoming, Laramie	1991



334 Main Street in Cold Spring Harbor Village

Mailing Address:

One Bungtown Road, Cold Spring Harbor, New York 11724

Phone (516) 367-7240

Fax (516) 367-3043

e-mail: [dna1c@csih.org](mailto:dna1c@csih.org)

WWW home page "<http://darwin.csih.org/>"