The DNA Learning Center is an operating unit of Cold Spring Harbor Laboratory, extending its traditional research and postgraduate education mission to the college, pre-college, and public levels. Founded in 1988, the DNALC is the world’s first science center devoted entirely to genetics education.

The mission of the DNA Learning Center is to prepare students and families to thrive in the gene age. We envision a day when all elementary students are exposed to principles of genetics and disease risk; when all high school students have the opportunity to do hands-on experiments with DNA; and when all families have access to genetic information they need to make informed health care choices.

Front cover: View of a portion of the DNA Learning Center NYC at City Tech museum exhibition “What DNA Says About Our Past and Future”: Ötzi the Iceman mummy replica in the foreground with a Philistine burial recreation and mural beyond.
DNA sequencing costs have decreased 50,000-fold in the last decade and free bioinformatics software is widely available online. These advances have blurred the lines between research and education. DNA, RNA, and protein sequence data are important among the “big data” that are now revolutionizing bioscience research and industry, and bioinformatics is the science of mining information from biological data. “Harnessing data for 21st century science and engineering” was first on NSF’s 2016 list of big ideas for future research. The Future of Jobs Report by the World Economic Forum lists careers in data science and data management as the first and third most in-demand careers. In the life sciences, data scientist is in the top five job postings in InnovATEBIO’s 2021 Life Science Workforce Trends report.

Over the last two decades, the DNALC has pioneered biochemical and bioinformatics infrastructure to lower the barriers to biological data analysis. This began in 1998 with the first “personal genetics” experiment that allows students to sequence and analyze their own mitochondrial (mt) DNA sequence—well in advance of 23andMe, the Genographic Project, and Ancestry DNA. With NSF Advanced Technological Education (ATE) support in 2000, we developed BioServers as a simple bioinformatics tool to compare mt sequences between classmates and with reference data from world populations and ancient hominins. This platform has proven remarkably durable, engaging over 662,379 users in 2.08 million sessions averaging 15+ minutes. The BioServers database currently contains over 168,972 student mtDNA sequences.

This was followed by the launch in 2010 and ongoing development of DNA Subway, an intuitive GUI that makes sophisticated bioinformatics analysis accessible to students without coding experience. Operating under the umbrella of the NSF CyVerse cyberinfrastructure, DNA Subway coordinated contributions from more than 25 scientists, computer programmers, and bioinformaticians at more than a dozen research institutions. Using the metaphor of a subway map, students can “ride” on any of five different lines to access and analyze DNA sequences. DNA Subway has garnered a dedicated following, with 265,832 total users logging 658,150 sessions averaging 17 minutes from 2010–22. Over 234,000 DNA sequences (mainly DNA barcodes) have been uploaded by our partner GENEWIZ, and Blue Line visits account for about 72% of traffic. Undergraduate students compose 68% of 53,336 registered users. Blue Line users have published 2,234 barcode records on GenBank with 1,543 unique student and faculty authors. In a recent survey, we found that 48% of two-year biotech programs that teach bioinformatics currently use or intend to use DNA Subway in the future. Efforts are underway to reach the similar percentage of two-year biotech programs that are unaware of DNA Subway.
The year saw us cementing new collaborations to bring relevant modern biology to high school and college students. One effort introduces “personal” DNA sequencing to education, another explores synthetic biology, and the third provides resources to analyze human migration and DNA ancestry.

Oxford Nanopore’s inexpensive MinION sequencer is emblematic of the next-generation sequencing technologies that have driven down the cost of DNA sequencing. Smaller than the average cell phone, the MinION connects to a personal computer via a USB port and can generate a whole genome’s worth of data for about a $1,000! Nanopore sequencing is the starting point to involve students in the entire data life cycle—generating, quality controlling, databasing, curating/annotating, analyzing, sharing, publishing, and reusing. Over the last several years, DNALC Assistant Director Jason Williams has explored the use of the Oxford Nanopore MinION in education. In 2022, the DNALC was awarded a two-year, $179K exploratory grant to developing nanopore DNA sequencing for course-based undergraduate research experiences (CUREs) at minority serving institutions (MSIs). In this project we will work with faculty from New York City College of Technology, Spelman College, and University of Puerto Rico-Río Piedras to: 1) develop a Nanopore biochemistry and bioinformatics workflow; 2) Develop demonstration projects and pilot the Nanopore workflow with students; and 3) Evaluate the project and characterize barriers to faculty adoption of Nanopore technology. Achieving these objectives will lay the groundwork for nationwide dissemination.

In the fall we received a subaward to do educational outreach for a synthetic biology project with Vincent Noireaux and Steve Bowden of the University of Minnesota. Our outreach will be based on a cell-free transcription-translation (TXTL) system developed in the Noireaux lab. We will use the TXTL system to develop models of CRISPR gene editing and cell-free assembly of bacteriophages. Our first target for development will be a synthetic biology approach to
produce green fluorescent protein. We will employ a cell-free production “chassis”—with “parts” including promoters, transcription factors, and ribosomes.

23andMe founder and CEO Anne Wojcicki contributed $3 million to the DNALC NYC endowment. This was doubly fortuitous, because personal DNA data is at the heart of the NYC exhibit under development, “What DNA Says About our Past and Future.” After several months of discussions with 23andMe scientists, in February we signed a license agreement to have exclusive use of 23andMe ancestry data in our exhibit, accompanying visitor guides, and student curriculum materials. The data allow us to map the distribution of 40 world population components. For example, the image below shows everyone who has taken a 23andMe test and who have an Iberian ancestry component—clearly showing the Spanish and Portuguese colonization of Africa and the New World. We also have maps of maternal and paternal lineages, which illustrate ancient migrations out of Africa to Europe, Asia, Australia, and the Americas. These will be displayed on a 9’ by 16’ digital “video wall” purchased through a grant from the Office of the Brooklyn Borough President, Eric Adams, who became NYC mayor in 2022.

As we turned to 23andMe for help with the DNA Present part of the exhibit, we also turned to David Reich, at Harvard University, for help with DNA Past. The availability of ancient human genomes—mainly from burials—has grown exponentially over the last decade. The bulk of this DNA sequencing has been performed by the Reich lab and made available through the Allen Ancient DNA Resource (AADR). Currently there are 9,990 ancient genomes available from all continents. Like the 23andMe population components, admixture analysis is used to gauge the population components of ancient genomes. With guidance from Dr. Iosif Lazaridis of the Reich lab, we are developing tools to allow students to visualize admixture analysis from Eurasian burials dated between 12,000 and 1,000 B.C. By comparing the admixture analysis of burials from different places in Europe from different time points, students can track the migration of agriculturalists from the Middle East and the Yamnaya (horse riders) from the Central Asian Steppes as they spread these innovations across Europe.

Coming Back from COVID-19

Operationally, 2022 witnessed a nearly complete rebound from the COVID-19 pandemic. Income and expenses came into balance, and DNALC operations returned to positive cash flow after two negative years. Income increased 30% over 2019, benefitting from new facilities at Regeneron and City Tech. The structure of these licenses—with no lease or
major facilities costs—means there is little impact on cash flow as we build visitation after the pandemic. Supplies are scaled to visitation, and 2022 income was in proportion to total DNALC staff—which has remained at 25 full-time-equivalents (FTEs) since 2018. We will only add staff members to the Regeneron and City Tech operations as visitation expands.

Summer camp visitation was a key to the year’s successful results. With 1,287 campers and $697,023 in income, the 2022 camp season was the best in DNALC history—besting the record number of 2018 campers by 20% and income by 10%. The DNALC’s established business on Long Island recovered to pre-COVID-19 levels. Regeneron income exceeded 2018 income at DNALC West (formerly at Northwell Health in Lake Success) in its last full year of operation. Regeneron operated at about 50% capacity during its first summer of operation; the same performance by DNALC West during its first year. On this pace, we expect that Regeneron will reach full occupancy in 2024-25. Scaled for its larger size, Brooklyn’s performance was about a third that of Regeneron, suggesting that it is not likely to reach full occupancy until 2026-27.

We awarded 118 summer workshop scholarships to underrepresented minority and disadvantaged students. We rekindled a collaboration with Gateway to Higher Education, an intensive college science prep program that operates in 11 New York City public high schools: A. Philip Randolph, Benjamin Cardozo, Brooklyn Tech, Clara Barton, Excelsior Prep, Francis Lewis, George Washington Carver, High School for Enterprise, Business & Technology, Jamaica Gateway to the Sciences, Port Richmond, and Queens Gateway to Health Sciences. We began to collaborate with Gateway in 1989, as part of a grant from the Josiah Macy, Jr. Foundation.

High School DNA Barcoding Research Programs

The DNALC continued efforts to enable high school students to conduct authentic biodiversity research using DNA barcoding. Barcode Long Island (BLI) involves students in “campaigns” to compare biodiversity across Long Island. The Urban Barcode Project (UBP), funded by the Thompson Family Foundation, and Urban Barcode Research Program (UBRP), funded by matching grants from the Pinkerton Foundation and Simons Science Sandbox, involve students in independent research of biodiversity in NYC. Science teachers are mentors for BLI and UBP students, while scientists from NYC institutions mentor UBRP students.

Following the completion of National Institute of General Medical Sciences (NIGMS) Science Education Partnership Award (SEPA) funding, BLI adopted a sustainable model of support for Cohort 8 where schools covered the cost of materials and sequencing for their teams, participated in the DNALC’s Associate Partner and Partner Memberships, or were awarded scholarships based on financial need. Forty-four teams including 146 total students completed projects. Ten teams were supported through open lab sessions at the Dolan DNALC and 31 teams borrowed equipment. One hundred and ninety-two sequences were published in GenBank with student authors, including four new barcode records and 86 with variable DNA sequence. Twenty teachers attended a five-day summer (6) or one-day fall (14) training workshop, including 17 who had never previously attended a BLI workshop. Over 40% of newly trained teachers submitted student project proposals for Cohort 9 as of December.

The annual Barcode Long Island Student Symposium was held in-person on June 7, 2022 on the Cold Spring Harbor Laboratory campus following two years of remote, combined BLI, UBP, and UBRP symposia. Keynote speaker Dr. Christopher J. Gobler presented on using molecular tools to decode harmful algal blooms.

Over 100 students working on 37 teams completed projects in the UBP and 38 students working on 19 teams completed projects in the UBRP. UBP and UBRP students made ample use of DNALC resources: 21 teams attended Open Lab sessions at the Harlem DNA
Lab or DNALC NYC, and 19 teams borrowed equipment. Twenty-eight UBP teams and 17 UBRP teams presented posters to peers and science professionals at the annual research symposium. Two UBRP teams also presented posters to peers and science professionals at the annual Science Research Mentoring Program (SRMP) Colloquium on June 7th. This year, 11 students in UBRP completed project exit surveys. Participants were asked about their experiences in the programs, how much they had learned, and how they felt about science. UBRP students emerged from the program with stronger interest and confidence in pursuing a path in science. In Cohort 9, 62.5% of students from were more interested in studying biology following their UBRP projects, and the same number were more interested in studying science in general. Eighty seven and a half percent felt more capable of going further in science than they did prior to participation in UBRP. Importantly, most of the students (87.5%) felt that UBRP gave them a better understanding of the role of technology in modern biology research and 63.6% felt that the approach to problem-solving they learned in UBRP would help them succeed in future science courses. Overall, our results suggest that DNA barcoding demystifies the process of science research and encourages students to continue on STEM pathways.

The annual Urban Barcode Project and Urban Barcode Research Program symposium was held in-person on June 3, 2022 on the campus of the New York City College of Technology. The keynote speaker, Dr. Theodore Muth of Brooklyn College, presented on the biodiversity
of microbial communities in New York City. Two teams were recognized with outstanding poster awards: in the UBP, a team from Brooklyn Tech for “Performing Barcoding and Soil Analyses to Investigate Ecosystem Resilience in Different Flood Zones of Brooklyn, NY”, and in the UBRP, a team mentored at the New York Botanical Gardens for “Analysis of Moss Biodiversity in Manhattan Parks”.

**Citizen Science DNA Barcoding**

*Citizen DNA Barcode Network* entered its third year of NIGMS SEPA funding. The project organizes local and national DNA barcoding campaigns for citizen scientists at science centers and through nature/conservation organizations. Participants collect and barcode “campaign” organisms including vectors of human disease, invasive species, and economically important species whose ranges may be shifting due to climate change and habitat destruction.

The New York Hall of Science (NYSCI) staff completed work as project co-PI, but implemented DNA barcoding programming permanently through their new *Cecily Selby Inquiry & Investigation Program*. The pilot cohort included five high school and five undergraduate “Explainers” who were trained in DNA barcoding as well as microscopy, microbiology, and entomology. Explainers developed new visitor demonstration, mobile cart, and interactive floor experiences on DNA barcoding. Explainer photographs of identified invertebrate samples will decorate NYSCI’s new lab space.

Year 3 officially began our national expansion by onboarding our first program hub, the California Academy of Sciences (CAS). A five-day workshop at CAS trained eight core team “Careers in Science” high school interns alongside two academy Youth Programs staff and a local community college collaborator in the DNA barcoding process and *CDBN program*.
implementation. However, delays in subaward funding and extreme weather shifted the majority of CAS program implementation to Year 4. New York collaborators at The Nature Conservancy at Mashomack Preserve, Sweetbriar Nature Center, Long Island Aquarium, Long Island Science Center, Jones Beach Energy and Nature Center, and new collaborator the Landcraft Garden Foundation, along with the Missoula Butterfly House and Insectarium (MT), also hosted public CDBN events. Activities included brief “tabletop” sessions introducing the use of DNA to identify species; partial- or full-day, hands-on labs; virtual bioinformatics activities, DNA barcoding training during internships; specimen collection events; and a two-week DNA barcoding summer camp. Two BLI mentors helped implement CDBN events.

The program supported 546 participants with a range of ages and skill levels. In total, 199 DNA barcodes were published to GenBank with citizen scientists as authors, including 30 previously unpublished barcode sequences and 89 new variants. Samples included an agriculturally significant leaf beetle (Brachypnoea lecontei) collected in Louisiana at the fringe of this species’ known range, suggesting a northeastward expansion; a high level (>12%) of variability in the barcode region for multiple collected Sternidius punctatus samples, suggesting a possible cryptic species; and multiple specimens of a potentially undefined Nylanderia species collected from various locations across the Northeastern US.

**DNA Barcoding in Undergraduate Classes**

Under our $2 million IUSE grant from the National Science Foundation, we continued to popularize DNA barcoding and metabarcoding as solutions for course-based undergraduate research experience. Along with our collaborators at James Madison University (JMU), CUNY City Tech, Bowie State University (BSU), and Austin Community College (ACC), we introduced large numbers of freshmen and sophomore college students to research. JMU administers one of the largest CUREs in the US, providing DNA barcoding experience to 1,500 students in 71 sections of freshman biology for majors and non-majors. Metabarcoding projects were done by 520 students in 24 sections of sophomore biology. At BSU, 84 freshman students participated in DNA barcoding CUREs, and 40 juniors did metabarcoding. We also supported faculty trained during the first three years of the grant, providing free reagents and DNA sequencing, and extended support through email, phone calls, and video chats as they grant as they implemented CUREs. We supported 23 faculty providing DNA barcoding to 2,076 students and 33 faculty providing metabarcoding for 338 students.

In the spring of 2022, respondents to the survey from a large implementation of DNA barcoding at Howard University (n=200) allowed us to compare results of a participant CURE to JMU’s large-scale CURE (n=808). Students from Howard University were half as likely to have had any research experience prior to their course. They reported statistically greater effects than their JMU counterparts on their interest in and belief in their ability to go further in science while having similar increases in their self-reported knowledge of barcoding, metabarcoding, and scientific methods. This suggests that replicating the barcoding CURE by a program participant was as effective as JMU’s implementation. In addition, the Howard University CURE may have greater impact, possibly because Howard serves a predominantly URM population (94%) while JMU has a predominantly white student population (13% URM).
The DNALC continued its work as a lead institution in the InnovATEBIO national biotechnology education center funded through NSF ATE, which supports training for America’s workforce. We continued to advance the concept of Hubs as a decentralized infrastructure that shares leadership among a unique team of biotechnology educators. Hubs support both the processes and emerging technologies that help prepare an agile bioscience workforce. Eight hubs are “go-to” places for specific expertise to create and support biotech programs in high schools and community colleges: alumni network, careers and entrepreneurship, high school pathways, industry and workforce development, supply chain, student research, genomics, and immunotherapy.

Our own Genomics Hub aims to popularize genomics technology as a means to introduce modern biological concepts and workforce skills. We continued to collaborate with Joe Oleniczak (above), to implement a DNA sequencing service at Austin Community College based on the systems we have developed to support human mtDNA sequencing and DNA barcoding. We continued to work with Aron Kamajaya, of Los Angeles Pierce College to develop simple, reproducible methods to isolation Taq polymerase. Here the objective is to illustrate modern methods for producing biologicals from cloned genes, as well as a template for student-run “companies” to produce Taq for use in other biology classes. This offers a complete model of a modern biological supply chain—from assembly of components, to production, quality control, and distribution. The SimpleTaq plasmid constructed by the DNALC constitutively expresses Taq polymerase, and we also devised a method to harvest Taq from bacterial lawns grown on culture plates. This did away with the need for any large-scale liquid culturing or shaking incubation. We have found that Taq polymerase produced by our SimpleTaq plasmid and isolated using our simple, 40-minute method has activity comparable to commercial Taq polymerase. We have also found that SimpleTaq lysates stored at 4°C remain stable and highly active for at least 16 months!

The COVID-19 pandemic broke our 35-year streak of conducting in-person summer teacher training workshops that began in 1985! So, we were happy to return to this tradition with an workshop on “Lab Methods in Personal Genomics and DNA Barcoding” at Los Angeles Pierce College. Hosted by our collaborator Aron Kamajaya, this three-day workshop provided an introduction to the DNALC’s popular experiments in polymerase chain reaction (PCR) and DNA sequencing. Two experiments in personal genetics—Alu Insertion Polymorphism and mtDNA Sequence Variations—illustrate human diversity and population genetics, while DNA barcoding positively identifies plants and animals—down to species level. All experiments entail the entire data life cycle—including data generation, databasing, and analysis using the DNALC’s bioinformatics tool, DNA Subway. These open-ended experiments are perfect for extended investigations or course-based undergraduate research experiences. Participants successfully isolated Taq polymerase and used it to amplify their own DNA polymorphisms, illustrating a practical use for the freely obtained reagent.
NSF CyVerse

2022 marked a transformative year for CyVerse as the platform transitioned to a subscription model for different service tiers. This sustainability approach is designed to charge researchers who make extensive use of CyVerse a fee that covers some of the cost of use. A free tier allows new or occasional users to continue using the platform without charge. Although the DNA Subway platform is no longer directly supported by the CyVerse grant, CyVerse continues to provide underlying infrastructure. As we enter the final year of the current CyVerse grant, we are revamping plans for a DNA Subway upgrade and refresh that will ensure continued and expanded access for educators. DNA Subway usage increased by 9% in 2022, with 1,292,306 page views (compared to 1,181,403 in 2021). The platform had 55,284 registered users, a 14% increase from 2021. Project creation increased dramatically with resumed training on metabarcoding with the Purple Line; users created 54,489 student projects, a 35% increase from 2021. We also supported our ongoing Foundational Open Science Skills course with a fall 2022 cohort of 48 students and hosted an in-person CyVerse workshop at SUNY Old Westbury College for 23 students. An additional 400 community members were reached at conferences, including the American Society of Plant Biology, Society for Developmental Biology Southwest Regional Meeting, and the NIH National Human Genome Research Institute’s summer short course.

Diversity, Equity, and Inclusion

The Science, Technology, and Research Scholars (STARS) program aims to cultivate and diversify the next generation of STEMM (science, technology, engineering, mathematics, and medicine) leaders. STARS is designed for high school students from the Long Island and NY metro area who are entering grades 10 and above and are members of groups that have been historically underrepresented in the sciences. In its fourth year, we enrolled 21 students from 13 school districts. Funds available through a gift from CSHL trustee Laurie Landeau were used to provide bussing for eight students who would not otherwise be able to attend. During a trip to Stony Brook this year, students participated in a “simulation” experience where one task included taking a case history of a model patient (an actor trained with a script of symptoms and medical history). The students also examined patient simulators—robotic patients with simulated heartbeats, pulses, and other features. We are now developing opportunities for students to have shadowing experiences with physicians. As alumni progress through the program, we see them integrating into other science research opportunities at CSHL. Several students have continued on to participate in the Partners for the Future program and other CSHL internships, including Harrison Banks (STARS ’20) and Madison Krug (STARS ’21). We also had several students participate in a college panel during our family orientation and alumni meetup, including Nigel Williams (STARS ’19) studying at Cornell and Jenifer Martinez (STARS ’19) attending Quinnipiac University. Carlos Javier (STARS ’21) and his classmate, Sadé Griffith of Wyandanch Memorial High School, also presented their work on lichens at the DNALC’s Barcode Long Island symposium. As STARS reaches its 100th student next year, we continue to actively build our network of alumni, engaging students year-round through virtual and in-person mentoring and meetups.
The DNALC was awarded a Coordinating Center award from the NIH National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). Short-Term Research Experiences to Unlock Potential (STEP-UP) supports high school students from groups historically excluded from science, offering paid, eight-week summer internships at research labs near their homes. Students work with scientist mentors on a research project to be presented at an end-of-summer symposium. During the school year, STEP-UP also provides mentorship to prepare students for college and future research.

As a Coordinating Center for the high school component of STEP-UP, the DNALC assists with placing students into research experiences, focusing on the US Northeast region. In the first year, we placed 11 students in colleges from Michigan to New York. STEP-UP is highly complementary with the DNALC’s STARS program and we anticipate that future STARS students will participate in STEP-UP as a follow-up research experience. STEP-UP is led by Assistant Directors for Diversity and Research Readiness, Jason Williams and Michelle Juarez. The DNALC’s participation has made activities such as nanopore sequencing and introductory genetics content visible to a national audience of students participating in STEP-UP, as we assist students in preparing for their summer research experiences and meet regularly with them for mentoring.

The Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) organized the National Diversity in STEM (NDiSTEM) Conference in San Juan, Puerto Rico. The largest multidisciplinary and multicultural STEM diversity event in the country, the conference serves to equip, empower, and energize participants for academic and professional paths in STEM. Jason and Michelle joined the CSHL School of Biological Sciences staff to participate in the conference as exhibitors. This was the first time DNALC staff attended the conference and highlighted our role as the STEP-UP program Northeast coordinating center. We focused outreach on networking about STEP-UP to potential mentors. Michelle has been attending the SACNAS conference since 2002 when she was an exhibitor for CSHL and presented her graduate research. Michelle also served as judge in the graduate student oral presentations and participated as a mentor in a one-on-one mentoring workshop. Jason presented on a scientific careers panel for working with data and plant sciences.

As the DNALC continues to strengthen its commitment to diversity and inclusion, we also have an obligation to share lessons learned and advocate for broad change. We did so in the article “Achieving STEM Diversity: Fix the Classrooms,” which appeared in Science magazine in June. We argued against conceptualizing diversity and inclusion as efforts that need to “fix” students or that assume some students are inherently less capable than others. Instead, we called for examining the structures of educational systems that do not meet the needs of students or appreciate that supporting a diverse population of students means anticipating different interests and needs. The lead recommendation of the article was the need to advance hands-on learning—something the DNALC has been doing for more than 35 years. We also stressed the importance of creating a welcoming environment where every student feels included. Our STARS program, for example, is designed to create an environment where students from underrepresented backgrounds are surrounded by their peers and exposed to role model scientists and professionals. As we continue to increase our commitment, we will also support and advocate for the inclusion of all students in the learning experience.

Licensed Centers
This was our first full year of in-person programming at the Regeneron DNALC. We worked hard to contact teachers we met before the pandemic, and initiate new relationships with others. In total, 889 students visited for field trips, including 31 high schoolers from Yonkers Partners in Education who met with social media influencer Dr. Raven the Science Maven to learn more about her journey in STEM and perform a genetic engineering lab. An additional 171 students from Sleepy Hollow Middle School visited for the annual Regeneron Day for Doing Good event. They moved through a series of lab activities presented by DNALC-trained Regeneron staff, who volunteered to help increase STEM exposure for the local community. Our first camp season in Sleepy Hollow was a success. We were thrilled to host 198 campers—33% of whom were children of Regeneron employees—meeting our goal of 50% occupancy for the pilot season.

With the release of new campus-wide COVID-19 safety protocols in April, the Notre Dame DNA Learning Center (ND DNALC) continued towards a return to pre-COVID-19 instruction programming. In summer, 43 participants attended the first in-person residential programs and workshops since 2019! An additional 250 students participated in laboratory field trips, more than half of whom were from schools visiting for the first time. In fall, seven high school students—including some former summer campers—worked on independent research projects from DNA barcoding bacteria, to cancer and COVID-19 investigations. One student project titled “What Is the Role of PRPF39 in Cisplatin Treated Cancer Cells?” advanced to the Regeneron International Science and Engineering Fair. Notre Dame staff also participated in two campus-wide science events: “Moment of Science” and the “College of Science Tailgate.”

We continued to develop plans for a DNA Learning Center in Passaic County, New Jersey. The new DNALC will be located in the Biotech Innovation Center on the campus of the Passaic County Technical Institute (PCTI), a vocational-technical high school. A bridge will connect the Biotech Center to an adjacent campus of Passaic County Community College (PCCC), which cements the center’s goal to provide AS degrees to 150 students per year in the dual-enrollment biotech program. The $25 million construction project is funded by New Jersey’s Securing Our Children’s Future Bond Act. The 6,500-square-foot DNALC will contain two teaching labs, a bioinformatics lab, and a research/supply chain lab (in part to produce Taq polymerase). The DNALC will serve biotech students, as well as students enrolled in PCTI’s Biomedical STEM Academy and AP Biology. Importantly, the new DNALC will provide lab field trips, summer camps, and DNA barcoding projects for middle and high schools throughout Passaic County, which have among the lowest science achievement scores in the US. The project is led by Ted Szczawinski, PCTI Assistant Superintendent for Instruction, and Steven Rose, President of PCCC. We have a strong advocate in Geoff Gordon, PCCC Director of Special Projects, who, as superintendent, steered Port Washington into the Wall Street Journal’s top 10 high schools in the US. During his 10-year tenure, Port Washington was a standout in the Intel Science Talent Search and a strong participant in DNALC programs.
International Partnerships

China

Travel restrictions continued to hamper our collaboration with Beijing No. 166 School in China. With our program on hold since the start of the pandemic, we worked with school faculty to figure out how to finish out the contract and provide hands-on instruction for their students. The solution was modified On-Demand camps with comprehensive pre-recorded video instruction so students could perform labs in their classrooms using real lab equipment, and follow a more traditional lab schedule for three courses: Genome Science, DNA Barcoding, and Introduction to Genetics, a hybrid of Fun with DNA and World of Enzymes. In addition to filming about 15 hours of video instruction per course, we developed custom course and support materials, and ordered reagents and consumables from a vendor in China. We also provided regular access to DNALC staff for Q & A, troubleshooting, and engagement with an instructor as needed. Overcoming obstacles like social distancing restrictions and family reticence to send children back to school following a lockdown, teachers filled one session each of DNA Barcoding and Introduction to Genetics, with 36 total enrolled. They plan to implement Genome Science over winter break in January 2023.

In 2022, Cold Spring Harbor Asia (CSHA) DNALC in Suzhou faced challenges due to COVID-19 closures, with schools reopening permanently in mid-May. Nonetheless, the center recorded 25,724 total visits—including 292 camp and 118 weekend program attendees—a 22% increase over the previous year. After-school science clubs thrived and student projects were showcased in a city-wide popular science event, garnering 120,000 views during live broadcasts. Illumina (China) Science Equipment Co., Ltd. sponsored the 2022 Life Science Enters Campus—Deciphering the DNA Code course, reaching 1,000 students across nine schools in four provinces. The 10-part Life Journey Lectures series engaged 4,148 people, and three-part series on biodiversity during Popular Science Week reached 159 classes, with nearly 10,000 live viewers.

The 6th Annual Suzhou Young Life Scientist Cultivation Program attracted 1,855 students from 129 schools, a significant increase from the previous year. This program has strengthened CSHA DNALC’s position as a leader in science education and fostered valuable school relationships. The DNA barcoding research course remained popular among high school students, aiding college applications with CSHL branding. The Phyto-Identity Collaboration (PIC) developed in 2021, engaged 24 students who completed 21 research posters and published over 100 sequences. The Innovative Biology Education Program (IBEP) continued to receive support from the SIP Education Bureau, enrolling 2,300 students, a 5% increase from the previous year. Since its inception in 2018, IBEP has engaged almost 32,000 high school students in two biotechnology labs. Research has shown that students taking this course can score about 15% higher on the biology portion of the Jiangsu Province Gaokao, the do-or-die entrance exam to Chinese Universities.

Dr. John Olsen, the former Education Director, left in March 2022 for a position at the University of California, San Diego. Dr. Zhiyuan Liu took over as lead educator.

DNA Learning Center Nigeria

The pandemic was just one of the challenges faced by DNALC Nigeria. Despite this, the center has continued to offer courses and meet its objectives using the current funding. Over 500 participants have benefited from the Center’s programs, including 240 post-graduate trainees and faculty members who enrolled in courses on DNA Barcoding and Genome Science. Furthermore, 200 pre-college students received training through the grant funding from the Back to School Initiative (BATOSCIN). Facility upgrades now ensure 24-hour power and increased water storage capacity, among other essential repairs. Even though attendance
numbers remain modest, these achievements are commendable, especially given the region’s challenges with rising insecurity, extended strikes, and economic difficulties. Michael Okoro, a former DNALC intern and now a DNALC Nigeria Scholar, continues to lead the Center’s operations, with supplemental funding from DNALC.

**Lab Instruction and Outreach**

With rising COVID-19 vaccination rates and the lift of the New York State school mask mandate, we started to see increased field trip reservations. This was especially noticeable on Long Island where high school classes began to flood back, making up for lost time in the lab. We initiated advertising campaigns in the fall to remind teachers who were still coming out of the pandemic haze that we were open for business. Our efforts paid-off, and a total of 16,335 students attended lab field trips at Dolan DNALC, *Regeneron DNALC*, and *DNALC NYC* at City Tech. In-school programs reached an additional 7,208 students, and footlocker kits were used by 1,499 students, 117 of whom were conducting independent research through *UBP*, *UBRP*, or *BLI*.

Tuition assistance for field trips to Dolan and *Regeneron DNALC* was provided for 234 students from Uniondale School District, A. Philip Randolph High School, Excelsior Prep High School, Benjamin N. Cardozo High School, and Jamaica Gateway to the Sciences. An additional 269 students from the Brentwood School District received subsidized in-school instruction for their honors Living Environment program. Five hundred and twenty 6th- and 7th-grade students from Central Islip School District participated in lab programs funded by the National Grid Foundation, including a student who was nominated by her science teacher for two camp scholarships. At *Harlem DNA Lab* and *DNALC NYC*, field trip scholarships were awarded to 870 students (24%) who attended Title I schools. A portion of these scholarships were subsidized by a grant from the William Townsend Porter Foundation.

In summer we offered a full schedule of in-person camps at all three locations, requiring that students provide proof of vaccination, or a negative COVID-19 test to attend. With 1,575 total campers, we had the highest summer enrollment in DNALC history—evidence that parents and their children were ready to get back to science camp! We had 772 campers on Long Island and an impressive 198 for our pilot camp season in Sleepy Hollow. In Brooklyn we hosted 459 campers, including 231 who attended subsidized *UBRP* prep courses, and 17 who were supported by the City Tech *Bridging the Gap Science and Technology Entry Program (STEP)* for pre-college students. Need-based scholarships were awarded to 55 campers in NYC. Sixty-seven percent of scholarship recipients were Black, Hispanic, or Native American, fulfilling our goal to focus on accessibility for underrepresented minorities in STEM.

In partnership with CSHL Women in Science and Engineering (WiSE), we hosted the sixth annual *WISE Fun with DNA* summer camp. Twenty-four female science enthusiasts had the opportunity to meet engaging role models with careers in science. After completing the core *Fun with DNA* curriculum each day, campers participated in WiSE activities on advanced topics like cancer.
research, neuroscience, and gene expression. In addition to Parent Participation on the final day of camp, parents and campers enjoyed a guided tour of the CSHL campus.

Membership programs thrived with a total of 19 Sustaining Members, including new member Hendrick Hudson School District at Regeneron. The Dolan Associate Partner program grew with the addition of Friends Academy. We helped design and implement a plan for the development of the school’s research program, with a focus on using DNA barcoding as a springboard into continued research. Associate Partner Glen Cove City School District, also invested instructional time in development of their research program, and implementing course related labs with their middle school life science, Living Environment, and AP Biology classes.

Dolan Partner Members, Long Beach City School District and Massapequa School District, started year two of membership with a number of new initiatives in place. In Massapequa, every research student will be exposed to our barcoding wet lab and bioinformatics infrastructure as 8th graders, and then complete a barcoding research project in grade 9. There are also structured exposure opportunities for all of the Living Environment and middle school life science classes. Long Beach instituted lab exposures for all of the 8th grade Life Science and Living Environment classes, and offered summer camps at Long Beach Middle School for their science interested 6th–8th graders. In July, 38 students attended Fun with DNA and Forensic Detectives. Feedback was positive: “Camp was very interactive which kept my daughter engaged and interested. She’s a visual, hands-on learner and this program really suited her learning style. She was always excited to share what she learned. That never happens….”

As part of other ongoing local partnerships, the year-long Molecular and Genomic Biology elective at Cold Spring Harbor High School continued in spring. The 12 enrolled students spent the last two periods of every other school day at the DNALC, immersed in hands on experiments in DNA barcoding, human and plant genomics, and bioinformatics. Due to low enrollment, a new student cohort was not enlisted in fall. An additional 11 students from St. Dominic High School in Oyster Bay participated in a half-year Molecular and Genomic Research elective taught at the DNALC. As part of their course requirements, all students in both elective classes participated in Barcode Long Island.

The NYC Partner Member program continued to provide custom instructional sequences and advanced electives for six independent schools.

- Portfolio School grade five students conducted molecular and historical inquiries into the origin of lactase persistence.
- Research teams from Fontbonne Hall Academy used DNA barcoding to produce novel GenBank entries for flowering plants and snails. AP Biology students studied viruses, vaccines, and protein structure, and created 3D-printed models of the SARS-CoV-2 spike protein.
- Lycée Français de New York implemented genetics programs in their AP Biology courses. High school students in a Genome Science summer camp pioneered a protocol to manufacture their own Taq DNA polymerase, which they used for PCR throughout the camp.
- At Marymount School of New York, genetics programs were incorporated as key parts of the biology curriculum at multiple grade levels, including Advanced Molecular Biology. Grade eight physical science students studied energy transformations and the nature of light using fluorescent proteins.
- St. David’s School integrated basic genetics with existing curricula in grade five. Grade eight used DNA barcoding to survey the ants of Central Park.
- The Chapin School coordinated genetics programs at several grade levels, including the advanced Molecular Genetics elective. Grade-six students analyzed chromosomes in human cells while studying Henrietta Lacks and bioethics. They were among the first students to explore the new What DNA Says About Our Past and Future exhibit at DNALC NYC.
This year we took steps to deliver on our commitment to level the science playing field for underrepresented minority (URM) and disadvantaged students. With support from the Lounsbery Foundation, we initiated our flagship Research Ready Program in New York City by selecting the first two public high schools to join elite independent schools as Partner Members of the DNALC.

- Manhattan Center for Science and Mathematics in Harlem is a URM alternative to NYC’s specialized science high schools. It has an impressive selection of advanced and college-level courses, which can readily incorporate the DNALC’s opportunities for student projects and research. The student body is 68% URM.
- Satellite Academy in midtown Manhattan is a transfer alternative high school that admits older students who have fallen behind in credits, dropped out, or need a fresh start. Satellite students will appreciate the workforce orientation that we can provide through InnovATEBIO, as the school is designed to help students get back on track towards graduation. The student body is 95% URM.

We began working with the leadership of these schools to develop an enhanced scope and sequence for modern biology that will include up-to-date lab experiences in Regents Living Environment, new biology electives, and extended student research opportunities. Long-term engagements will support cohorts of students along the pathway from high school to college to careers.

In September, the Our Human Inheritance exhibition in Cold Spring Harbor was finally reopened to the public and we hosted 39 visitors after a two-year pandemic closure. An additional 2,722 students received guided tours of the exhibit on field trips. In parallel, the new What DNA Says About Our Past and Future exhibition under construction at DNALC NYC had 77 visitors, 65 of whom were on field trips.

The Saturday DNA! program drew 258 participants across three locations, including the first ever Saturday DNA! sessions at the Regeneron DNALC. Eighteen different sessions included topics such as cellular respiration in yeast, how to be DNA detectives, the indestructible tardigrade, Mendelian genetics, “painting” with bacteria, and the scientific method. Participants had fun with Halloween-themed sessions and extracted DNA from pumpkins, built candy DNA models, and delved into the enduring mystery of Anastasia Romanov. On Veteran’s Day we also hosted a Saturday DNA! spin off called Day in the Lab. With the help of the CSHL Association Directors, we enrolled 152 children and their parents for fun hands-on activities designed to expose a young (ages 5–10) audience to a variety of STEAM (Science, Technology, Engineering, Art, and Math) including fingerprint analysis and painting with fingerprints, heredity, observing biochemical reactions, and DNA extraction from strawberries.
In spring, 11 high school students in the City Tech Bridging the Gap STEP program attended 12 hours of Saturday workshops at DNALC NYC to provide a comprehensive introduction to DNA—from DNA isolations to forensic DNA fingerprinting and DNA restriction analysis. Math for America teachers attended two mini courses in Brooklyn where they explored applications of genetic engineering. Participants genetically engineered bacteria to produce Green Fluorescent Protein (GFP), and used PCR to test snack foods for genetic modifications. Teachers who attended these mini-courses are now eligible to borrow DNALC footlockers to implement these labs at school, and many decided to bring students on a field trip after seeing our new space.

DNALC NYC staff participated in Brooklyn community events to meet the neighbors and do hands-on science! Families attending the Brooklyn Bridge Parents Indoor Block Party and the Brooklyn “Atlantic Antic Festival” extracted DNA and made DNA necklaces. We also participated in the SUBMERGE Marine Science Festival field trip day at Hudson River Park. Students visiting rotated through activity tables and learned about eDNA or did “pipette painting” with our team.

The virtual Meet a Scientist series continued to connect high school and public audiences with local researchers to learn more about their career paths, and current projects. CSHL Assistant Professor Dr. Jeremy Borniger shared his work on how bran circuits influences cancer processes in the body; CSHL Fellow Dr. Corina Amor introduced her research on senescent cells and their involvement in aging and age-related diseases like cancer and fibrosis, focusing on the importance of identifying new therapeutic approaches; CSHL Assistant Professor Dr. Jessica Tollkuhn discussed how estrogen and testosterone generate sex differences in the brain and behavior; CSHL Assistant Professor Dr. Ullas Pedmale presented his work on how plants sense their environments; and CUNY City Tech Associate Professor Dr. Jeremy Seto introduced how he dissects genomes, microbiomes and transcriptomes of common disease vectors in the city to find ways to reshape urban ecosystems. All lectures are archived on the DNALC website.

With the return of field trips in Cold Spring Harbor, we re-initiated our graduate training collaboration with the CSHL School of Biological Sciences. This year’s program included both the first-year cohort, and the second-year students who couldn't participate in 2021 due to COVID-19 field trip restrictions. First-year graduate students worked with DNALC instructors to develop skills needed to communicate science to a variety of audiences. They completed 12 half-day sessions where they progressed from observation to co-instruction, and then independent teaching of lab classes, while second year students did the same over a modified six sessions.

**BioMedia Visitation and Projects**

In 2022, 4.69 million visitors accessed our multimedia resources, a decrease from the previous year largely attributed to fall off of YouTube visits after two videos went viral in 2021. Our YouTube channel had 1,817,089 views with 106,480 hours of watch time and added 5,889 subscribers. Google Analytics counted 2.4 million visits to DNALC websites, 91.72% of the prior year. 3D Brain and Gene Screen smartphone/tablet apps were downloaded 485,201 times, including 4,800 3D Brain HQ in app purchases earning $3,319. We benefitted from an ongoing nonprofit Google Ads grant that funds ads for our websites and programs in the Google search engine; ads generated 146,299 impressions and 12,401 clicks; the equivalent of $19,992 in advertisement spending.

Development of the What DNA Says About Our Past and Future exhibition at DNALC NYC continued through the year. For the DNA Past section this included: installation of the Ötzi mummy replica glass case after months of supply chain delays, as well as a life model of Ötzi wearing replica clothing; mount of final display labels in July, including a timeline of notable
events from the end of the Copper Age into the early Iron Age; and addition of a touch screen and interactive on the introductory wall (see images below). In consultation with CSHL trustee Jeanne Moutoussamy-Ashe, the All the World in New York City photography contest wrapped up and 17 photos were selected for inclusion; the gallery space will be completed in early 2023. A Samsung “The Wall” video screen was installed in May and staff received training on its use. We are able to control the display and schedule media content from anywhere using cloud-based tools. A new sign was hung in the lobby and several donors’ names were added to relevant spaces acknowledging gifts.

The BioMedia team continues to provide support for our programs through print and web design, photography, and videography. In the spring three sets (total 33.5 hours) of modified On-Demand camp videos were produced—Introduction to Genetics, DNA Barcoding, and Genome Science—for collaborators at Beijing 166, although the videos can be used by any educator with the necessary equipment. In collaboration with educators, a new “Producing Taq DNA Polymerase” 69-page protocol was laid out in our Genome Science textbook style.
**Staff and Interns**

In March, we welcomed Michelle Juarez as the Assistant Director of Diversity and Research Readiness at DNALC NYC. She has a Ph.D. in Genetics from SUNY Stony Brook, and defended her thesis on the genetics of developmental patterning and microRNA regulation in corn at Cold Spring Harbor Laboratory. Throughout her postdoctoral journey, Michelle has served as a mentor to precollege, undergraduate, and graduate level students, and has been part of the teaching faculty at a number of universities, including locally at City College of New York, City University of New York School of Medicine, and John Jay College of Criminal Justice. Most recently she was a Science Education Fellow at Howard Hughes Medical Institute. Michelle’s experiences in research and education, her commitment to science accessibility and mentorship, and her connections to CUNY are the perfect fit for her DNALC role of working to level the STEM playing field for students in NYC.

Elizabeth Asaro came aboard in September as the Receptionist at the Dolan DNA Learning Center. Liz recently re-entered the workforce after choosing to stay home and raise her three children. Liz grew up on Long Island, and received a B.A. in Public Communication from Ithaca College. She has previously worked as a teaching assistant for Harborfields School District, a real estate agent, a bank teller, and a pharmaceutical sales specialist, executive, and representative. With her customer relations, networking, analytical and creative thinking and public speaking experience, Liz is well prepared for working on the DNALC front-line directly with parents, students, and teachers.

Chaunna Henry joined the Brooklyn team in November as the Administrative Manager at DNALC NYC. Born and raised on Long Island, she is a graduate of Uniondale High School, and received a Bachelor of Science in Journalism from St. John’s University. Chaunna has held a number of eclectic positions within the legal, e-commerce, art production, and education fields. She has also traveled to over 20 countries, including living in South Korea for a few years! Chaunna’s extensive background in a variety of roles, and her adaptability, creativity, and problem-solving skills will be helpful as she oversees administrative support for the programs in Brooklyn.

In December, we welcomed new middle school educator Tiffani Rushford to the Dolan DNALC. A graduate of Smithtown School District, Tiffani went on to complete a B.A. in Environmental Studies with an Ecology Concentration from SUNY Purchase. In 2018, Tiffani volunteered at Costa Rica Animal Rescue Center, a wildlife rehab facility. The experience sparked her passion for ecosystem preservation, so locally she volunteered at Coastal Steward Long Island and Westmoreland Nature Sanctuary, and became an Environmental Educator at Sweetbriar Nature Center. She has also been a General Ecology Learning Assistant, Great Ecology Environmental Monitor, Jones Beach Energy and Nature Center Environmental Educator, and HDR Wildlife
We bid farewell to five staff members in 2022: administrators Valerie Meszaros and Andréa Mahee; educators Megan Capobianco and Catherine (Xiaoqun) Zhang; and lab technician Justin Burke.

Huntington native Valerie Meszaros started as an Administrative Assistant in April 2007, and was promoted to the role of Administrative Manager in 2017. With experience at two major Manhattan law firms and a background in advertising, communication, and publishing, she successfully led the DNALC admin team for five years. Her role included field trip and camp administration support, proofreading grants, articles, and reports, and marketing local programs. Val retired in April to pursue her passions for writing, art, and music, and spend quality time with her son Matthew.

Andréa Mahee became Administrative Manager at DNALC NYC in spring 2021. Her experience with event and workshop coordination and her outgoing personality served her well as she helped bring Brooklyn up to full speed at a difficult time. She worked through the very first summer as we settled in a new place, hired and trained new staff, and navigated the new landscape of CUNY infrastructure.

With her strong teaching experience, background in environmental conservation, and love of science Megan Capobianco was an valued member of the DNALC instructional team. Her degree in Childhood and Special Education supplied her with the pedagogical tools to skillfully engage with a wide variety of students. In addition to teaching, she also oversaw the management of the middle school program, which included working closely with school teachers and administrators to book field trips and in-school instruction. Megan left the DNALC to work for the TNPO2 Foundation. She assists with outreach and research efforts that focus on a rare genetic disease involving variations in the TNPO2 gene which can lead to developmental delays, seizures, and other severe abnormalities.

Justin Burke became our lab technician in 2019. His college education combined business, biochemistry, and cell biology, which served him well as a lab and intern manager. His job was to support all of our lab-based programs, and oversee lab preparation and quality control for everything we teach—a monumental task! During the pandemic he organized, prepared, and filled an essential role and managed packing and shipping of kits for virtual labs all over the country. In spring he left the DNALC to pursue other interests.

Catherine Xiaoqun Zhang began her CSHL journey in 2000 as a technician in the Tonks Lab, assisting with cancer research. She transitioned to the DNALC in 2013 to help culture our relationship with Beijing School 166, and oversaw that fruitful collaboration for 10 years. She was also a high school educator, and handled lab purchasing, including for the Breakthrough Junior Challenge program.
Since the DNALC opened, we have relied on high school and college interns to support our day-to-day operations. An internship offers students the unique opportunity to gain real laboratory or design experience in an educational environment. This year an amazing group of interns helped out, and we said farewell as others left for college:

**High School Interns**

Ashley Alexander, Yonkers High School  
Lauren Belkin, Syosset High School  
Hayden Calabretta, Cold Spring Harbor High School  
Daniel Galvin Gusmano, Portledge High School  
Charlotte Gordon, Cold Spring Harbor High School  
Alexander Gottlieb, St. John the Baptist High School  
Lauren Graziosi, Syosset High School  
Nathan Leobandung, John Jay Senior High School

**High School Interns Departing for College**

Raquel Belkin, SUNY Stony Brook University  
Kimberly Cardinale, Oxford College of Emory University  
Nicholas Liotta, Borough of Manhattan Community College

**College Interns**

Timothy Broadbent, Colby College  
Taeahwan Cha, New York University  
Cristofer Hernandez, Hunter College  
Anagha Khandelwal, SUNY Stony Brook  
Ashley LaSalle, New York City College of Technology  
Jillian Maturo, Boston College  
Sebastian Maurice, The City College of New York  
Neal Mehta, Boston College

David Micklos  
DNA Learning Center Executive Director
## Workshops, Meetings, Collaborations, and Site Visits

### January
- **5–February 16** *Urban Barcode Research Program Conservation Genetics Workshop, DNALC NYC*
- **15** *Saturday DNA! *Yeast Feast,* DNALC
- **18** Site Visit & Tour by Dr. Avner Hershlag, Stony Brook University Department of Medicine, with Bruce Stillman, Alea Mills, and Leemor Joshua-Tor, DNALC
- **20** “Meet a Scientist: Dr. Jeremy C. Borniger,” Virtual Webinar, DNALC

### February
- **5** *Urban Barcode Project Open Lab, Harlem DNA Lab*
- **12** *Saturday DNA! “DNA Detectives,” DNALC*
- **17** “Meet a Scientist: Dr. Corina Amor,” Webinar, DNALC
- **18** *Barcode Long Island Open Lab, DNALC*
- **22–25** *Urban Barcode Research Program Conservation Genetics Workshop, Harlem DNA Lab*

### March
- **5** Brooklyn Bridge Parents Block Party and Summer Camp Fair, City Point, Brooklyn, New York
- **7–April 13** *Urban Barcode Research Program DNA Barcoding and Bioinformatics Workshop, DNALC NYC*
- **14** *Urban Barcode Project Open Lab, Harlem DNA Lab*
- **17** “Meet a Scientist: Dr. Jessica Tollkuhn,” Webinar, DNALC
- **19** *Saturday DNA! “Tardigrades: The Indestructible Water Bears,” DNALC*
- **21** *Urban Barcode Research Program Open Lab, Harlem DNA Lab*
- **23** “Plotting and Programming in Python Software Carpentry,” Student Training Workshop, National Society of Black Engineers National Conference, Anaheim Convention Center, Anaheim, California
- **26** *Citizen DNA Barcoding Network Bug DNA Barcoding Event, Long Island Science Center, Riverhead, New York*
- **29** Math for America Teacher Training Workshop, “Biotechnology with a Flair: From Genes to Jellyfish Part 1,” DNALC NYC
- **31** Open House, DNALC NYC

### April
- **2** *Saturday DNA! “Cracking the Code,” DNALC NYC*
- **4** *Urban Barcode Project Open Lab, DNALC NYC*
- **7** Open House, Regeneron DNALC
- **9** *Saturday DNA! “Agar Art,” DNALC*
  - Doggie DNA: Session 1,” Quogue Library, New York
  - “Open Science and Learning in the Genome Age,” National Academies of Sciences, Distinctive Voices Seminar Series, Irvine, California
- **14** District 7 Science Expo, Bronx, New York
- **16** “Doggie DNA: Session 2,” Quogue Library, New York
- **18–22** *Urban Barcode Research Program DNA Barcoding and Bioinformatics Workshop, Harlem DNA Lab*
- **21** “Meet a Scientist: Dr. Ullas Pedmale,” Webinar, DNALC
- **26** Math for America Teacher Training Workshop, “Biotechnology with a Flair: From Genes to Jellyfish Part 2,” DNALC NYC
- **27** *Urban Barcode Research Program Workshop, Irondale Theatre, Brooklyn, New York*
- **30** *Barcode Long Island Open Lab, DNALC*

### May
- **3** Math for America Teacher Training Workshop, “Biotechnology with a Flair: From Genes to Jellyfish Part 3,” DNALC NYC
- **7** *Saturday DNA! “Mendelian Critters: Inheritance of Traits,” DNALC NYC*
May 11
Site Visit by Kelly Gaudreau and Carissa Jordan, CSHL Association Directors with Karen Orzel, DNALC
Site Visit by Dr. Avner Hershlag, Stony Brook University Department of Medicine and Mrs. Shelley Hershlag, DNALC

May 14
**Saturday DNA! “A Method to the Madness,”** DNALC
*Barcode Long Island* Open Lab, DNALC

May 15-28
“Making Career-spanning Learning in the Life Sciences Inclusive and Effective for All,” CSHL Banbury Center, Lloyd Harbor, New York

May 19
“Meet a Scientist: Dr. Jeremy Seto,” Virtual Webinar, DNALC

May 21
**Saturday DNA! “Selection Detection,”** DNALC

May 31–June 3

June 1–3
2022 IUSE National Summit, Washington, D.C.

June 3
*Urban Barcode Project/Urban Barcode Research Program* Symposium, The Theater at City Tech, Brooklyn, New York

June 4
**Saturday DNA! “A Royal Ruse,”** DNALC

June 7
*Barcode Long Island* Student Symposium, CSHL

June 13–17
Genome Science Workshop, Lycée Français de New York, New York
Green Genes Workshop, Lycée Français de New York, New York

June 18
Citizen DNA Barcoding Network Collection Event, Jones Beach Energy & Nature Center, Wantagh, New York

June 20-24
InnovATEBIO National Biotechnology Education Center: Methods in Personal Genetics and DNA Barcoding, DNA Sequencing, PCR, and *Taq* Supply Chain Production Teacher Workshop, DNALC NYC

June 21–24
Forensic Detectives Workshop, St. David’s School, New York, New York

June 27–July 1
DNA Science Workshop, DNALC
World of Enzymes Workshop, DNALC
Fun with DNA Workshop, DNALC
Green Genes Workshop, DNALC
DNA Science Workshop, DNALC NYC
Fun with DNA Workshop, DNALC NYC
Forensic Detectives Workshop, DNALC NYC
Fun with DNA Workshop, Regeneron DNALC

June 29
Site Visit by Marilyn Simons, CSHL Board of Trustees, DNALC NYC
Site Visit by Kristin Olson Smith, CSHL Association Directors, and Sara Naison-Tarajano, DNALC NYC

July 5–8
Green Genes Workshop, DNALC
Fun with DNA Workshop, DNALC
Forensic Detectives Workshop, DNALC
World of Enzymes Workshop, DNALC
Fun with DNA Workshop, DNALC NYC
World of Enzymes Workshop, DNALC NYC
Forensic Detectives Workshop, Regeneron DNALC

July 7
Citizen DNA Barcoding Network Landcraft Collection Event, Landcraft Garden Foundation, Mattituck, New York
DNA Science Workshop, DNALC
Forensic Detectives Workshop, DNALC
Fun with DNA Workshop, DNALC
Genome Science Workshop, DNALC
BioCoding Workshop, DNALC
DNA Science Workshop, DNALC NYC
Genome Science Workshop, DNALC NYC
DNA Science Workshop, Regeneron DNALC

July 11
“Reproducible Workflows with CyVerse,” Public Lecture, Plant Biology 2022, Oregon Convention Center, Portland, Oregon

July 12–15
InnovATEBIO National Biotechnology Education Center: Methods in Personal Genetics and DNA Barcoding, DNA Sequencing, PCR, and Taq Supply Chain Production Teacher Workshop, Pierce College, Los Angeles, California

July 13
“Riding the Bicycle, Putting all Researchers on a Path to Excellence,” Public Lecture, Intelligent Systems for Molecular Biology 2022, International Society for Computational Biology, Madison, Wisconsin

July 18–22
DNA Science Workshop, DNALC
Fun with DNA Workshop, DNALC
Forensic Detectives Workshop, DNALC
World of Enzymes Workshop, DNALC
Forensic Detectives Workshop, DNALC NYC
DNA Barcoding Workshop, Regeneron DNALC
Urban Barcode Research Program Conservation Genetics Workshop, Harlem DNA Lab

July 20–22
InnovATEBIO National Biotechnology Education Center: Teaching Biotechnology Skills through DNA Metabarcoding Biodiversity Research Teacher Workshop, DNALC NYC

July 25–29
DNA Science Workshop, DNALC
Green Genes Workshop, DNALC
World of Enzymes Workshop, DNALC
DNA Barcoding Workshop, DNALC
World of Enzymes Workshop, DNALC NYC
Green Genes Workshop, DNALC NYC
Urban Barcode Research Program Conservation Genetics Workshop, DNALC NYC
World of Enzymes Workshop, Regeneron DNALC
Fun with DNA Workshop, Long Beach Middle School, Long Beach, New York

July 25
High Impact Technology Exchange Conference 2022, “Planning and Experiencing the Biotechnology Future,” Salt Lake City, Utah

August 1–5
Green Genes Workshop, DNALC
Genome Science Workshop, DNALC
Fun with DNA Workshop, DNALC
Citizen DNA Barcode Network Barcoding Workshop, DNALC
BioCoding Workshop, DNALC NYC
Urban Barcode Research Program DNA Barcoding and Bioinformatics Workshop, DNALC NYC
DNA Science Workshop, Regeneron DNALC
Forensic Detectives Workshop, Long Beach High School, Long Beach, New York
Urban Barcode Research Program Conservation Genetics Workshop, Harlem DNA Lab
August 3
“Opening the Door to Good Science Education,” Johns Hopkins University Welsh Virtual Symposium
“DNA Barcoding - A Simple and Robust Research Experience for Molecular Biology, Bioinformatics, and Biodiversity,” National Human Genome Research Institute Virtual Short Course in Genomics, NIH

August 8–12
DNA Science Workshop, DNALC
STARS DNA Barcoding Workshop, DNALC
Forensic Detectives Workshop, DNALC
World of Enzymes Workshop, DNALC
DNA Science Workshop, DNALC NYC
DNA Barcoding Workshop, DNALC NYC
Urban Barcode Research Program Conservation Genetics Workshop, DNALC NYC
Genome Science Workshop, Regeneron DNALC
Urban Barcode Research Program DNA Barcoding and Bioinformatics Workshop, Harlem DNA Lab

August 8–10
InnovATEBIO National Biotechnology Education Center: Teaching Biotechnology Skills through DNA Metabarcoding Biodiversity Research Teacher Workshop, Forsyth Technical Community College, Winston-Salem, NC

August 15
NYC Science Research Mentoring Consortium Summer Symposium and College Now Poster Presentations, DNALC NYC

August 15–19
DNA Science Workshop, DNALC
Green Genes Workshop, DNALC
Fun with DNA Workshop, DNALC
DNA Barcoding Workshop, DNALC
STARS BioCoding Workshop, DNALC
Fun with DNA Workshop, DNALC NYC
Urban Barcode Research Program DNA Barcoding and Bioinformatics Workshop, DNALC NYC
Fun with DNA Workshop, Regeneron DNALC

August 22–26
Forensic Detectives Workshop, DNALC
Sequence a Genome Workshop, DNALC
Wise Fun with DNA Workshop, DNALC
World of Enzymes Workshop, DNALC
DNA Science Workshop, DNALC NYC
Fun with DNA Workshop, DNALC NYC
Urban Barcode Program Teacher Training, DNALC NYC
World of Enzymes Workshop, DNALC NYC
Green Genes Workshop, Regeneron DNALC

August 29–September 2
Fun with DNA Workshop, DNALC
Forensic Detectives Workshop, DNALC NYC
World of Enzymes Workshop, DNALC NYC
Forensic Detectives Workshop, Regeneron DNALC

September 16
“Open Science, the Next Generation,” NASA Horizons in Biosciences & Informatics Virtual Seminar Series

September 20–24
Citizen DNA Barcode Network Training Workshop, California Academy of Sciences, San Francisco

September 26
Site Visit by Dr. Raven the Science Maven, Regeneron DNALC

September 29
City of Science – Dr. Phillip Sharp in conversation with Dr. Siddhartha Mukherjee, hosted by CUNY Graduate Center and CSHL Archives

September 30
“A Day in the Life” River Program, Massapequa Preserve, Massapequa, New York
October 2  “Atlantic Antic Festival,” Brooklyn, New York
October 10–11 National Institute of Health Meeting, Seattle, Washington
October 12 Math for America Teacher Training, “Genetically Modified Organisms,” DNALC NYC
October 14 SUBMERGE Marine Science Festival, Hudson River Park, New York, New York
October 15 Saturday DNA! “Agar Art,” DNALC NYC
October 18–20 NSF CyVerse Meeting, Knoxville, Tennessee
October 19 Math for America Teacher Training, “Genetically Modified Organisms,” DNALC NYC
October 21 Regeneron Day for Doing Good, Regeneron Pharmaceuticals, Sleepy Hollow, New York
Site Visit by Michelle Kidwell-Gilbert, National Arts Club, DNALC NYC
October 22 Saturday DNA! “Dust Away Crime: Fingerprints,” DNALC
Saturday DNA! “Cancer Cells Under the Scope,” DNALC NYC
Saturday DNA! “Jack-o’-Lantern Genetics,” Regeneron DNALC
October 26 Math for America Teacher Training, “Genetically Modified Organisms,” DNALC NYC
October 26–28 NSF National ATE Principal Investigators’ Conference, Washington, D.C.
October 27–29 Society for the Advancement of Chicanos/Hispanics & Native Americans in Science 2022 National Diversity in STEM Conference, San Juan, Puerto Rico
October 29 Saturday DNA! “Halloween at the DNALC NYC,” DNALC NYC
November 3 “Effective, Inclusive, and Scalable Training in the Life Sciences, Clinical Education, and Beyond,” Australian Biocommons Virtual Webinar
November 4 “Career-spanning Learning in the Life Sciences,” Southwest Society for Developmental Biology Regional Meeting, Austin, Texas
November 5 Urban Barcode Project Teacher Training, DNALC NYC
Ötzi the Iceman Museum Tour, DNALC NYC
November 8 Barcode Long Island Teacher Training Workshop, DNA Barcoding, DNALC
DNALC Teacher Training Workshop, “Detect Genetically Modified Foods with In-lab Purified Taq DNA Polymerase,” DNALC
Regeneron DNALC Teacher Training Workshop, “DNA Barcoding,” Regeneron DNALC
November 11 “A Day in the Lab,” DNALC
November 12 Saturday DNA! “The Hominin Family Tree,” DNALC
Saturday DNA! “Compare Yourself to a Plant!” DNALC NYC
November 19 Saturday DNA! “Mystery of Anastasia,” DNALC NYC
December 2 Shelter Island High School Science Fair, Shelter Island, New York
December 10 Saturday DNA! “A Royal Ruse,” Regeneron DNALC
December 13 Site Visit by Bruce Ratner, CSHL Board of Trustees and Linda Johnson, DNALC NYC
December 17 Saturday DNA! “Butterfly Secrets,” DNALC
December 21 Site Visit by Dr. Jim Watson and Liz Watson, DNALC
December 27–28 Citizen DNA Barcoding Network LEGO® Sequencer Activity, Long Island Aquarium, Riverhead, New York
## Sites of Major Faculty Workshops

<table>
<thead>
<tr>
<th>State</th>
<th>Institution</th>
<th>Year(s)</th>
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<tbody>
<tr>
<td>VIRTUAL</td>
<td>Host: Atlanta University Center Consortium, Atlanta, Georgia</td>
<td>2021</td>
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<tr>
<td></td>
<td>Host: Bowie State University, Bowie, Maryland</td>
<td>2020</td>
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<td>Host: DNA Learning Center, New York</td>
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<td>Host: Harlem DNA Lab and Regeneron DNALC, Sleepy Hollow, New York</td>
<td>2020</td>
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<td></td>
<td>Co-host: James Madison University, Harrisonburg, Virginia</td>
<td>2020, 2021 (3)</td>
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<td>Host: North Carolina State University, Raleigh, North Carolina</td>
<td>2021</td>
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<td>Co-hosts: University of Arizona, Tucson, Arizona &amp; DNA Learning Center, NY</td>
<td>2020</td>
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<td>Host: Quantitative Undergraduate Biology Education and Synthesis</td>
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<td>ALABAMA</td>
<td>University of Alabama, Tuscaloosa</td>
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<td>Hudson Alpha Institute, Huntsville</td>
<td>2014</td>
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<td>ALASKA</td>
<td>University of Alaska, Anchorage</td>
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<td>University of Alaska, Fairbanks</td>
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<td>ARIZONA</td>
<td>Arizona State University, Tempe</td>
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<td>University of Arizona, Tucson</td>
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<td>United States Department of Agriculture, Maricopa</td>
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<td>ARKANSAS</td>
<td>Henderson State University, Arkadelphia</td>
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<td>University of Arkansas, Fayetteville</td>
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<td>University of Arkansas, Little Rock</td>
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<td>CALIFORNIA</td>
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<td>Chan-Zuckerberg BioHub, San Francisco</td>
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<td>Pierce College, Los Angeles</td>
<td>1998, 2022</td>
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<td>Salk Institute for Biological Studies, La Jolla</td>
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<td>Scripps Institute, San Diego</td>
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University of California, Davis 2012, 2014–15
University of California, Long Beach 2015
University of California, Northridge 1993
University of California, Riverside 2011
University of California, Riverside 2012
University of California, San Francisco 2015

COLORADO
Aspen Science Center 2006
Colorado State University, Fort Collins 2013, 2018
Community College of Denver 2014

University of Colorado, Denver 1998, 2009–10

CONNECTICUT
Choate Rosemary Hall, Wallingford 1987
Jackson Laboratory, Farmington 2016

DELTAKE
University of Delaware, Newark 2016

DISTRICT OF COLUMBIA

FLORIDA
Armwood Senior High School, Tampa 1991
Florida Agricultural & Mechanical University, Tallahassee 2007–08
Florida Agricultural & Mechanical University, Tallahassee 2011
Florida SouthWestern State University, Fort Myers 2015
North Miami Beach Senior High School 1991
Seminole State College, Sanford 2013–14
University of Florida, Gainesville 1989
University of Miami School of Medicine 2000
University of Western Florida, Pensacola 1991

GEORGIA
Fernbank Science Center, Atlanta 1989, 2007
Gwinnett Technical College, Lawrenceville 2011–12
Morehouse College 1991, 1996

HAWAII
Kamehameha Secondary School, Honolulu 1990
University of Hawaii at Manoa 2012

IDAHO
University of Idaho, Moscow 1994

ILLINOIS
Argonne National Laboratory 1986–87
IBIO Institute/Harold Washington College, Chicago 2010
Illinois Institute of Technology, Chicago 2009

KINGS COLLEGE, CHICAGO
Kings College, Chicago 2014

University of Southern Illinois, Carbondale 2016

INDIANA
Butler University, Indianapolis 1987

Purdue University, West Lafayette 2012

IOWA
Drake University, Des Moines 1987

KANSAS
University of Kansas, Lawrence 1995

KENTUCKY
Bluegrass Community & Technical College, Lexington 2012–14
Murray State University 1988
University of Kentucky, Lexington 1992
Western Kentucky University, Bowling Green 1992

LOUISIANA
Bossier Parish Community College 2009
Jefferson Parish Public Schools, Harvey 1990
John McDonogh High School, New Orleans 1993
Southern University at New Orleans 2012
University of New Orleans 2018
Bates College, Lewiston 1995

Southern Maine Community College 2012–13
Foundation for Blood Research, Scarborough 2002

Maryland University of Maryland, School of Medicine, Baltimore 1999
Bowie State University 2011, 2015
Frederick Cancer Research Center 1995
McDonogh School, Baltimore 1988
Montgomery County Public Schools 1990–92
National Center for Biotechnology Information, Bethesda 2002
St. John's College, Annapolis 1991

Massachusetts Arnold Arboretum of Harvard University, Roslindale 2011
Beverly High School 1986
Biogen Idec, Cambridge 2002, 2010
Boston University 1994, 1996
CityLab, Boston University School of Medicine 1997
Dover-Sherborn High School, Dover 1989
Randolph High School 1988
The Winsor School, Boston 1987
Whitehead Institute for Biomedical Research, Cambridge 2002

Michigan Schoolcraft College, Livonia 2012

Minnesota American Society of Plant Biologists, Minneapolis 2015
Minneapolis Community and Technical College, Madison 2009
Minneapolis Community and Technical College, Madison 2013
University of Minnesota, St. Paul 2005
University of Minnesota, St. Paul 2010

Mississippi Mississippi School for Math & Science, Columbus 1990–91
Rust College, Holly Springs 2006–08, 2010

Missouri St. Louis Science Center 2008–10
Stowers Institute for Medical Research, Kansas City 2002, 2008
University of Missouri, Columbia 2012
Washington University, St. Louis 1989
Washington University, St. Louis 1997, 2011, 2019

Montana Montana State University, Bozeman 2012

Nebraska University of Nebraska-Lincoln, Lincoln 2014

Nevada University of Nevada, Reno 1992, 2014

New Hampshire Great Bay Community College, Portsmouth 2009
New Hampshire Community Technical College, Portsmouth 1999

New Jersey Coriell Institute for Medical Research, Camden 2003
Raritan Valley Community College, Somerville 2009

New Mexico Biolink Southwest Regional Meeting, Albuquerque 2008
Los Alamos National Lab 2017
New Mexico State University, Las Cruces 2017
Santa Fe Community College, Santa Fe 2015

New York Albany High School 1987
Bronx High School of Science 1987
Brookhaven National Laboratory, Upton 2015–18
Canisius College, Buffalo 2007
Canisius College, Buffalo  
City College of New York 2011  
Cold Spring Harbor High School 2012  
**Cold Spring Harbor Laboratory** 1985, 1987  
Columbia University, New York 1993  
Cornell University, Ithaca 2005  
DeWitt Middle School, Ithaca 1991, 1993  
Dulan DNA Learning Center West 2005  
DNA Learning Center NYC 2019, 2021, 2022  
Environmental Science Center, Bergen Beach, Brooklyn 2015–16  
Fostertown School, Newburgh 1991  
**Harlem DNA Lab, East Harlem** 2008–09, 2011–13, 2016–19  
Harlem DNA Lab, East Harlem 2015–16  
Huntington High School 1986  
Irvington High School 1986  
K-12 Summer Institute, Kerrville 2019  
John Jay College of Criminal Justice 2009  
Junior High School 263, Brooklyn 1991  
Lindenhurst Junior High School 1991  
**Math for America** 2017–19, 2022  
Michel J. Petrides School, Staten Island 2018  
Mount Sinai School of Medicine, New York 1997  
**Nassau Community College, Garden City** 2013  
New York Botanical Garden, Bronx 2013  
New York City Department of Education 2007, 2012  
New York City Technical College (City Tech) 2018  
New York Institute of Technology, New York 2006  
**New York Institute of Technology, New York** 2006  
Orchard Park Junior High School 1991  
Plainview-Old Bethpage Middle School 1991  
Regeneron Pharmaceuticals, Inc 2019  
School of Visual Arts, New York 2017  
State University of New York, Purchase 1989  
State University of New York, Stony Brook 1987–90, 2015–18  
**State University of New York, Stony Brook** 2014, 2016  
The Rockefeller University, New York 2003, 2015–16  
**The Rockefeller University, New York** 2010  
Titusville Middle School, Poughkeepsie 1991, 1993  
Trudeau Institute, Saranac Lake 2001  
Union College, Schenectady 2004  
**United States Military Academy, West Point** 1996  
Wheatley School, Old Westbury 1985  
**NORTH CAROLINA** 2003  
CIT Center for Health Research, Triangle Park 2003  
**Forsyth Technical Community College, Winston-Salem** 2022  
North Carolina Agricultural & Technical State University, Greensboro 2006–07, 2009–11  
North Carolina School of Science, Durham 1987  
**North Carolina State University, Raleigh** 2012, 2018  
**NORTH DAKOTA** 2012  
North Dakota State University, Fargo 2012
### OHIO
- Case Western Reserve University, Cleveland (1990)
- Cleveland Clinic (1987)
- Langston University, Langston (2008)
- North Westerville High School (1990)
- **The Ohio State University, Wooster** (2016)

### OKLAHOMA
- **Oklahoma City Community College** (2000)
- Oklahoma City Community College (2006–07, 2010)
- Oklahoma Medical Research Foundation, Oklahoma City (2001)
- Oklahoma School of Science and Math, Oklahoma City (1994)
- Tulsa Community College, Tulsa (2009)
- **Tulsa Community College, Tulsa** (2012–14)

### OREGON
- **Linfield College, McMinnville** (2014)

### PENNSYLVANIA
- Duquesne University, Pittsburgh (1998)
- Germantown Academy (1998)
- Kimmel Cancer Center, Philadelphia (2008)

### RHODE ISLAND
- Botanical Society of America, Providence (2010)

### SOUTH CAROLINA
- **Clemson University** (2004, 2015)
- Medical University of South Carolina, Charleston (1988)
- **University of South Carolina, Columbia** (1988)

### SOUTH DAKOTA
- **South Dakota State University, Brookings** (2015)

### TENNESSEE
- NABT Professional Development Conference, Memphis (2008)

### TEXAS
- Austin Community College – Roundrock Campus (2012)
- Austin Community College - Austin (2018)
- **Houston Community College Northwest** (2009–10)
- J.J. Pearce High School, Richardson (1990)
- Langham Creek High School, Houston (1991)
- **University of Lone Star College, Kingwood** (2011)
- Midland College (2008)
- Southwest Foundation for Biomedical Research, San Antonio (2002)
- Taft High School, San Antonio (1991)
- **Texas A&M University, College Station, TX** (2013)
- **Texas A&M University, Prairie View, TX** (2013)
- Texas A & M, AG Research and Extension Center, Weslaco (2007)
- **Trinity University, San Antonio** (1994)
- University of Texas, Brownsville (2010)
- **Brigham Young University, Provo** (2012)
- University of Utah, Salt Lake City (1993)
- **University of Utah, Salt Lake City** (1998, 2000)
- **Utah Valley State College, Orem** (2007)

### UTAH
- University of Vermont, Burlington (1989)
- Champlain Valley Union High School (1989)

### VERMONT
- Eastern Mennonite University, Harrisonburg (1996)
- **James Madison University, Harrisonburg** (2017)
- Jefferson School of Science, Alexandria (1987)
- Mathematics and Science Center, Richmond (1990)
- Mills Godwin Specialty Center, Richmond (1998)
- **Virginia Polytechnic Institute and State University, Blacksburg** (2005, 2008–09)

### VIRGINIA
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<thead>
<tr>
<th>Location</th>
<th>Institution/Conference</th>
<th>Years</th>
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<td>WEST VIRGINIA</td>
<td>Shoreline Community College</td>
<td>2011, 2012</td>
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<td>Bethany College</td>
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<td>Blood Center of Southeastern Wisconsin, Milwaukee</td>
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<td>Marquette University, Milwaukee</td>
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<td>University of Wisconsin, Madison</td>
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<td>WYOMING</td>
<td>University of Wyoming, Laramie</td>
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<td>University of Puerto Rico, Mayaguez</td>
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<td>University of Puerto Rico, Rio Piedras</td>
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<td>University of Puerto Rico, San Juan</td>
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<td>University of Puerto Rico, San Juan</td>
<td>2019</td>
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<td>AUSTRALIA</td>
<td>Walter and Eliza Hall Institute and University of Melbourne</td>
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<td>EMBL/Australian Bioinformatics Resource, University of Melbourne</td>
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<td></td>
<td>University of Western Australia, Perth</td>
<td>2018</td>
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<td>AUSTRIA</td>
<td>Vienna Open Lab, Vienna</td>
<td>2007, 2012</td>
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<td>CANADA</td>
<td>Technical University of Graz</td>
<td>2019</td>
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<td></td>
<td>Red River Community College, Winnipeg, Manitoba</td>
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<td></td>
<td>University of Quebec, Montreal</td>
<td>2018</td>
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<td>CHINA</td>
<td>Beijing No. 166 High School, Beijing</td>
<td>2013–19</td>
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<td>Ho Yu College, Hong Kong</td>
<td>2009</td>
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<td>DENMARK</td>
<td>Faroe Genome Project, Torshavn, Faroe Islands</td>
<td>2013</td>
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<td>GERMANY</td>
<td>Urania Science Center, Berlin</td>
<td>2008</td>
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<td>IRELAND</td>
<td>European Conference on Computational Biology/Intelligent System for Molecular Biology Conference, Dublin</td>
<td>2015</td>
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<td></td>
<td>University College Dublin</td>
<td>2018</td>
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<td>ITALY</td>
<td>International Institute of Genetics and Biophysics, Naples</td>
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<td>Porto Conte Research and Training Laboratories, Alghero</td>
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<td>MEXICO</td>
<td>ADN Mexico, Morelia</td>
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<td>ASPB Plant Biology, Mérida</td>
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<td>Langebio/Cinvestav, Irapuato</td>
<td>2016</td>
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<td>NIGERIA</td>
<td>Godfrye Okoye University, Enugu, Nigeria</td>
<td>2013, 2018</td>
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<td>PANAMA</td>
<td>University of Panama, Panama City</td>
<td>1994</td>
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<td>PHILIPPINES</td>
<td>Eastern Visayas Campus, Philippine Science High School, Palo, Leyte</td>
<td>2017</td>
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<td>RUSSIA</td>
<td>Shemyakin Institute of Bioorganic Chemistry, Moscow</td>
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<td>SINGAPORE</td>
<td>National Institute of Education</td>
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<td>Singapore Science Center</td>
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<td>SOUTH AFRICA</td>
<td>North-West University, Potchefstroom</td>
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<td>South African Bioinformatics Society, Durban</td>
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<td>SWEDEN</td>
<td>Kristineberg Marine Research Station, Fiskebackgkil</td>
<td>1995</td>
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<td>Uppsala University</td>
<td>2004</td>
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<td>THE NETHERLANDS</td>
<td>International Chromosome Conference, Amsterdam</td>
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<td>Wageningen University and Research Center, Wageningen</td>
<td>2014</td>
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<td>UNITED KINGDOM</td>
<td>Earlham Institute, Norwich</td>
<td>2018</td>
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<td>The Genome Analysis Center, Norwich</td>
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<td>University of York, York</td>
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<td>Wellcome Trust Conference Center, Hinxton</td>
<td>2012–13</td>
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<td>University of Warwick, Coventry</td>
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## 2022 Grants

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<th>Grantor</th>
<th>Program</th>
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<td><strong>FEDERAL GRANTS</strong></td>
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<td>National Institutes of Health</td>
<td>Genomics Step-Up High School</td>
<td>5/22-3/27</td>
<td>$106,564</td>
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<td>National Science Foundation</td>
<td>Implementing DNA Barcoding for Course-Based Undergraduate Research Experiences</td>
<td>10/18-9/23</td>
<td>$368,649</td>
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<td>National Science Foundation (U of Arizona)</td>
<td>CyVerse: Cyberinfrastructure for the Life Sciences</td>
<td>8/18-7/23</td>
<td>$160,721</td>
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<td>National Science Foundation (Austin CC)</td>
<td>InnovATEBIO National Biotechnology Education Center</td>
<td>10/19-9/24</td>
<td>$345,539</td>
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<td>National Science Foundation (Pierce College)</td>
<td>Advanced Student-Focused Projects: Internship, Research and Education (ASPIRE)</td>
<td>9/21-8/24</td>
<td>$11,209</td>
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<td>National Science Foundation (U. of Minnesota)</td>
<td>FMRG:BIO: Enabling Cell-Free Engineering</td>
<td>10/22-9/26</td>
<td>$1,956</td>
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<td>National Science Foundation</td>
<td>What Works in Workshops-Evolving Short Format Training to Serve Life Sciences STEM Professionals in the 21st Century</td>
<td>3/21-2/23</td>
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<td>National Science Foundation</td>
<td>Nanopore DNA Sequence Course-Based Undergraduate Research</td>
<td>6/22-5/24</td>
<td>$31,699</td>
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<td><strong>NON-FEDERAL GRANTS</strong></td>
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<td>Beijing No. 166 High School</td>
<td>Chinese Collaboration Agreement</td>
<td>7/19-6/23</td>
<td>$11,150</td>
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<td>Breakthrough Prize Foundation</td>
<td>Laboratory Design &amp; Teacher Training for Breakthrough Junior Challenge Prize Winners</td>
<td>12/15–12/22</td>
<td>$186,243</td>
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<td>Health Park</td>
<td>Health Park Agreement</td>
<td>12/15-12/23</td>
<td>$2,901</td>
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<td>Paul Taubman</td>
<td>Support for DNALC NYC Exhibit Development</td>
<td>6/21-6/23</td>
<td>$319,207</td>
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<td>Pinkerton Foundation</td>
<td>Urban Barcode Research Program</td>
<td>1/21–5/23</td>
<td>$89,238</td>
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<td>Richard Lounsbery Foundation</td>
<td>Videos and Animations to Explain Environmental DNA to a Broad Audience</td>
<td>2/22-8/23</td>
<td>$67,003</td>
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<td>The Simons Foundation</td>
<td>Urban Barcode Research Program</td>
<td>12/17-8/23</td>
<td>$98,778</td>
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<td>William Townsend Porter Foundation</td>
<td>Harlem DNA Lab for Underprivileged Students</td>
<td>1/20–1/23</td>
<td>$10,517</td>
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<td>Office of the Brooklyn Borough President</td>
<td>DNALC NYC Video Wall</td>
<td>10/21-10/22</td>
<td>$261,032</td>
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<td>Hudson River Park Trust</td>
<td>Environmental DNA Survey in Hudson River Park’s Estuarine Sanctuary</td>
<td>1/20-12/22</td>
<td>$6,409</td>
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<td>NY Harbor Foundation</td>
<td>Billion Oyster Project</td>
<td>6/20-12/21</td>
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<td>Laurie Landeau Foundation</td>
<td>Laurie Landeau Seed Program</td>
<td>1/21-2/23</td>
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School Membership Programs

The following schools and school districts participated in these membership programs of the Dolan DNALC:

**Sustaining Memberships**

- Bellmore-Merrick Central High School District: $3,000
- Elwood UFSD: $3,000
- Great Neck: $3,000
- Herricks Union Free School District: $3,000
- Huntington: $3,000
- Island Trees: $3,000
- Jericho High School: $3,000
- Levittown Union Free School District: $3,000
- North Shore Central School District: $3,000
- Oceanside Union Free School District: $3,000
- Oyster Bay-East Norwich Central School District: $3,000
- Plainview-Old Bethpage Central School District: $3,000
- Portledge School: $3,000
- Port Washington Union Free School District: $3,000
- Roslyn Union Free School District: $3,000
- Syosset Central School District: $3,000
- Yeshiva University High School for Girls: $3,000

**Associate Memberships**

- Glen Cove Central School District: $16,000
- Friends Academy: $16,000
- St. Dominic High School: $16,000

**Partner Memberships**

- Glen Cove Central School District: $16,000
- Friends Academy: $16,000
- St. Dominic High School: $16,000

The following schools participated in these membership programs of the DNALC NYC at City Tech:

**Sustaining Membership**

- Stuyvesant High School: $3,000

**Associate Membership**

- Portfolio School: $16,000

**Partner Memberships**

- The Chapin School: $33,000
- Marymount School of NY: $33,000
- Lycée Français de NY: $33,000
- St. David's School: $33,000

The following school participated in this membership program of the Regeneron DNALC:

**Sustaining Membership**

- Hendrick Hudson Central School District: $3,000