In 2002, a 17 year old researcher named Charles A. Jantzen won the American Indian Science and Engineering Society award at the Intel International Science Fair for a paper on the genetic origins of Oklahoma’s five native tribes—the Cherokee, Chickasaw, Choctaw, Creek, and Seminole. Collaborating with 20 local researchers, Jantzen collected samples from 20 individuals from each tribe, and looked for sequential differences in the mitochondrial DNA between the groups. He found that the Choctaws and Chickasaws had the greatest similarities in the mitochondrial DNA. This confirmed an oral tradition that they probably had been brothers at one time, but had subsequently diverged into two separate tribes. The Chickasaws and Cherokee, on the other hand, were the most distant. Jantzen’s study was remarkable because it filled gaps in the geographical and cultural heritage of Native America that had been lost in the Trail of Tears.

This group of researchers was based in Ada, Oklahoma, a rural community of 16,000 people. Their mentor was Susie Stevens, a high-school biology teacher who introduced the class to state-of-the-art biology. Stevens hasn’t rested on her laurels. She was recently named 2006 All-USA Teacher, one of America’s most prestigious teaching awards. In an interview with *USA Today,*
Stevens attributed her success, and the continued success of her students, to a series of workshops she has taken with CSHL’s Dolan DNA Learning Center (DNALC) over the past thirteen years.

Stevens attended her first DNALC workshop, DNA Science, in 1994. The start of the course, she recalls, coincided with the breaking news that Nicole Brown Simpson and Ronald Goldman had been found murdered in a Los Angeles condominium. Over the course of the workshop, the group examined the incident a number of times in the context of DNA fingerprinting and forensic science. According to Stevens, these discussions were pivotal to her understanding of biology instruction. She became interested in the tangible applications of modern genetics, what she calls “actual current science”. She returned to Latta High School in Ada determined that her students get their hands dirty with relevant and authentic lab work.

She began to teach science as activity rather than pedagogy. “When they go into the lab and they use equipment and do activities that they see on the news that gives them such an internal sense of importance that what they are doing is authentic. That, to me, is hugely important,” explained Stevens.

Since 1994 Stevens has overseen a major upgrade in lab science facilities at Latta. She has played a big part in these changes, having been beneficiary of a number of development grants and awards. Part of this year’s biology curriculum is a module on bioinformatics, where her class uses the DNALC’s BioServers internet site to perform BLAST searches to understand genetic diseases. This same tool is a staple of virtually every bioinformatics lab. For Stevens, this interactive tool is critical. “It’s so much more important for them to engage in actual science activities. That’s the stuff they’re going to carry forward with them, and later in their lives they’ll be much more cognizant of science and scientific research,” Stevens said.

Her students are fortunate that their teacher has been able to raise significant funds to improve facilities. For many teachers, the pool of resources is extremely limited, and they simply do not have access to comparable facilities. Inevitably, this has a negative effect on instruction. With this in mind, the DNALC recently completed a collaboration with CSHL researchers Dick McCombie, Marja Timmermans, and Lincoln Stein to pioneer a unique program targeted at underrepresented minorities. Funded by the National Science Foundation (NSF), the program enabled four educators to attend an intensive three-week research residence undertaking plant research at CSHL. When they returned to their institutions, educators partnered with DNALC staff to teach a plant genomics workshop to local biology faculty. More importantly, they brought with them a footlocker of equipment and supplies which remained to be shared among workshop attendees.

Each footlocker provides pipettes, centrifuges, thermal cyclers, and gel electrophoresis equipment, which are rotated among approximately 20 local institutions. In total, they support 4,000 student experiments a year. DNALC educator Laura Johns recalled a recent trip to Weslaco, Texas, when one of the footlockers was first distributed. “Their eyes literally widened. They couldn’t believe all the resources that were suddenly available to them—some of them had never even used a pipette before. Within hours they got together and had drawn up a roster for when to share the equipment. It was probably the most rewarding experience of my career.”

The Howard Hughes Medical Institute Initiative (HHMI) for Biomedical Research Institutions has just awarded $750,000 to a DNALC/New York City Department of Education partnership to initiate an expanded footlocker program. Over the course of five years, 820 teachers will each receive four days training in six targeted genetics and biotechnology experiments. All attendees will share an equipment footlocker and reagent kit, and will make use of a targeted Lab City internet site. This large-scale program will have a major impact on New York science education in New York. It will supplement the DNALC’s existing mobile footlocker program, which reaches 12,000 students in 60 school systems each year on Long Island. For Dave Micklos, Executive Director of the DNALC, the project has the potential to redefine the landscape of biology instruction. “We believe that the HHMI program can provide a reproducible model for how science institutions can interact with large school systems to help transform science education for urban students,” said Micklos.

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This model is complemented by an ambitious curriculum development initiative. This summer, the DNALC is celebrating the success of a $450,000 NSF award to disseminate its Silencing Genomes curriculum. Silencing Genomes is the world’s first integrated set of RNA interference (RNAi) experiments designed specifically for education. Because the technique allows researchers to effectively switch genes on and off through the regulation of expression, RNAi holds incredible promise as a potential therapeutic intervention. As such, it is truly on the frontier of scientific development. Workshop participants will collaborate on a series of projects to silence approximately 100 genes in the nematode, and will use the same technology that won the Nobel Prize in Physiology or Medicine in 2006. The dissemination program will reach 208 college teachers at week-long nationwide workshops. At least half of the workshops will be conducted at historically Black or Hispanic institutions. By implementing programs such as these, the DNALC has ensured that the students and teachers who need it most have access to the most current research, information, and facilities.

Genomic science has made incredible progress since Susie Stevens took her first course at the DNALC in 1994. The rate of scientific progress is now so rapid that it is no longer possible to rely upon textbooks for up-to-date information. There is, therefore, an increasing necessity for educational institutions to develop programs that are neither redundant nor inaccessible. The DNALC, which enjoys privileged access to some of the world’s leading scientists, is well-situated to meet this need. A wide range of instructional activities and ever-burgeoning catalogue of high-end internet sites are testament to a resource that has become the gold standard for genetics instruction; an assertion that Stevens is keen to recognize. “I graduated from college in 1972, and we did not know all that much about DNA and its possibilities...really virtually everything that I have learned has come through the DNALC workshops.”

The DNALC’s Bimedia division is responsible for creating material that succeeded in attracting more than 7 million unique visits to its internet sites in 2006. Its flagship sites, DNA Interactive, DNA from the Beginning, and Inside Cancer will be supplemented in 2009 by Genes to Cognition Online, a network-based site that represents the DNALC’s first foray into neuroscience. This public education initiative is moving forward simultaneously with CSHL’s Hillside Campus expansion that will expand neuroscience research and tackle this ‘final frontier’ of biological inquiry.