DIRECTOR'S REPORT

This year, Cold Spring Harbor Laboratory witnessed one of the most significant events in its history: the establishment of our own School of Biological Sciences. With the ability to grant the degree of Doctor of Philosophy (Ph.D.), we expect to attract some of the world's brightest young people to the shores of Cold Spring Harbor for an experience that will change their lives and, we expect, ours. As we enter into a new era, the Watson School of Biological Sciences will have a broad impact on the future of the Laboratory, much like other new educational programs have in the past.

For much of its existence, CSHL has played two overlapping roles in biological science. One stems from the need in the late nineteenth century for a gathering place for people—primarily teachers—to practice and teach biology. Biology was at that time predominantly devoted to the study of the organism and its environment, so the bountiful resources of the shore of Cold Spring Harbor were a distinct attraction. With the help of the local philanthropic community, the Laboratory evolved into a center for both visiting researchers and year-round investigators, particularly with the addition of the Carnegie Institution of Washington laboratories in 1904, where genetics became the primary focus of research. Thus, the Laboratory became a place for teachers to learn during their summer breaks and for researchers to work year-round. In addition, local school-age children could come to the Laboratory to participate in a summer nature study program, making the most of the shores of Cold Spring Harbor, its surrounding springs, creeks, and fields, a program that still exists today.

During the height of the classical genetics period, the year-round research effort was complemented by the introduction of a formal meetings program (1933) and soon after the Second World War, with an advanced laboratory course (1945). Both of these programs set a new direction for the Laboratory, and it is these programs that greatly influence our current activities and make the Laboratory a wonderfully unique place. Principal among the modern benefits is the constant flow of visiting scientists who attend meetings and demonstrate and lecture in our advanced courses, thereby keeping us up to date with the latest results and technologies. In 1998, approximately 7000 scientists visited CSHL to attend 1 of the 20 meetings at our main campus, study in 1 of our 25 courses, or work in our labs as visiting scientists. We have thus long existed as a dynamic center for science by combining a focused and productive research program with a vibrant and world-renowned academic program.

There are many times when the two endeavors have dovetailed, with each program influencing the other. The animal cells and viruses courses that started in 1958 preceded the highly productive era of research at CSHL aimed at understanding how DNA tumor viruses induce cancer. Tumor virus research at CSHL in turn helped focus attention on the molecular biology of animal cells and led to major insights into how genes are expressed, how they replicate, and how the tumor viruses intersect with the host cell's division-control machinery to promote tumor growth. Similarly, the introduction of the neurobiology courses in the early 1970s promoted an environment in which we could no longer resist starting year-round research on learning and memory, a program that is currently under significant expansion due to its great success.

Forty years ago, the introduction of a summer Undergraduate Research Program broadened our educational program. With the goal of providing research opportunities to undergraduate students from throughout the United States and abroad, this program has brought

some of the brightest students to Cold Spring Harbor to experience both the research and the summer's advanced educational programs. This year, we had more than 400 applications and accepted 22 students, who then studied with our best researchers.

Learning about science is not just for the young; it is a life-long undertaking that will never escape the productive scientist. Attending research meetings is a form of continuing education that enables active scientists to keep apace with the rapid developments in research. In addition to the meetings on our main campus, we have a complementary program of smaller meetings at our Banbury Conference Center. It was very fortunate that we were graced with the addition of Charles Robertson's Banbury estate in 1976, where we were able to establish the Banbury Conference Center. Functioning as a biological think tank, the Center brings scientists together to discuss research, policy, funding, and ethics, as well as to learn about fields of biology unfamiliar to them. Today the Banbury Center facilitates the continuing education of scientists in a remarkably beautiful setting.

In the mid 1980s, the DNA Learning Center (DNALC) arose because of the need to reach out to high school students and their teachers and inform them of the exciting developments in DNA research. Biological discovery is moving at an unparalleled pace and has had, and will have, a broad impact on society as a whole. The DNALC therefore fulfills three essential goals: First, to educate young students in modern genetics so that the next generation can understand how modern biology can improve their lives; second, to expose talented students to biological research at an early age, so that some will be inspired to pursue a career in biological science or medical research; and third, to make it possible for teachers to use the DNALC and its resources to keep abreast of developments in biology, so that they are teaching relevant biology to their students. The DNALC is another one of the Laboratory's educational success stories, and it serves as a model for similar centers throughout the United States and abroad. As a recent part of this effort, an exciting genetics Internet site, inspired by Jim Watson in collaboration with David Miklos, Jan Witkowski, and John Kruper, and with funds from the Josiah Macy, Jr., Foundation, saw significant development in 1998. The first sections on genetics were released in January 1999 (http://vector.cshl.org/dnaftb). This site is for everyone who wishes to learn about biology, not just high school students.

With the extensive teaching opportunities we have offered in the past, CSHL has in a very unique way emerged as a powerhouse of science education. The establishment at the end of 1998 of the School of Biological Sciences represents another significant milestone and a major addition to our educational mission and soon will have an impact that will be as prominent as the other educational activities. We now maintain an almost continuous educational slate, ranging from early school years to the most advanced biology for active scientists. Importantly, the graduate school will establish a more intimate connection between our research program and its scientists and our educational program.

When Jim Watson arrived as Director in 1968, he brought along a few students to do their thesis research at CSHL, contributing to the successful DNA Tumor Virus program. But they were formally aligned with universities such as Harvard, Columbia, and New York University. Beginning in the mid 1970s, students from the nearby State University of New York at Stony Brook began working at CSHL. The first arrival was Jim Manley, who graduated in 1978 and is now chair of the Department of Biological Sciences at Columbia University. The number of students coming from Stony Brook increased steadily, initially through our strong relationship with the Stony Brook Department of Microbiology, which was then headed by Arnold Levine, a former Laboratory trustee and now president of the Rockefeller University, and more recently by Eckard Wimmer, also a former CSHL trustee. With the establishment of the multi-institutional graduate program in genetics in the early 1980s, which brought together scientists at Stony Brook, CSHL, and the Brookhaven National Laboratory, there were even more opportunities for students to work at CSHL.

A particularly important event in the evolution of the interactions between Stony Brook and CSHL was the collaboration between Stony Brook's Nicholas Muzyczka, director of Stony Brook's Genetics Graduate Program, and Winship Herr, who spearheaded the involvement of CSHL scientists in the recruiting and teaching students. The interactions between Stony Brook and CSHL flourished and expanded to include students from the graduate programs in molecular and cellular biology, pharmacology, and, most recently, neurobiology. CSHL scientists are also members of the Medical Scientist Training Program that trains M.D./Ph.D. students at Stony Brook. In 1998, we had 57 graduate students from Stony Brook working at the Laboratory, making up a sizable fraction of our total research scientists. As we established our own graduate school, maintaining and even strengthening the interactions between Stony Brook and CSHL were of the utmost importance . These interactions not only promote the training of graduate students, but they are the basis of the relationship between our two institutions and thereby broaden the intellectual environment on Long Island, a highly desirable goal for all involved.

Throughout this period, there had often been discussions about whether CSHL should establish its own graduate program, but they were usually tabled because we were busy venturing into new research fields. In addition, many people quite rightly questioned whether our own program might change the nature of the Laboratory. This was a very appropriate question to ask. Eventually, however, the notion that we start a graduate school at CSHL emerged as one of the principal topics for discussion, encouraged by the Board of Trustees under the strong and enthusiastic leadership of David Luke. As a result, we embarked on a journey that, I believe, will have as much of an impact on the Laboratory as the starting of the postgraduate courses did in 1945.

CSHL has always enjoyed the ability to be flexible in its programs and not having to follow what people elsewhere have done. This key thread was woven into the plans for the new graduate program. Beginning from scratch, Winship Herr again took on a major new challenge to lead the design of a graduate program with CSHL faculty that was appropriate for the modern era of biology and that would serve us well far into the future. He also had to guide our application through the New York State Board of Regents' stringent approval process while not compromising on our desire to be innovative. In both of these, he and the Laboratory were spectacularly successful.

Incorporating the experiences of our diverse faculty who have studied in many different countries and graduate programs, the design of our graduate school took shape. Several important principles emerged that guided the thinking behind the design process and that became part of the graduate school curriculum. Many graduate students in the United States spend far too long in graduate school (up to seven years in some cases), so the program was designed to take about four to four and a half years. For the highly motivated students we expect to attract, this time frame should be more than adequate to embark on a life-long journey as a scientist. (I was fortunate to have completed a successful Ph.D. degree in three years and thus come to Cold Spring Harbor as a postdoctoral fellow having just turned 25. But I was trained well enough to appreciate all that CSHL had to offer.)

To ensure that our students can maximally benefit from the exciting environment at CSHL, we have incorporated a two-tier mentoring system. Students will have an academic mentor from the faculty, who will guide their intellectual and individual development, in addition to a research mentor to guide their thesis research. The relationship between a student and a research advisor is particularly unique and affects both people and their careers in significant ways. Indeed, it is a very special relationship that develops. But there are potential conflicts because the research advisor's research goals often have little to do with the education of a student. Moreover, the very nature of graduate thesis research focuses the student on a very narrow, albeit important problem. The addition of a second mentor for each student who will meet with and guide the student in all aspects of science should counter these possible con-

flicts. That mentor will guide the overall education of the student, particularly in areas of science not related to the research thesis.

Together, the student and academic mentor will discuss science and address problems that might arise. Although such discourse may also come from the research mentor (and I hope it will), the academic mentor will provide another point of view. I was aided greatly by having a marvelous thesis advisor in Alan Bellett, but also a second mentor, Ban Younghusband, who gave me the good advice to come to CSHL from Australia, against the advice of others. Ban urged me to come here because we got to know each other very well, and he therefore knew what would be good for my future. He turned out to be right.

The shorter training period necessitates a way of teaching that is more intense and different from what many graduate programs use, where students spend one to one and a half years in formal course work. It is my observation that following this, students often think that they do not have to continue to learn about science outside their thesis field. But those who take this attitude are doomed to mediocre science.

The innovative curriculum of the new school was designed to teach students in an initial 14-week course how to learn, think, and expand their own horizons. By exposing students to what they need to know in the first semester, we do not expect them to become experts in all subjects. Rather, we expect that the course will open doors and that they will then seek out more information on their own, with their mentors' guidance. To reinforce the concept of continuing education, short courses over the entire four years of the program will provide opportunities for students to learn about new areas, particularly taking advantage of the CSHL advanced courses. There, scientists do not become instant experts in the field taught in a course, but they are exposed to what is currently possible, enabling them to continue the learning process when they return to their own laboratories.

The graduate program involves a significant commitment on behalf of our faculty and the students, so we have initially limited student numbers to approximately five per year. But the small number will also allow us to address other important aspects of the program. First, because we seek high-quality students who will bring a vital energy to the program, recruiting must be highly selective. Second, so as to not have a negative impact on the current research budget, we will endow the graduate school with sufficient funds so that every student will have a guaranteed stipend, in addition to coverage of research costs and other expenses. This will have the added advantage that the students will have more flexibility in selecting the topics for their thesis research because they will not have to rely solely on funds from research grants that have other aims.

There was an obvious choice for the name of the school. Jim Watson has made pioneering contributions to research and to CSHL, but he has also made many significant contributions to education. As a teacher at Harvard, he developed perhaps the most influential textbook in modern biology, *Molecular Biology of the Gene*. This book greatly influenced later texts, including the popular *Molecular Biology of the Cell*, which Jim also helped write. He was a driving force in the establishment of the DNA Learning Center and its programs, and greatly expanded the postgraduate courses at CSHL during his tenure as director. Jim has been uncompromising on quality, innovation, and enthusiasm as a leader in education. I was therefore most pleased that when David Luke and I asked Jim whether we might name the school the Watson School of Biological Sciences, he said yes, although somewhat reluctantly.

None of this would be possible if it had not been for the dedication and very hard work of Winship Herr. He has guided the development of the curriculum, organized the faculty, and set a high standard for the graduate school. The Laboratory owes him a great debt. It is therefore most appropriate that Winship was named the first Dean of the Watson School of Biological Sciences at the November meeting of the Board of trustees.