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THE BIOSCIENCE INDUSTRY ON LONG ISLAND: MOVING TOWARD CRITICAL MASS

America remains a global leader in terms of biotechnology research. Its 1,400 public and private biotechnology companies employ tens of thousands of workers and account for about 75 percent of global revenue in the industry. Long Island is sharing in the growth of this emerging industry. It is part of a statewide biotechnology corridor extending through New York City and reaching into upstate New York. This article discusses Long Island's expanding role in bioscience research. It focuses on the local institutions that are putting Long Island on the cutting edge of new discoveries.



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The Process of Drug Discovery

Drug discovery is a lengthy and costly process. It generally takes ten to fifteen years and costs approximately \$1 billion to bring each new drug to market. Drug testing requires sophisticated laboratories as well as dedicated computer systems to track the resulting data. In late-stage drug testing, it is often a challenge to find enough suitable subjects with the disease and condition to which the drug being tested is targeted.

The pharmaceutical industry is undergoing dramatic changes. The number of brand name drugs coming to market has been stagnant for a decade. Legal challenges to patents of the nation's major pharmaceutical companies by generic drug makers are reducing patent protection earlier in each drug's life cycle. This means that brand name drugs may reach peak sales for as little as five years before being replaced by a cheaper generic version. With the market for conventional drugs flattening, "big Pharma", as the major pharmaceutical companies are called, is counting on their biotechnology departments to generate the newest blockbuster drugs.

The recent decoding of the human genome has created a flood of genetic data that can be utilized by the bioscience industry to develop new drug targets and therapies. New genetic links to disease are constantly being discovered. Just recently, researchers identified new genetic links to autism and lupus. Using a new type of genetic screen, researchers at Harvard Medical School recently identified the proteins that the AIDS virus needs to survive in human cells. A new generation of medical tests utilizing genetic information is also being used to rapidly identify deadly antibiotic-resistant pathogens. With each new discovery, it has become clear that the bioscience industry will play a key future role in the process of drug discovery.

The Long Island/ New York City Region As a Leader in Bioscience Research

The New York-Northern New Jersey-Long Island metropolitan area has long been dominant in pharmaceuticals manufacturing. According to the Battelle Memorial

Institute, an applied science and development company headquartered in Columbus, Ohio, the New York region employed almost 52,000 persons in pharmaceuticals manufacturing in 2004, more than in any other U.S. metropolitan area.

The historical concentration of pharmaceutical firms in the New York Metropolitan Region and the large number of premier medical facilities throughout the region, give it a competitive edge in developing new bioscience-based drugs and in commercializing these discoveries. New York City and Long Island are well on their way to becoming leading centers for commercial bioscience.

New York City's planned East River Science Park (ERSP), located adjacent to Manhattan's major east side medical centers, will contain over 1.1 million square feet of office and laboratory space for pharmaceutical, biotechnology, bioinformatics, contract research and medical device companies. The Audubon Business and Technology Center, a 100,000 square foot research facility developed by Columbia University and supported by New York City and New York

State, houses early stage, private research and development companies in the life sciences. New York City has also earmarked 300,000 square feet at the former Brooklyn Army Terminal for biotechnology research and bio manufacturing and plans to make further space available as needed. There is also a growing biotechnology park and incubator at the Downstate Medical Center in Brooklyn.

Similar efforts are under way on Long Island, where the industry is rapidly approaching the critical mass needed for future growth. Long Island is home to institutions that are at the forefront of groundbreaking discoveries in the life sciences. These include Cold Spring Harbor Laboratory, Brookhaven National Laboratory, the State University of New York campuses at Stony Brook and Farmingdale and the Feinstein Institute for Medical Research, part of the North Shore-LIJ Health System.

The presence of these institutions gives Long Island major competitive advantages in attracting fledgling bioscience firms originating in New York City and elsewhere. Long Island's growing bioscience clusters can give them affordable laboratory

space as well as access to scientists performing cutting-edge research at its premier research institutions.

Long Island's Premier Bioscience Research Institutions

Brookhaven National Laboratory (BNL) has a distinguished history of basic studies on DNA and proteins, the building blocks of life. BNL biologists study how cells respond to damaged DNA and examine the mechanisms that repair DNA. BNL scientists have made great strides in understanding how the human brain works at the cellular level. Their findings are helpful in treating drug addictions, eating disorders and attention deficit disorders.

BNL has developed a network of brain-imaging tools, including positron emission tomography (PET) and magnetic resonance imaging (MRI), to aid in the diagnosis and treatment of these disorders. This neuroimaging research reflects the longstanding commitment of the U.S. Department of Energy, the major source of financial support for BNL, to basic research in chemistry, physics and nuclear medicine.

BNL's biology department recently received almost \$660,000 in funding

from the U.S. Department of Health and Human Services for antiviral and immune research. The project, which has been ongoing for a decade, involves finding targets on viruses to which antiviral drugs can attach. BNL researchers will focus on designing drugs that will bind to the newly discovered virus targets.

Cold Spring Harbor Laboratory is a private, non-profit institution dedicated to basic research and education. Its more than 400 scientists conduct groundbreaking research in cancer, neurobiology, plant genetics and bioinformatics. CSHL has long been associated with research concerning the fundamental biology of human cancer. Its scientists are developing biochemical and genetic tools that will enhance our capacity to understand, diagnose and treat cancer. The Laboratory has been designated a National Cancer Institute Cancer Center since 1987.

CSHL disseminates its findings through an extensive education and teaching program that includes workshops for students and teachers, advanced courses for scientists and publications by the CSHL Press. The Laboratory hosts approximately 20 scientific meetings annually, which draw more than 7,000 scientists from around the world. Cold Spring Harbor Laboratory has been responsible for more than eighteen corporate spin-offs based upon its technologies over the past two decades.

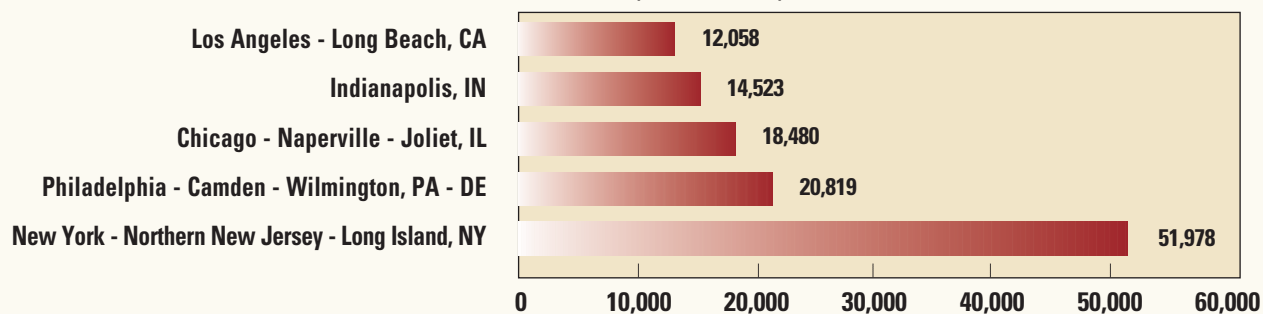
In an effort to retain more of these businesses on Long Island and capitalize on their commercial success, Cold Spring Harbor Laboratory and Farmingdale State College jointly created the Broad Hollow Bioscience Park, a non-profit research park on the campus of Farmingdale State College. The Park is helping to commercialize new bioscience technologies by nurturing bioscience firms in

The Top-Ranked U.S. Metropolitan Areas in Terms of Pharmaceutical Employment

Rank	Metropolitan Statistical Area	Pharmaceuticals Employment
1	New York-Northern New Jersey-Long Island, NY-NJ-PA	51,978
2	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	20,819
3	Chicago-Naperville-Joliet, IL-IN-WI	18,480
4	Indianapolis, IN	14,523
5	Los Angeles-Long Beach-Santa Ana, CA	12,058
6	San Francisco-Oakland-Fremont, CA	9,775
7	Durham, NC	8,226
8	Oxnard-Thousand Oaks-Ventura, CA	6,131
9	Boston-Cambridge-Quincy, MA-NH	5,984
10	Kalamazoo-Portage, MI	5,387

Source: Battelle Memorial Institute based on Bureau of Labor Statistics Data

Top-Ranked Metropolitan Areas, Pharmaceutical Employment (No. of Jobs)



their formative years. With financing from New York State, the Park's first 63,500 square foot facility opened in September 2000. A second 43,000 square foot research facility is slated to open early this year. The Park's anchor tenant, OSI Pharmaceuticals, specializes in the discovery, development and commercialization of innovative therapies that extend life and improve the quality of life for patients with cancer, diabetes and obesity. OSIP's flagship drug, Tarceva®, is FDA-approved for advanced non-small cell lung cancer and advanced pancreatic cancer.

Farmingdale State College is an important partner in this collaboration. Its new baccalaureate degree program in bioscience produces the bench scientists needed by growing bioscience firms. The curriculum has a strong biology core but also incorporates selected courses from business administration, computer sciences, management technology, manufacturing engineering technology and medical laboratory technology. Students can choose from among five concentrations: bioinformatics, biopharmaceutical, bioscience research, forensic DNA technology and molecular pathology. Tenant companies at

the park support the educational process by providing internships to students in the program.

Researchers at the *State University of New York at Stony Brook* are also making groundbreaking discoveries in medical bioscience technology. The biomedical and life sciences account for almost 45 percent of Stony Brook's externally sponsored research. Two FDA-approved drugs — Repro, used in cardiac angioplasties, and Periostat, used to treat periodontal disease — were developed as a result of research conducted by SUNY, Stony Brook scientists.

Stony Brook's Center for Biotechnology, one of two New York State Centers for Advanced Technology on campus, focuses specifically on medical biotechnology. This includes molecular and cell biology, medical laboratory technology, drug discovery, high-throughput screening and drug development. The Center works with local bioscience companies to identify and support technologies that have commercial potential. A broad range of commercially promising research is competitively evaluated from both a

scientific and business perspective. Advisors are selected from a network of scientists, engineers and technology officers in the academic and industrial sectors.

The Center also offers courses in the business side of the life sciences through its Fundamentals of the Bioscience Industry program. The program provides graduate students, postdoctoral researchers and employees of life science and biotech companies with a deeper understanding of life science product development cycles, regulatory practices, financial models and managerial challenges in the bioscience industry. This type of education is extremely important because it acquaints students with issues such as quality control and FDA compliance.

Last year, ground was broken for the new STAR Center for Biotechnology and Bioengineering at Stony Brook. It will focus on gene discovery, drug design, drug delivery and smart micro and nano-based biomaterials and biosensors. At its scheduled completion, in April 2009, the STAR center will house the applied research programs of 17 entrepreneurial Stony Brook faculty members employing more than 100 people.

The *Feinstein Institute for Medical Research* in Manhasset is one of the fastest-growing biomedical research institutes in the country. Established in 1999 as part of the North Shore-Long Island Jewish Health System, its physicians and scientists hold patents for experimental drugs that are in various stages of clinical and preclinical testing for diseases such as arthritis, cancer, cardiac disease, sepsis, shock, trauma and other inflammatory conditions. Since its inception, the Feinstein Institute has enrolled more than 115,000 participants in clinical research studies. It also helps train the next generation of physician-scientists through its Graduate School of Molecular Medicine. Physicians at the Institute obtain a PhD degree in molecular medicine. This training ensures that the breakthroughs generated by biomedical researchers are translated into patient cures.

In 2006, the Feinstein Institute installed a powerful new technology for scanning the human genome. Using this new technology, they recently discovered two previously unknown genetic linkages for rheumatoid arthritis. The Feinstein Institute's commitment to this latest technology for comprehensive genetic mapping will benefit research on a broad range of autoimmune diseases as well as Alzheimer's disease, schizophrenia and autism.

Cooperation and Collaboration in the Biosciences: The Key to Future Success

New York State has made a significant investment in the growth of the local bioscience industry. Ongoing and planned future collaborations between Long Island's premier research institutions will ensure that the state receives an ample return on that investment.

An outstanding example of the potential benefits of such collaborations is a recent five-year research project involving Cold Spring Harbor Laboratory, Brookhaven National Laboratory and the State University of New York at Stony Brook. Their joint analysis of the development of brain nerve tissue led to a major breakthrough that will significantly improve the diagnosis and monitoring of brain tumors and assist in the diagnosis and treatment of other brain-related diseases such as Parkinson's disease, epilepsy, Alzheimer's disease, schizophrenia, bipolar disorder, depression and post-traumatic stress disorder.

The simultaneous expansion of the bioscience industry in New York City and on Long Island will allow the downstate New York region to compete for research funding with major biotechnology hubs such as Cambridge, Massachusetts and San Francisco, California. Once the downstate New York region reaches a certain critical mass in terms of bioscience development, it will become easier to recruit the scientific talent needed to lock in past development and ensure future

industry growth. Bioscience researchers strongly prefer to work in areas that have growing, contiguous bioscience clusters. This gives them the greatest employment mobility. It also fosters an exchange of ideas that jumpstarts the process of innovation. Until Long Island can develop a critical mass of commercially sustainable bioscience firms, recruiting and retaining scientists and support personnel will continue to be problematic.

Attainment of that critical mass will require accelerating the process of technology transfer. The successful commercialization of new bioscience technologies is already under way on Long Island. The Center for Biotechnology at SUNY Stony Brook is devoting considerable resources to commercializing promising bioscience research. The Broad Hollow Bioscience Park is essential to retaining fledgling bioscience companies formed around locally generated technologies.

A research institute modeled after the Stanford Research Institute in California could also be helpful. SRI's Biosciences Division has the resources to take biological research from an initial idea through clinical trials. Working with government and industry partners, SRI has helped advance more than one hundred drugs into clinical trials and has been successful in bringing more than thirty drugs to market.

Long Island is well on its way to developing the critical mass needed for future bioscience industry growth, but it is not there yet.