

GEN*NY*SIS

GENERATING EMPLOYMENT THROUGH NEW YORK SCIENCE

Two years ago, the Senate Majority sponsored legislation signed by Governor George E. Pataki to create a multi-year program of over \$500 million to promote technology transfer opportunities at the State's higher education institutions. The goal of this "Jobs 2000 for New York State Act" commonly referred to as "J2K", is to increase the commercialization of laboratory discoveries, thereby creating new jobs and businesses in New York, especially in upstate New York. The response to this idea has been overwhelming. It is expected that the programs offered under J2K will be oversubscribed as new ideas in telecommunications, thin film technologies and information technologies are developed spurring New York State to the forefront of these industries.

While bioscience research is a strong component of the State's economy and of the J2K program, the recent announcement of the identification of the components of the human genome has quickly propelled research in the life sciences into areas of discovery only imagined years ago; certainly beyond the levels imagined at the time the J2K program was created. The economic benefits of gene sequencing will be enormous, leading to the next wave of economic growth as this new knowledge base is applied to the creation of new medicines and technologies to improve human health.

However, while New York State is home to some of the most preeminent research institutions in the world, New York State is not at the forefront of biomedical research and biotechnology development. New York, therefore, is not properly positioned to be a full participant in the wave of economic growth that will be generated by the genomics revolution. New York is instead losing ground as the federal government and other states including Michigan, Texas and even Georgia have expanded their investment in research in the life sciences and the translation of discoveries into new biotechnology jobs and businesses.

According to a 1997 report by The Council on Biomedical Research and Development at the New York Academy of Medicine, the State's vast infrastructure of prominent research oriented institutions received more research funding through the Federal National Institutes of Health (NIH) than any other state until 1990 when New York dropped to second place behind California. Since that time, New York's share of NIH funding has continued to decline. An analysis by the Academic Medicine Development Company (AMDeC) indicates that New York State ranked 43rd out of 50 states in percentage growth in NIH funding throughout the 1990's.

This drop in New York's ranking translates into a loss of over \$400 million in research dollars from approximately \$1.5 billion to \$1.1 billion; a drop of over 35 percent. These funds went to other states. It is expected that over the next decade Congress will seek to vastly increase the federal NIH budget as a result of the success of the human genome project. If New York does not become competitive, most of the increase will end up at research institutions in other states.

If New York State is to reap the economic benefits of the explosion in knowledge from the identification of the human genome, investment must be made immediately in New York's research institutions to attract the talent, both scientists and entrepreneurs, interested and eager to enter into the next economic revolution: the life sciences. New York State already contains the basic elements for success as reflected in the recent growth of bioscience "clusters" around the State; in Long Island, New York City, Albany, Rochester, Buffalo and Ithaca. However, New York State is behind many other states who have made biomedical research an economic development priority and have invested hundreds of millions of dollars into the effort.

To accomplish this task, the Senate Majority under the leadership of Senator Joseph L. Bruno, along with Senate Finance Chair Ronald B. Stafford, Senate Investigations, Taxation and Government Operations Committee Chair Senator Roy M. Goodman, Senate Higher Education Chair Senator Kenneth P. LaValle, Senate Health Committee Chair Senator Kemp

Hannon and Senate Economic Development Chair Senator James S. Alesi, propose the creation of a five year **\$500 million Gen*NY*sis Program** (Generating Employment Through New York Science) focused on strengthening the linkage between life science discoveries made at New York State's research institutions and the creation of new businesses and jobs in New York State.

This proposal would be funded by \$225 million in direct State grants and loans, \$45 million in targeted tax relief and \$225 million in academic, federal or industry matching grants. The Senate Majority's **Gen*NY*sis Program** seeks to move New York to the forefront of research and technology development in the life sciences by supporting basic research and the translation of this research into new products and technologies. This program also expands the State's current business development programs by focusing on the unique developmental nature of emerging biomedical and biotechnology companies to nurture the growth of these industries and jobs in New York State.

The success of New York's effort in building its biotechnology industry hinges upon enhancing the State's current research and development infrastructure. The focus of the **Gen*NY*sis Program** is, therefore, on strengthening the collaboration already underway between academic scientists and biotechnology companies as evidenced by the presence of regional clusters in biomedicine and biotechnology already established in New York State, from Long Island to Buffalo. Funding is provided not only for shared lab space between academic institutions, but for bioscience parks whereby academic scientists can meet and interact with biotechnology industry scientists. In these shared settings, scientists are able to exchange knowledge not only in basic research, but on the translation of their research into new products and technologies, from new medicines to the most efficient delivery system for new medicines.

The Senate Majority expects that institutions in every regional cluster will participate in the **Gen*NY*sis Program** making New York State the premier location for biomedical and biotechnology companies and jobs. Such efforts will allow New York State to expand and diversify its economy, especially in upstate New York, as the 21st century begins.

The Gen*NY*sis Program

The purpose of the **Gen*NY*sis Program** (Generating Employment Through New York Science) is to promote economic development in New York State by strengthening the linkage between research at New York's public and private research institutions in genomics and the life sciences (including plant, animal and human genomics) and the application of this research to new products and technologies, thereby increasing the number of businesses and jobs in New York State.

The **Gen*NY*sis Program** would be administered by the New York State Office of Science, Technology and Academic Research (NYSTAR) and the Empire State Development Corporation (ESDC), with an emphasis on supporting and promoting research and business development in genomics and related areas of bioscience. The proposed amount of \$500 million would include \$225 million in direct State aid, \$45 million in targeted tax relief and \$225 in academic, federal and industry matching funds. Total State support would be allocated as follows:

- **Basic Research (\$150 million);**
- **Life Sciences Business Development Program (\$75 million);**
- **Targeted Tax Relief (\$45 million); and**
- **NYSTAR and ESDC Support Funding (\$5 million).**

A. Basic Research (\$150 million)

Strengthening New York's bioscience industry begins with the ability to attract and retain the nation's top scientific talent. Given the competition to claim and patent discoveries and the limited talent pool of researchers, this program is designed to allow New York's institutions to compete with other institutions across the country for the best and the brightest.

In addition, continued success is dependent on a highly trained stable workforce as highlighted by a recent report “Assessing Workforce Needs in the Biotechnology Industry” published by the Rochester Institute of Technology. This report, sponsored by Senator James Alesi, speaks not only to the need to attract students to academic programs in the life sciences but to maintain the skills of those individuals already working in the biotechnology industry. To this end, the **Basic Research Program** proposed by the Senate Majority would provide **matching** grants for the following:

- Recruitment and retention of professional and support staff as well as graduate students for a period not to exceed four years;
- Laboratory construction and/or rehabilitation;
- Laboratory equipment;
- Federal/industry/academic research grants in excess of \$250,000;
- Expansion of life sciences academic programs to increase the number of researchers, funding not to exceed four years;
- Expansion of enabling technology academic programs (see below), funding not to exceed four years;
- Computer technology and infrastructure enhancements necessary to build the New York genomics corridor to further the sharing of information; and
- Grants for public policy forums on bioethics.

In addition, this fund would finance the James D. Watson Young Investigator’s Program which would award research grants of up to \$250,000 over two years to new faculty members who are recent PhD graduates. This program is named after Dr. Watson, who along with Dr. Francis Crick discovered the double helix formulation of the genetic code, leading to the genomics revolution today. Dr. Watson is currently President of the Cold Spring Harbor Laboratory on Long Island. This program would be funded at \$3 million.

These awards would be distributed through a competitive process involving review and rankings by an outside peer review committee composed of scientists and leading business people well versed and experienced in both basic and applied life sciences. After the peer

review committee ranks all applications, the Advisory Board of the Office of Science, Technology and Academic Research (NYSTAR) would determine the final awards.

An outside peer review committee would ensure a thorough, objective review of both the merits of the science involved and the potential commercial application of any discoveries to marketable products or technologies. Awards would be granted to the best science with the best economic development possibilities. This process, already utilized by other states such as Michigan, ensures that the most promising research opportunities are undertaken at New York's research institutions.

To be eligible for funding under the basic research program, the recipient would have to be currently engaged in life science research, defined as genomics and related genetic technologies, diseases including chronic diseases as well as other health problems related to aging, neuroscience, animal and plant genomics.

In recognition of the necessary contribution of other fields of science to further explore and develop bioscience research, those researchers engaged in developing enabling technologies for life science research would also be eligible for funding under the Senate's proposal. Such researchers would include those involved in any computer, engineering, mathematical, physical science and electronics research whose applications would be directly applied to life science research including bioinformatics, bioengineering, nanotechnologies, applications of microelectronics and micro-electromechanical devices.

The goal of Senate Majority's **Gen*NY*sis Program** is the creation of new businesses and jobs in New York State. Therefore, all grant applicants would be required to demonstrate the economic development application of their research. Also, preference would be given to requests involving collaboration with other researchers, with industry, across disciplines and/or among institutions in recognition of the synergistic effects of collaborative efforts in life sciences research.

B. Life Sciences Business Development Program (\$75 Million)

New York's current economic development programs are structured to create, attract and retain traditional manufacturing industries. The parameters surrounding these programs are not conducive to attracting and retaining high technology industries, especially those involved in biotechnology.

The most recent example of this lack of flexibility in the State's economic development programs is the expansion of a biotechnology company, OSI, on Long Island. This company, as with other businesses in New York State approached the Empire State Development Corporation (ESDC) with a request for funding to expand its facilities in New York. However, unlike manufacturing companies but very similar to other new biotechnology firms, OSI did not meet the criteria of the State's current business development programs and was therefore turned down for assistance. The long lead time from discoveries to actual products and technologies characterizing emerging biotechnology companies disqualified OSI from any assistance through the State's current economic development programs. The intervention of Senator Joseph L. Bruno and Senator Charles Fuschillo to obtain a specific grant for OSI as part of the SFY 2000-01 budget allowed the company to expand at SUNY Farmingdale on Long Island bringing 300 new, permanent high paying jobs to this part of the State.

Therefore, in order to further aid the development of new jobs and businesses, the Senate Majority proposes the creation of a new economic development program, the **Life Sciences Business Development Program**, focused on biotechnology. Along with targeted tax initiatives (discussed below), this new program is designed to support young promising biotechnology companies through the years of testing and federal approval processes necessary before any product can be marketed.

The Senate Majority's **Life Sciences Business Development Program**, would be administered by the Empire State Development Corporation (ESDC) in conjunction with NYSTAR to provide emerging biotechnology companies with the following assistance:

- Grants or loans to further develop the technology or product before licensing;
- Financial assistance (loans/grants) for the renovation or construction of facilities and/or equipment;
- Working capital for emerging biotechnology companies;
- Worker training/retraining grants; and
- Financing for the construction/reconstruction of bioscience parks including infrastructure such as access roads as well as equipment.

The Life Sciences Business Development Program is designed to reinforce the current paradigm; the success of collaboration through bioscience clusters. This program, therefore, in addition to relying on traditional financial criteria amended for the unique nature of the biotechnology industry would also seek to encourage collaboration between industry and academics, including the financing of new bioscience parks or the expansion of current bioscience parks located near the State's research institutions.

Targeted Tax Relief (\$45 Million)

Further recognizing the cash flow needs of these young fledging biotechnology companies, the Senate Majority proposal provides tax relief in the early years of development. Specifically, the Senate proposal provides the following:

- The creation of life sciences development zone(s) which would provide tax-free research zone(s) similar to benefits provided in Empire Zones;
- Increases in Research and Development Tax Credits (**refundable**) from the current nine percent to 20 percent;
- Doubles the current Qualified Emerging Technology Company wage and capital credits for life sciences companies;

- Removes the current Alternative Minimum Tax (2.5 percent) limitation for emerging life sciences companies, leaving the fixed dollar alternative minimum tax.

NYSTAR and ESDC Support Funding (\$5 million)

These administrative funds would support staff of NYSTAR and ESDC necessary to implement the **Gen*NY*sis Program** including expenses of the peer review process.

In addition, critical to the success of this initiative is a knowledgeable high technology business development staff to assist researchers, research institutions, incubator tenants and others in navigating the State regulatory processes, setting up small businesses, coordinating potential funding resources and/or tax credits from other State agencies (such as the Senate sponsored Pipeline for Jobs Program in EFC and the Industrial Access Program of the Department of Transportation). This business development staff would also aid entrepreneurial researchers in business plan development and in acquiring outside sources of funding. This staff would also be responsible, in conjunction with the Department of Economic Development with marketing the State's growing commitment to bioscience research and development.

Concluding Observations

The Senate Majority's **Gen*NY*sis Program** expands upon the economic development concept embedded in the J2K Program; ideas generating future technologies and economic expansion will be developed at public and private research institutions. Other states have recognized the trend in economic development and have invested hundreds of millions of dollars in research and technology transfer programs. For example, the state of Michigan is investing **\$1 billion** over a multi-year period in genomics research alone.

The genomics revolution has become an international race for economic development that New York State **cannot** afford to lose. In the 1980's, the lack of not only the State's investment, but the State's interest in the developing computer technologies resulted in the loss of thousands of jobs to other states. The genomics revolution presents New York State with another chance at becoming the leader in the development of new biotechnology businesses. The infrastructure is already in place, ranging from nanobiotechnology development at Cornell University to cancer research at the University of Rochester and at Cold Spring Harbor.

However, the State needs to play an active role in encouraging collaboration among the various research projects, institutions and industries in New York to maximize the number of discoveries and the translation of these discoveries into jobs and new biotechnology businesses. Also, New York must invest in talent, facilities and business development programs to fill in the gaps that have allowed New York State to slip behind other states in bioscience research and technology development. The Senate Majority's **Gen*NY*sis Program** fills these gaps and through focusing approximately 50 percent of funding under this proposal to upstate New York, will strengthen the entire State economy.

Appendix**New York's Excellence in Research**

New York State is currently home to a number of exceptional life sciences research institutions, all devoted to expanding New York's presence in bioscience research and development. It is the excellence of these institutions working together as a team in bioscience clusters, which forms the cornerstone of the Senate Majority's **Gen*NY*sis Program**. These bioscience clusters are located in the Capital Region, New York City, Long Island, the Finger Lakes, Buffalo and Rochester with developing clusters in the Mid-Hudson and North Country region of the State.

The Comparative Functional Genomics Center on the East Campus of the University of Albany, Albany Medical Center, the Wadsworth Center and RPI are the primary research institutions formulating the Capital Region's growing bioscience cluster. The East Campus is a recent recipient of a five year grant from the federal government to serve as one of three National Institutes of Health Mutant Mouse Regional Centers in the country. The center will receive and identify mice with certain gene alterations for research. RPI has recently approved a Ph.D. Program in bioinformatics, understanding that a strong computer science infrastructure is crucial to attracting the life sciences companies of the future.

New York City is home to world-class medical schools and research universities. A collaboration of nine of these academic institutions including Albert Einstein College of Medicine, CUNY, Columbia University, Memorial Sloan-Kettering Cancer Center, Mount Sinai School of Medicine, NYU, Rockefeller University and Weill Medical College of Cornell University have committed funding and received State support to establish the New York Structural Biology Center. This center will house five 800-megahertz magnets and one 900 megahertz magnet ranging in size from a small Toyota to a large Buick creating the largest cluster of high field magnets in the United States. These giant MRIs will chart how molecules react in real time, which will provide vital data in designing modern drugs.

In addition to the Structural Biology Center, New York University School of Medicine and the Mount Sinai School of Medicine opened the Skirball Institute of Biomolecular Medicine in 1993 to show their commitment to cutting-edge life sciences/genomics research. The New York City region is also benefited by the Audubon Biomedical Science and Technology Park, a biotechnology incubator located on the campus of Columbia University.

SUNY Stony Brook, Cold Spring Harbor Laboratory, Brookhaven National Laboratory and the North Shore hospital system are together creating a formidable cluster in life sciences research and development. SUNY Stony Brook operates a Center for Advanced Technology in Medical Biotechnology and the Long Island High Technology Incubator which provides start up biotechnology companies with affordable lab or office space and business services as well as access to research university resources. Currently, Stony Brook is working under contract with the National Human Genome Research Institute and the National Cancer Institute on DNA sequencing instrumentation. Cold Spring Harbor Laboratory has recently acquired a 63,000 square foot facility in Woodbury, Long Island where it will house its Genome Research Center. The Genome Research Center will focus on cancer research, genome sequencing, plant genetics and bioinformatics.

Cornell University is home to its own cluster containing Cornell's agricultural, veterinary and medical research. Cornell University also houses the Center for Advanced Technology in Biotechnology which focuses on agriculture, the environment, food science and nutrition and health care. The University of Rochester has just completed a \$120 million expansion and renovation of its biomedical research facility -- the Aab Institute of Biomedical Sciences in an effort to attract the best and brightest scientists to Rochester and strengthen its research and development presence in biotechnology. The new Institute is recruiting scientists to work on cancer vaccines, genetics and aging. Along with the Rochester Institute of Technology, another cluster in bioscience research and development is forming along the shoreline of Lake Ontario.

In Western New York, the Roswell Park Cancer Institute is one of the nation's premier centers for cancer research and treatment. In addition, SUNY Buffalo ranks in the top 40 nationally in biological research based on National Science Foundation Research and Development data. SUNY Buffalo and the Roswell Park Cancer Institute are working together to create a new Biotechnology Research Center at SUNY-Buffalo.

The Mid-Hudson and North Country are also making a significant regional commitment to life science and biotechnology research and development. In the Mid-Hudson, the New York Medical College in Valhalla has helped expand basic and clinical research through collaboration with nearby biotechnology and pharmaceutical companies. Clarkson University in the North Country, offers undergraduate, graduate and doctoral programs in sciences and is one of the best undergraduate engineering schools in the nation. The Trudeau Institute in Saranac Lake conducts research into the body's immune system to develop new treatments for serious infectious diseases.