

Appendix A:

Press Releases and Speeches

GOVERNOR PATRICK ANNOUNCES MASSACHUSETTS' NEW LIFE SCIENCES INITIATIVE

Investment package, industry and public- private higher education collaboration and state stem cell bank make Massachusetts global leader

BOSTON - Tuesday, May 8, 2007- Governor Deval Patrick today announced his plan to make Massachusetts the global leader in life sciences, unveiling for the first time ever a comprehensive, collaborative Massachusetts Life Science Strategy.

The plan, outlined during a speech at the BIO 2007 convention, includes a 10 year, \$1 billion investment package that will both enhance the state's already nationally recognized assets in the fields of medicine and science and fill gaps in federal funding to ensure the state's ability to support life science progress from the idea stage through the production stage. The Patrick Administration's strategy brings together industry, academic research hospitals, and public and private colleges and universities to coordinate these efforts, spur new research, strengthen investments, create new jobs and produce new therapies for a better quality of life.

"There is no place in the world with as much talent in life sciences and biotech as here in Massachusetts," said Governor Patrick. "Now is the time for us to invest in that talent and bring together the resources of our unparalleled research universities, teaching hospitals, and industry to work towards a common goal - to grow ideas into products to create cures and jobs."

Key to the Governor's Life Science Initiative is new legislation that will strengthen the Massachusetts Life Science Center and charge it with the execution of a life science mission focused on science and economic development, strategic investments at critical stages of the development cycle, and collaboration with the private sector to create innovation infrastructure critical to both researchers and companies. The Governor also announced his commitment to making targeted investments in companies that encourage life science economic development in the Commonwealth.

"I commend the Governor for reaching out to all sectors of our life science cluster in order to craft a stem cell/life science package that recognizes the unique institutional assets and intellectual firepower in our region," said Steven Hyman, Professor of Neurobiology at Harvard Medical School and Chairman of the Massachusetts. "The Governor allocates state resources in effective ways to enhance our traditional strengths, buttress areas that need attention, and encourage powerful collaborations between our leading edge institutions."

Today's announcement at the BIO 2007 Convention highlighted the following:

A \$1 billion investment package that includes funds to:

- **Bridge the NIH funding gap** - A competitive grant program during the current downturn in federal support to sustain key programs in the state. Our collective success during the 1998 - 2003 period when the NIH budget doubled from \$14 billion to \$28 billion only solidified Massachusetts' dominance in the area of biomedical research. However, the subsequent four years of flat funding since 2003 has caused a 13 percent loss of funding power by NIH and a 35 percent reduction in support for clinical trials. The Patrick administration will make surgical investments during the downturn to sustain key programs here in Massachusetts in order that our position is sustained to once again capture large percentages of new funding when it materializes.
- **Create the Massachusetts Stem Cell Bank** - A first A first in the nation centralized repository of new stem cell lines available to all sectors, public and private, of research enterprise. Boston University, Brigham & Women's, Children's Hospital, Harvard University, Massachusetts General Hospital, the Massachusetts Institute of Technology, Partners HealthCare and the University of Massachusetts have already agreed to participate in the Bank when it is completed.
- **Establish Massachusetts Life Science Fellowship Grants** - Grant packages for research institutions in Massachusetts to attract and retain the rising stars of life sciences research in the Commonwealth, and ensure Massachusetts is competitive with other states and nations.
- **Establish Massachusetts Life Science Innovation Centers** - Center-based research facilities that streamline technology transfer, development time and funding opportunity.

"As the president of the University of Massachusetts, the leading public academic research institution in the Commonwealth, I applaud Governor Patrick for making such a strong commitment to the life sciences, particularly stem cell research and RNAi-related research and development," said University of Massachusetts President Jack M. Wilson. "The announcement today is an important step in developing a world-class life sciences strategy for the Commonwealth that will foster scientific innovation, including unlocking the mysteries of debilitating diseases, and spur economic growth. The University of Massachusetts is proud to be able to play an important role in this strategy and I truly believe this proposal is far-reaching, comprehensive and of sufficient scope and scale to enable Massachusetts to continue and expand its national and global leadership in biotechnology and the life sciences."

"It is clear to me that scientific innovation and cutting-edge research help set Massachusetts apart in the eyes of the life sciences and greater scientific community. Today's announcement of this significant, new state funding is an important signal that the opportunities to do cutting-edge research in this state are

expanding. I am proud that RNAi is already changing the scientific landscape, offering new tools in the effort to better human health; my colleagues at the UMass Medical School and I see great promise in our continued work with RNAi and RNAi Therapeutics. Support of this type from the government, academic institutions and society allows us to further advance science and to conduct important basic, clinical and translational research," Nobel Laureate Craig Mello, Ph.D. of the University of Massachusetts Medical School said.

"The future of life sciences is here in Massachusetts." Governor Patrick said. "We have the talent. We have the entrepreneurial spirit. Now let's seize the future."

05.08.07 - Governor Announces Life Sciences Initiative

Governor Deval L. Patrick

Life Sciences Initiative Announcement

May 8, 2007

As Delivered

Senate President Murray reiterated her long commitment to support stem cell research on the very day she assumed her new role as President of the Senate. And under Speaker DiMasi's leadership Massachusetts passed one of the most important pieces of Life Sciences legislation in the nation just two years ago. Today we will build upon that foundation.

I'm delighted also to be joined by my friends and partners in today's initiative, Dr Peter Slavin, CEO of Massachusetts General Hospital, Jack Wilson, president of the University of Massachusetts, Josh Boger, CEO of Vertex in Cambridge and chairman elect of BIO, and Jonathan Kraft of the Kraft group.

These gentlemen represent others among the teaching hospitals and research universities and biotech companies and business community generally, whose willingness to care about and in their own ways invest in science and healing has been key in our success to date and will be key to our leadership tomorrow. And I also want to welcome former senate president Robert Travaglini. Where are you Trav?

His vision helped to position this commonwealth to assume global leadership in the life sciences, and that is a profound legacy to have left this generation and the next.

This is an important time for the life sciences all over the world. Its ideas and innovations can change lives, and can generate billions of dollars in new products, good jobs at good wages, and robust sustainable economic growth.

This industry capitalizes on the best that Massachusetts has to offer, and serves the best of what Massachusetts is about. Within this small state we have an extraordinary confluence of research universities, teaching hospitals, brain power, venture capital, and a long tradition of entrepreneurialism that has helped defined this economy as being fueled by innovation. We are quite simply the largest life sciences super-cluster on the planet, and that is a thing to be very proud of.

And that concentration of expertise and talent annually brings home a disproportionate share, over \$2 billion dollars a year of funding from the national institute of health. That is why we have made your work

central to our economic vision for this commonwealth. That confluence of strength is the foundation of our economy for tomorrow. One out of every seven jobs in the Massachusetts economy is in the life sciences cluster. Companies were started in Massachusetts by graduates of our universities, researchers in our research hospitals and academic medical centers go on to create breakthrough cures, but thousands of jobs. Storied companies like Genzyme, Biogen, Vertex and now, Bristol Myers Squibb, start here or move here because of the unique combinations of strengths here in this Commonwealth.

Dr. Craig Mello who has joined us here I am very proud to have by my side and is one excellent example of the work and the strength of the talent here in Massachusetts. He and his team at UMASS Medical School in Worcester just brought home a Nobel prize for their work on RNAi, a gene silencing technique that holds the promise against diabetes cancer and HIV AIDS, we are very proud of you doctor, and your team and of your work.

But the point is also this, Dr. Mello is a part of a community of tens of thousands of people working to advance the life sciences industry and the future of healing and that is a point worth emphasizing. For us, the success of the biotech industry is more than a commercial matter. Each family can speak about a mother or father who suffered from Lupus or Cancer or some other disease. All of us have known relatives and friends who live with debilitating illnesses like Alzheimer's and diabetes. Every day we meet people with spinal injuries or HIV/AIDS whose families are looking for a reason to hope. You cannot be in the company of someone you love, powerless to help them, without appreciating the vital importance of stem cell research and other biomedical breakthroughs. In many ways, the health of this industry and the health of our society are closely linked. That is why we will not rest on our laurels. Right now our competitor states and foreign nations are investing billions of dollars to attract researchers, institutions and industries. At the same time, federal funding through the National Institutes of Health, of which Massachusetts has received a disproportionate share, is flat and likely to diminish in the short term. Politics, especially around stem cell research, impairs the innovation and calculated risk-taking that make breakthroughs possible. It is essential now that the Commonwealth step up to maintain and extend our global leadership in the life sciences. That is why I am proud to announce today the Massachusetts Life Science Initiative, a 10 year - \$1billion dollar investment that will create new partnerships between state government, industry, academic medical centers and public and private higher education, and accelerate our statewide life sciences growth into high gear. We want Massachusetts to provide the global platform for bringing your innovations from the drawing board to the market, from inspiration to commercialization, and from ideas to cures. We know that begins with new ideas and innovation. Our rate of innovation in recent years has been triple that of the national average and I have no intention of letting it slip. We will close the funding gaps left by depleted NIH support with grants to sustain existing research and support new explorations. This funding for promising research in areas such as stem cells and on RNAi will allow us to build on our existing strengths and bypass the impact of national politics. To increase our intellectual capital, we will offer Massachusetts Life Science Fellowship Grants to young, emerging talent. We

recognize the value of attracting and retaining the best and brightest minds to our life sciences sector, and want to help them and you build careers here in Massachusetts. It is these young talented men and women who go on to start the next Genzyme and the next Biogen and the next Vertex, and create thousands of new jobs in our communities. Our next step is the creation of an Innovation Infrastructure, one that provides the necessary support for life sciences research and development. Playing to our world leadership in stem cell research, we will create the Massachusetts Stem Cell Bank. This is unique endeavor, to be hosted at the University of Massachusetts, will be the world's largest catalog of stem cell lines widely available to researchers, and cut through the administrative tasks associated with storing, handling, and shipping stem cell lines. Beth Israel Deaconess, Brigham & Women's, Children's Hospital, Harvard, MGH, MIT, Partners HealthCare and UMass have already agreed to donate their stem cell lines to the Stem Cell Bank - keeping with and emphasizing the spirit of collaboration that has characterized our work here in Massachusetts and will be our secret weapon going forward. Researchers all over the world will have access stem cell lines that are truly made in Massachusetts. Together we are dedicated to making Massachusetts the foremost capitol of stem cell research on the planet.

In that same spirit, the state will invest in Innovation Centers to provide industry and the academic community access to cutting-edge facilities and technology. By creating central locations for resources and research, we can enhance technology transfer, cut development time, and improve our workforce deployment. These centers will serve as regional economic hubs throughout the entire Commonwealth, spawning new companies and new jobs in the cities and towns around them.

We will also partner with the private sector to purchase equipment and instruments for those innovation centers and for private facilities, right now, equipment worth millions of dollars sits idle in our own labs in Massachusetts because the federal government has prohibited its use on stem cell research. This must end, and it will end here in Massachusetts.

Life sciences in this commonwealth will be defined by innovation and cures, not ideology and short term political gain. Finally, when an idea is ready to become reality, we will make targeted investments to guide it to the marketplace. I know that all too often, breakthroughs fall into the so-called "valley of death," the investment gap between early stages of academic research and industry development. We will provide grants to translate Massachusetts discoveries into real health applications, support partnerships to move new ideas towards market supported development, and fund efforts to create new tools like stem cell lines to be made available at low cost.

We will also develop support programs for improved outreach, grant matching, and loans for life science projects qualifying for federal SBIR/STTR programs. Today, Massachusetts companies lead the nation in per capita awards under these programs. We will build on that existing creativity and entrepreneurship. Every new direct job created in the life sciences brings with it two additional jobs in support services for

suppliers, vendors, and construction and we want to pay attention to that fact.

In addition, we will develop a tax incentive program for life science companies that directly rewards job creation in Massachusetts. My administration will compete for every single job available, every single one. Using our sales team, we will aggressively seek to recruit emerging ones.

And that job creation strategy is not complete without extensive workforce training. We will focus on training that meets the skills employers are asking for. I want to make sure that the Commonwealth partners with you, your employees and with higher education to make sure that we close the skills gap and spread opportunity to all regions of this great state.

This is the vision we have for the life sciences in Massachusetts. I thank all of you for coming here at a time of great opportunity, but also of great urgency for your industry and for society. In past years the work of our academic community, and groups like the Massachusetts Life Science Collaborative have helped move this industry to a place of world leadership. But sustaining that leadership requires a bold new approach. State government now has the opportunity to be an active partner in meeting that challenge. In Massachusetts, we intend to seize it.

I look forward to working with all of you.

ON HEELS OF LIFE SCIENCES INITIATIVE, GOVERNOR PATRICK ANNOUNCES ORGANOGENESIS TO EXPAND IN MASSACHUSETTS

World's first profitable regenerative medicine company to grow in Massachusetts due to state's newly unveiled life science initiative

CANTON - Thursday, May 31, 2007 - Governor Deval Patrick announced today, with the support of Senate President Therese Murray and alongside House Speaker Salvatore F. DiMasi, Organogenesis' CEO Geoff MacKay and dozens of Organogenesis employees that the Massachusetts-based company, which was once planning to expand its operations outside of the state, has decided instead to stay and grow in Massachusetts. Organogenesis, the world's first profitable regenerative medicine company, made the commitment to stay in the Commonwealth as a result of Governor Patrick's \$1 billion life science initiative, which was announced at this year's international BIO 2007 convention in Boston.

"I am pleased that Organogenesis has decided to stay and expand upon its success here in Massachusetts, and proud of our team for working so hard and so well to make this partnership work," said Governor Patrick.

"Regenerative medicine, which was both invented and pioneered in Massachusetts, is the most exciting and prominent frontier in healthcare. The success of this new field is directly dependent on positive governmental policies, and Governor Patrick has taken the necessary steps in this direction with an unprecedented commitment to both industry and academic institutions," said Organogenesis CEO Geoff MacKay.

"This is exactly the kind of positive and immediate response that we had hoped to see after we announced the Commonwealth's commitment to help expand this segment of our innovative economy," said Murray. "I am thrilled that Organogenesis will continue to headquarter here and provide new jobs."

"The decision by Organogenesis to keep their home in Massachusetts is yet another sign of good things to come for our thriving life science industry," said DiMasi. "Today's announcement shows the climate for doing business in Massachusetts is improving and that we must continue to do all we can to help companies keep jobs here, expand here and move here."

Canton-based Organogenesis is the world's leading regenerative medicine company and delivers living cell therapy "on demand" to medical clinics. Regenerative medicine is the process of creating living, functional cells and tissues, to repair or replace organ function lost due to disease, damage or even the natural aging process. Organogenesis' signature product, Apligraf®, is the first bio-engineered cell therapy to have received FDA approval, and is used by doctors successfully in treating patients in the US and other markets across the world. Currently a patient is treated with an Apligraf® living cell therapy

every 10 minutes in the United States. This constitutes over two-thirds of all living cell therapies applied to patients worldwide.

Organogenesis had been planning to expand its operations outside of Massachusetts, seeking a business climate that would be more favorable toward regenerative medicine. As a direct result of Governor Patrick's Life Sciences Initiative, however, Organogenesis has decided to maintain its headquarters in Massachusetts. The company also will initiate an aggressive expansion of its global head office, research, development and manufacturing facilities within the state. Organogenesis will add 300 new highly skilled jobs, thereby doubling its existing employee base and expanding its facilities to 250,000 square feet.

The Governor's plan, unveiled on May 8 during a speech at the BIO 2007 convention, includes a 10-year, \$1 billion investment package that will both enhance the Commonwealth's already nationally recognized assets in the fields of medicine and science, and fill gaps in federal funding to ensure the state's ability to support life science progress from the idea stage through the production and commercialization stages. Key to the Governor's Life Science Initiative is new legislation that will strengthen the Massachusetts Life Science Center and charge it with the execution of a life science mission focused on science and economic development, strategic investments at critical stages of the development cycle, and collaboration with the private sector to create innovation infrastructure critical to both researchers and companies.

"The reality is that the regenerative medicine field is highly competitive. Without government ensuring a positive business climate, the innovation, the jobs and ultimately life altering therapies like those involving stem cells, will move to other parts of the world," said MacKay. "The Governor's plan will solidify this state as the place where all this great science is translated into therapies benefiting patients."

The Massachusetts Office of Business Development worked closely with Organogenesis to create a \$12.9 million incentive package that includes grants as well as support for when the company identifies its expansion site. In addition, the state has facilitated \$5 million in low-interest loans for growth initiatives. The proposed Life Sciences Initiatives also levels the tax playing field for all regenerative medicine companies when compared to nearby states.

GOVERNOR PATRICK FILES PLAN TO MAKE MASSACHUSETTS A GLOBAL LEADER IN LIFE SCIENCES

Package includes capital and investment funds, tax incentives, expansion of Massachusetts Life Sciences Center

BOSTON - Thursday, July 19, 2007 - Joined by legislative leaders at a special Joint Session of the Legislature, Governor Deval Patrick today filed legislation providing for a major investment in and expansion of the Life Sciences industry in Massachusetts. The legislation is a comprehensive plan to make Massachusetts the global leader in the life sciences industry.

"We want Massachusetts to provide the global platform for bringing innovation from the drawing board to the market, from inspiration to commercialization, and from ideas to cure," Governor Patrick said. "We look forward to working with the Legislature on speedy passage and to bringing to life our vision for expanding the Commonwealth's global leadership in the life sciences."

The plan is a significant milestone in moving forward on the administration's 10-year, \$1 billion investment package that will both enhance the Commonwealth's already nationally recognized assets in the fields of medicine and science, and fill gaps in federal funding to strengthen the state's capacity to support life science progress from the idea stage through the production and commercialization stages.

"I have always been in support of a Life Sciences initiative that would keep Massachusetts competitive with the rest of the country, and I look forward to examining the details of the Administration's proposal as we move forward," said Senate President Therese Murray.

"This is an ambitious plan put forward by Governor Patrick and we certainly embrace the concepts," said House Speaker Salvatore F. DiMasi. "The Commonwealth must continue to be a partner with the life sciences industry and make sure we provide whatever assistance we can to ensure the industry's future growth here. As with any proposal of this magnitude, we must always keep costs and affordability in mind."

The legislation, which was outlined during a speech at the BIO 2007 convention in May, includes \$500 million in capital funds that will allow for the creation and construction of the Massachusetts Stem Cell Bank and an RNAi center that will highlight and build on the work of Nobel Laureate Craig Mello, Ph.D of the University of Massachusetts Medical School. The Bank will be the world's largest repository of new stem cell lines available to all sectors, both public and private, of the life sciences sector.

The bill also includes \$15 million for the Massachusetts Life Sciences Investment Fund to finance basic research, small business innovation grants, life science fellowships and workforce training. The fund will be overseen by a strengthened Life Sciences Center Board, which, under the legislation, would be expanded to include two new members and would be chaired by the Secretary of Housing and Economic

Development. Under Governor Patrick's legislation, the center would have the authority to build capital projects, award grants, and expend funds consistent with the plan outlined by the Governor. The board will be required to establish a formal process to determine how capital projects are spent.

The legislation also establishes a 10-person Advisory Committee to the Life Sciences Center Board from members of the Massachusetts Life Sciences Collaborative.

To encourage job creation and growth in the field, the legislation also creates tax incentives for certified life science sector projects. Among the credits are a redeemable 10 percent 10-year carry-forward Life Sciences Investment Incentive Tax Credit and a provision that allows projects to receive an additional 2 percent tax credit if they locate in Economic Opportunity Areas. The legislation includes a clawback provision to ensure that companies meet their job creation goals. The bill also creates a sales tax pass through for bricks and mortar purchases associated with the development of life sciences projects and creates a 100 percent refundable FDA User Fee Credit.

The bill imposes a yearly project evaluation and provides for decertification in the event that a company fails to achieve the projected return on investment mandated as part of the project certification.

"This is the future of life sciences here in Massachusetts," said Governor Patrick. "We have the talent, we have the entrepreneurial spirit. Now let's execute the vision."

10.30.07 - Governor Gives Testimony on Behalf of Life Sciences Bill

Governor Deval L. Patrick

Testimony Before Joint Committee on Economic Development and Emerging Technologies on Behalf of Life Sciences Legislation

October 30, 2007

As Delivered

Chairman Bosley, Chairman Hart, Members of the Committee.

Thank you for your attention to this bill and for today's public hearing.

I am here today to testify in strong support of H4234, An Act Providing for the Investment in and Expansion of the Life Sciences Industry in the Commonwealth. As you know, this bill is a collaborative effort among leaders from all aspects of the Massachusetts Life Sciences sector (many of whom are here today), working together with Senate President, the Speaker of the House and members of my administration. I want to thank everyone for that collaboration and acknowledge the unusually broad base of support for the measures proposed.

As you know, Massachusetts is world-renowned as a Life Sciences Supercluster. We have an unrivaled concentration of biopharmaceutical, biotechnology, and medical device expertise, of academic medical centers, hospitals, research institutions, and patient advocate group; and of venture capital. Our Life Sciences sector has led the world in creating life-saving medicines and therapies and innovative stem cell research that will save lives, ease suffering and reduce long-term health care costs. Our preeminence in early-stage research attracts world class talent.

The sector is an important feature of our economy as well. Growth has outpaced other industries and has provided a broad range of job opportunities at all income and skill levels. According to a study conducted by the Milken Institute, every direct job in life sciences (scientists, technicians, lab assistants, bio-manufacturing engineers) creates 3.6 indirect jobs (suppliers, vendors, support services, utilities, construction, real estate, transportation, among others). The Life Sciences is a powerful economic engine for this Commonwealth.

But regional, national and global competition is fierce. At the BIO 2007 convention in Boston, dozens of competitor states and nations aggressively targeted our talent and companies. As we gather here today, our competitors are actively luring our state's best and brightest researchers, doctors and entrepreneurs.

California and New Jersey are investing hundreds of millions in the Life Sciences, North Carolina is providing lucrative tax benefits to lure our companies, and Florida has invested hundreds of millions so that Life Sciences can expand in their state. China and Ireland - two nations with a proven record of well-coordinated competitive strategies -- have joined the global sweepstakes for talent as well. For Massachusetts -- a state dependent on intellectual capital and research -- the threat is real and the stakes are high.

In addition to the direct threats from competitor states and nations, we also face the threat of flat NIH research funding - a critical source of research funding that has declined, especially for stem cell research.

In addition, the Bush Administration's prohibition on the use of federal funds for embryonic stem cell research combined with the Romney Administration's restrictions on stem cell research have made us vulnerable to efforts by other states and foreign countries to lure Massachusetts researchers and companies with offers of new funds, new facilities, and robust research incentives free of political restrictions.

All of these are ways in which the world is changing. If we do nothing, we lose.

Recognizing these challenges, and unwilling to accept defeat, the Senate President, the Speaker and I announced the bill before you at the BIO 2007 International Convention in May. You will hear from the experts who follow me details about each element of the bill. But in brief summary, the bill contains measure to: 1) develop stronger public/private partnerships around funding and investment strategies to create new jobs, spur innovative research, strengthen investments in higher education and workforce training, 2) make targeted investments at stages of the development and commercialization cycle, particularly those where venture capital has not been available, that result in robust job creation, and 3) create Regional Innovation Centers that attract researchers and companies and grow cures and jobs.

Today, you will hear from many industry leaders, researchers, and medical experts, as well as those affected by curable diseases, about the many benefits we will derive from the implementation of the Massachusetts Life Sciences Initiative. These benefits include the creation of life saving medical therapies and cures, attraction and retention of world-class researchers and life science companies, as well as new employment opportunities for people at all wage levels.

In terms of job creation, estimates by nationally known and respected economic forecasting firms attest to the potential for up to 250,000 new direct and indirect jobs as a result of the programmatic elements of the plan.

As far as research talent is concerned, passage of the bill will help us attract and retain world-class talent,

such as Nobel Laureate Dr. Craig Mello, whose cutting edge research in RNAi is supported by our bill, or MacArthur prize winner Dr. Kevin Eggan, director of the Harvard Stem Cell Institute, whose stem cell work is also supported by and leveraged through this bill. Both are here today to offer testimony as well.

You fully appreciate that we cannot rest on our laurels and we have not done so. Just last week - and thanks in large part to your efforts - the Life Science Center approved a grant-making process that will make available \$12 million toward stem cell research and other Life Science initiatives. In addition, it approved the first phase of the development of a stem cell bank and registry at the University of Massachusetts Medical School.

As you know, Bristol-Myers Squibb has chosen to open a major operation at Devens, and Genzyme has many facilities in Massachusetts, including a manufacturing facility in Cambridge and operations in Westborough. Avant Immunotherapeutics has located a facility in Fall River on the South Coast. Other companies have agreed to stay here because of our demonstrated commitment to cultivate and support this industry, and to join the global competition for investment and talent.

But not everyone is convinced that we mean it. One large company - Project Magellan - was prepared to invest hundreds of millions of dollars in over 700,000 square feet of lab and office space creating over 400 new, well-paying jobs. But our inaction on this proposal over many months caused them to abandon those plans here and focus instead on other states.

For the sake of our economy, for the sake of healing, for the sake of our future - and because you hate to lose as much as I do - I urge the Committee to take swift and favorable action on this bill. Thank you for your consideration.

COMMONWEALTH'S TRADE MISSION TRIP TO CHINA TO FOCUS ON ECONOMIC DEVELOPMENT IN LIFE SCIENCES AND CLEAN ENERGY

COMMONWEALTH'S TRADE MISSION TRIP TO CHINA TO FOCUS ON ECONOMIC DEVELOPMENT IN LIFE SCIENCES AND CLEAN ENERGY

BOSTON-Wednesday, November 28, 2007-The Patrick Administration today announced details for the Commonwealth's trade mission to China. Governor Deval Patrick will travel with a team of business executives, academic leaders and senior government officials next week to continue his work building trust and credibility in the growing relationship between Massachusetts and China.

The visit will include a number of meetings with Chinese government officials and business leaders to strengthen innovation and collaboration around clean energy, life sciences, education and transportation. The delegation will visit Beijing and Shanghai for the 7-day trade mission, departing Boston on Friday, Nov. 30 and arriving in China on Dec. 1, and departing China on Dec. 7 to Boston.

"Massachusetts is already a national leader in alternative energy technology and the life sciences, and in providing high-quality education at every level. But we can't compete by looking inward. To move Massachusetts forward, we have to look outward to new markets," said Governor Patrick.

This visit will be the first in a series of steps Governor Patrick takes to strengthen the Massachusetts-China relationship. The agenda will include meetings in Beijing and Shanghai with representatives from Chinese companies and universities focused on China's academic, research and development and commercial achievements.

Members of the delegation include: Secretary Dan O'Connell, Housing and Economic Development; Secretary Bernard Cohen, Transportation; Greg Watson, Senior Advisor for Clean Energy Technology; Thomas J. Kinton, Jr., CEO, Massachusetts Port Authority; Mitchell Adams, Executive Director, Massachusetts Technology Collaborative; Jack Wilson, President, University of Massachusetts; Dr. Craig Mello, Professor, University of Massachusetts Medical School, 2006 Nobel Laureate; Dr. Victor Zue, Co-Director, Computer Science and Artificial Intelligence Laboratory, Massachusetts Institute of Technology; Anthony Saich, Faculty Chair of Asia Programs, Harvard University; Josh Boger, Chair, Biotechnology Industry Organization and CEO, Vertex Pharmaceuticals; and Thomas J. Sommer, President, Massachusetts Medical Device Industry Council. Representatives from Massachusetts life science and clean energy companies - many with a presence in China - will also participate in portions of the trip (list attached).

As key partners in the Commonwealth's mission agenda and the Administration's overall economic development agenda, Massport and the Massachusetts Technology Collaborative will fund the trip. The estimated cost of the trip is roughly \$200,000.

"China is the largest market in the world and the country is experiencing unprecedented economic growth and dramatic changes," said Dan O'Connell, Secretary of Housing and Economic Development. "Their spirit of entrepreneurship and innovation combined with continuously developing partnerships with the Commonwealth's many academic institutions and companies lay the foundation for long term business collaboration that will have a positive and lasting effect on Massachusetts."

China is a growing source of economic activity, and the Chinese government has called for prioritization of science and technology. Massachusetts generated \$1.3 billion in manufactured goods exports to China in 2006. China wants to shift its image as a country focused on low-wage manufacturing to one of sophisticated research, development and innovation. This dynamic will shape China's relationship to Massachusetts on this trade mission and in its continued relationship with the Commonwealth.

Life Sciences in China

China's life sciences sector has many possibilities for our companies and institutions. Already, a broad range of the Commonwealth's medical centers, research institutes and life sciences companies are developing a presence in China. By traveling to China and expressing a sincere interest in cross-national development, the Commonwealth can deepen its involvement there.

China is a key location for market growth in the life sciences sector, for both consumer market expansion and as a location for research and development. The landscape for life sciences products has changed rapidly in the last several years, with the Chinese government's involvement increasing in effectiveness and sophistication.

"I look forward to working with the Governor and other business and academic leaders as we embark on this important mission. Massachusetts companies have an opportunity ahead to broaden their business activities in China and to bring their innovations into a new market," said Joshua Boger, Ph.D., President and CEO of Vertex Pharmaceuticals of Cambridge, and Chairman of the Biotechnology Industry Organization. "In the coming years, China's presence in the global life sciences community is expected to grow significantly as it both strengthens and expands its own capabilities and also works to establish relationships with U.S.-based firms."

Current economic growth projections for China generally far exceed most other industrialized countries. This market expansion is both general and specific to life sciences industries (all dollar figures in USD):

- 44% GDP Growth projection between 2004 and 2010.
- Total health care growth projection to move from \$34 billion in total health care spending in 2000 to \$150 billion in 2010, a compound annual growth rate (CAGR) of 16%.
- Projections in the pharmaceutical industry show growth from \$18 billion to \$70 billion in 2010, accounting for a 17% CAGR.

- In the medical devices market, a growth of \$3.2 billion to \$14.8 billion is projected between 2000 and 2010, a CAGR of 19%.
- Projections also estimate that China will be the 5th largest pharmaceutical market by 2010 and the 3rd largest market for medical devices by 2010.

Clean Energy in China

China's clean energy development has grown rapidly in recent years - a trend that is expected to continue as the country strives to generate 20 percent of its energy from renewable sources by 2020. There will be a unique window of opportunity in the coming years for clean energy technologies developed in Massachusetts to be in China.

Massachusetts' highly skilled workforce, leading universities, venture capital community and entrepreneurial environment make the Commonwealth an attractive site for Chinese investors to look for opportunities around clean energy.

"The Governor's trade mission will highlight how Massachusetts' innovative clean energy companies can help China meet two of its greatest challenges - cleaner energy sources and cleaner, more efficient industrial production," said Annie Johnson, Executive Director of the New England Clean Energy Council. "We will build partnerships that will assist these companies to gain a foothold and expand in China's enormous, fast growing energy market. Access to such vast, new markets is vital - both for these companies to attain their growth potential and to enhance Massachusetts' position as a global leader in energy innovation."

Massachusetts' clean energy cluster of more than 550 companies represents a healthy, growing ecosystem of small and medium-sized companies that present myriad opportunities for joint ventures, partnerships, technology licenses and co-investment to exploit market opportunities both in China and the US.

Massachusetts China Partnership Official Delegation

Members of the Official Government Delegation:

- Governor Deval L. Patrick, Commonwealth of Massachusetts
- Secretary Daniel O'Connell, Housing and Economic Development
- Secretary Bernard Cohen, Transportation and Public Works
- Gregory Clarke Watson, Senior Advisor for Clean Energy Technology
- Tom Kinton, Jr., Chief Executive Officer, Massachusetts Port Authority
- Mitch Adams, Executive Director, Massachusetts Technology Collaborative
- Jack Wilson, President, University of Massachusetts

- Dr. Craig Mello, Professor, University of Massachusetts Medical School, 2006 Nobel Laureate

Members of the Official Non Government Delegation:

- Dr. Victor Zue, Co-Director, Computer Science and Artificial Intelligence Laboratory, Massachusetts Institute of Technology
- Anthony Saich, Faculty Chair of Asia Programs, Harvard University
- Joshua Boger, Chair, Biotechnology Industry Organization and Chief Executive Officer, Vertex Pharmaceuticals
- Tom Sommer, President, Massachusetts Medical Device Industry Council

Massachusetts China Partnership COMPANY Representatives

Representatives from Massachusetts companies who do business in China will participate in portions of the trade mission. Some of these representatives are already based in China.

Massachusetts Life Science Industry Representatives:

- Gunther Winkler, Vice President of Strategic Initiatives, Biogen Idec
- Marc D. Beer, President and Chief Executive Officer, ViaCell, Inc.
- Thomas Taylor, Vice President Global Marketing & Business Development, Healthcare, Nypro
- Jerry Chung, Vice President, Nypro Beijing
- Geoffrey MacKay, President and Chief Executive Officer, Organogenesis
- James Qun Xue, Director of Genzyme China
- Michael Glynn, Senior Vice President, Genzyme Asia Pacifica, Canada and South Africa
- Jeffrey J. Elton, Senior Vice President of Strategy and Global Chief Operating Officer, Novartis Institutes for BioMedical Research
- En Li, Vice President and Head of Research, Novartis Institutes for BioMedical Research Shanghai

Massachusetts Clean Energy Industry Representatives:

- Bruce N. Anderson, Chief Executive Officer, Wilson Turbopower
- Mitchell Tyson, Chief Executive Officer, Advanced Electron Beams

- Leo Casey, Vice President and Chief Technology Officer, Satcon Corporation
- Elbert Leo McDaniel III, Vice President of Sales and Marketing, Satcon Power Systems
- Dennis John Duffy, Vice President of Government and Regulatory Affairs, Energy Management Incorporated / Cape Wind
- Hal M. Thrasher, Director of New Business Ventures, Rohm & Haas Electronic Materials
- Robert J. Ferguson, Vice President, Business Unit Director, Circuit Board Technologies, Rohm & Haas Electronic Materials

GOVERNOR PATRICK AND EMD SERONO ANNOUNCE \$50 MILLION BILLERICA EXPANSION

New Center of Excellence in Life Sciences Research Will Create 100 New Jobs

BOSTON - Wednesday, April 16, 2008 - Governor Deval Patrick today announced life sciences company EMD Serono, Inc., and Merck Serono - both affiliates of Merck KGaA of Germany - will invest \$50 million to expand its Billerica facility, creating at least 100 new jobs.

The announcement comes a week after the Governor delivered a major speech outlining his economic plan to create a culture of opportunity focused on restrained spending and long- and short-term investments, while preparing for the impacts of a softening national economy.

"I am delighted that EMD Serono has decided to expand in Billerica. The region's tremendous talent and resources will now be at Serono's disposal in their work to improve the quality of life for people living with serious diseases," said Governor Patrick. "Today's announcement exemplifies the value of the Life Sciences Initiative in encouraging economic development and job growth throughout Massachusetts."

"This announcement reflects Merck KGaA's strong commitment to expand EMD Serono and anchor our US operations in Massachusetts," said Elmar Schnee, President of Merck Serono. "We recognize the significant value of augmenting our research capabilities in Boston - a region with tremendous life-sciences influence not only across the US, but globally as well."

EMD Serono is a leader in the United States biopharmaceutical arena, which focuses on fertility treatments and neurodegenerative diseases and integrates cutting-edge science with patient support systems. The \$50 million investment will support the construction of a Center of Excellence in discovery, which will accommodate approximately 200 scientists specializing in cancer and fertility research, and approximately 50 technical operations employee specializing in process development and protein production.

The new site's proximity to the company's Billerica protein production facility, which manufactures products for early stage clinical testing, will allow for collaborative interactions and support the rapid transition from research to manufacturing.

Construction on the new Billerica site will take approximately two years, beginning early next year. The total square footage of the Billerica Campus will be approximately 210,000 square feet, including more than 160,000 square feet of lab space. The expansion in Billerica will also create additional commercial space opportunities in Rockland, as the company strengthens its leadership position in its current therapeutic areas of neurodegenerative diseases and endocrinology, and builds the necessary infrastructure to support an increase in U.S. clinical trials and commercial growth.

"I would like to thank Governor Patrick for his unwavering commitment to strengthening Massachusetts' reputation as a global leader in science and medicine," said Fereydoun Firouz, CEO and President of EMD Serono, Inc. "The partnership and commitment of Governor Patrick, Senate President Murray, and Speaker of the House DiMasi to make the Life Sciences Initiative a reality will help ensure that Massachusetts' existing life sciences companies stay and thrive in the state, and that new life sciences companies come to Massachusetts to further enhance our position at the forefront of healthcare."

Today's announcement comes on the heels of the release of encouraging information about the professional, scientific and business services sectors as a whole. The Executive Office of Labor and Workforce Development reported earlier today that monthly survey estimates show that 2,900 new jobs were added in Massachusetts in March, the largest monthly increase since November of last year and the sixth consecutive monthly increase in jobs. Of the 2,900 jobs, 1,000 came from the professional, scientific and business services.

04.16.08 - Life Sciences Expansion in Billerica

Governor Deval L. Patrick

EMD Serono Expansion Remarks

April 16, 2008

As Delivered

From 25 years here in the Commonwealth we know just how exciting the efforts and the promise of EMD Serono will be both in terms of advancing healing and growing our economy. With this further investment of \$50 million you add another 100 jobs in Massachusetts and another 100 opportunities for Massachusetts people to apply their talent and build better futures for themselves, their families, and for all of us.

So on behalf of my colleagues in government and all of the people in Massachusetts thank you for choosing the Commonwealth and maybe you do not hear that often enough. Let me tell you, thank you for choosing us.

There was a great team who were a part of making this work for you and I want to acknowledge them and thank them because they do it over and over and over again for companies all across the commonwealth. We want you to know at EMD Serono and all of those in the industry that you are welcome here in Massachusetts.

I am proud to say that today's announcement is the third in two weeks about a life sciences company that has chosen to grow business and locate jobs here. It is happening all across the Commonwealth.

Indeed, we are not anymore 49th in the nation, Fereydoun, for job creation. We moved last year to 15th in the nation. This morning we published job numbers showing that in the face of weakening national economic statistics, Massachusetts added upwards of 3,000 new jobs in February and March alone. We are on the move.

Our Life Sciences Initiative, that \$1 billion, 10 year investment to accelerate our world leadership in this sector as contributed to that good news which Fereydoun said. The world knows that as a Commonwealth we are serious about you, about this industry, about its possibilities for healing and for its opportunity for economic expansion.

The Life Sciences initiative has indeed passed out of both the House and the Senate. It is a better bill now that it was when it went in. It has been improved by the collaboration of the members of the house and the senate and the industry and EMD Serono has been a part of that and I want to thank you all.

Senator Marzilli, Rep Green, Rep Atkins, who is here, and all of the members who have contributed to making this bill as strong as it is. I look forward to signing it very soon indeed.

We will continue because this is an industry that has great promise for all of us on a host of levels. We want you to know whether you are here in the presence of those of us making these announcements, or within our sounds of our voice and images in Rockland and elsewhere, that you are welcome here. We value you. We look forward to continuing this partnership and we wish you every success. Thank you for having us here.

Governor Patrick Signs Groundbreaking Life Sciences Legislation

Governor, Senate President, Speaker Head to BIO International Convention with Cutting-Edge Life Sciences Law in Hand

BOSTON- Monday June 16, 2008 - Governor Deval Patrick, joined by Senate President Therese Murray and Speaker of the House Salvatore F. DiMasi, signed pioneering legislation today at the Joslin Diabetes Center that will secure Massachusetts' position as a global leader in life sciences, unveiling for the first time the comprehensive, innovative Massachusetts Life Sciences Law.

"With this initiative we take our rightful place as a global leader in the life sciences," said Governor Patrick. "There is no place in the world with as great a concentration of life sciences talent, resources and vision as Massachusetts. With these resources - and the collaboration and support of the industry, academia, business and government - we are on our way to helping find new cures for diseases, creating new jobs, and positioning ourselves for long-term economic growth."

The 10-year \$1 billion investment package is the result of a year-long collaboration between the Governor, the Legislature, academia, life sciences industry leaders and patient advocacy groups.

"Here in Massachusetts we have all the components to support a strong life sciences industry," President Murray said. "With our world-class medical centers and universities, and an educated workforce, the addition of this life sciences package makes Massachusetts the ideal choice for researchers and biotech companies to grow and conduct groundbreaking and potentially lifesaving work that will push treatment and medical discoveries to a whole new level."

"Today, we take a bold step to again solidify our position as the world leader in life sciences and biotechnology and our already-thriving life sciences cluster is now the envy of the world," said Speaker DiMasi. "But more importantly, we are together investing in the cures of tomorrow so we can eradicate diseases that ravage our nearest and dearest, from cancer to Alzheimer's. I am pleased with the great law we have today and the partnership with Governor Patrick, Senate President Murray and all the legislators that brought it to fruition."

The new law will enhance the state's already nationally recognized strengths in the fields of medicine and science and fill gaps in federal funding to ensure the state's ability to support life sciences innovations from idea to product. By bringing together businesses, research hospitals, and public and private colleges and universities, the law will lead to new jobs and the discovery of novel therapies that will change the way people live in the Commonwealth and throughout the world.

"We're honored to host Governor Patrick and other legislative leaders for the signing of the historic Life Sciences Bill," said Ranch C. Kimball, President and CEO of Joslin Diabetes Center. "As the world's largest diabetes research and clinical care organization, the global diabetes community counts on us for

breakthroughs. We support Massachusetts' commitment to life sciences leadership, which is so vital to our efforts to improve the lives of people with diabetes and provide the greatest hope for a cure."

Aimed at capturing the best life sciences talent worldwide, the package includes:

- **\$500m in Capital Funding to be spent over a 10 year period;** \$299.5m for targeted infrastructure projects and the balance - \$200m in unrestricted funds for investment in public infrastructure projects, at the discretion of the MA Life Sciences Center (MLSC).
- **\$25m each year for 10 years for the MA Life Sciences Investment Fund,** held at the MLSC, for loans, grants, fellowships, and investments to stimulate increased research and development in the life sciences sector.
- **\$25m each year for 10 years in tax incentives to be awarded to certified life sciences projects.**

The law also:

- **Creates the MLSC Life Sciences Investment Program** to expand employment in the life sciences sector in MA and to promote health-related innovations by supporting research and development, manufacturing and commercialization in life sciences.
- **Creates 5 Regional Technology and Innovation Centers** to be identified from among existing life science regional centers.
- **Adds an 18 member advisory board** to be appointed by the Governor, including 10 members of the Massachusetts Life Sciences Collaborative, 5 chancellors of the UMass system, and 3 patient advocates. The Secretary of Labor & Workforce Development and 5 directors of Regional Technology Innovation Centers shall all be non-voting members.
- **Creates four additional funds to be administered by the MLSC:**
 - Dr. Craig C. Mello Small Business Equity Investment Fund;
 - Judah Folkman Higher Education Grant Fund for grants to graduate school students;
 - MA Small Business Matching Grant Fund; and the
 - MA Life Sciences Education Fund for vocational and technical school equipment purchases.

"The Life Science Initiative creates a climate which will attract and retain successful biotech companies to commit expansion plans within Massachusetts," Geoff MacKay, President and CEO of Organogenesis.

"Organogenesis is implementing a major expansion to 250,000 square feet and 600 high tech jobs, and the Governor's Life Science Initiative is the driving factor guiding our selection of Massachusetts over competing options. The Life Science Initiative has given Organogenesis Inc. the business confidence to grow in Massachusetts and expand our R&D labs, manufacturing facility and global head office."

"The Juvenile Diabetes Research Foundation is very pleased that the Life Science Initiative has been passed," said Heidi Daniels, Executive Director of the Juvenile Diabetes Research Fund-New England. "This significant investment in research will help Massachusetts continue to be a leader in the research world, help Massachusetts retain the brightest minds in science to focus on solving problems, and most importantly, help all its residents move closer to cures for chronic diseases, such as type 1 diabetes, that affect so many of our loved ones."

The new law also strengthens the Massachusetts Life Sciences Center, which has been charged with executing much of the life sciences initiative by focusing its attention on science and economic development, strategic investments, and collaboration with the private sector to create innovation infrastructure critical to both researchers and companies. The Center, which has just named its new CEO and President, Susan Windham-Bannister, Ph.D., will use its scientific and financial expertise to allocate the \$25 million per year dedicated to the MLSC Fund. It will also be empowered to direct approximately \$200 million of the \$500 million in capital funds.

"This is an exciting moment for our life sciences supercluster, and I am committed to doing all I can to advance the Governor's vision for the Mass Life Sciences Center," said Dr. Windham-Bannister. "This law will open the door for tremendous scientific, research, academic, and business opportunities here in the Commonwealth, and I am thrilled to be able to lead the Center as we begin this new chapter."

"This bill will do a great deal to increase the infrastructure for life sciences research and development in the Commonwealth," said Harvey F. Lodish, a member of the Whitehead Institute for Biomedical Research and Chair of the Massachusetts Life Sciences Center Scientific Advisory Board. "Our Scientific Advisory Board will do its best to insure that these moneys are spent on the projects, people, and facilities that have the greatest promise for developing new treatments and medical devices to address the conditions and diseases that affect us all."

"This ambitious legislation will accelerate innovation in the Commonwealth's life sciences cluster and allow Massachusetts researchers and companies to solidify our state's national and international leadership in the growing biomedical and life sciences industry. This bill is a game-changer for the Commonwealth—it will create new breakthroughs, new jobs and new companies today and will help the University of Massachusetts and other academic institutions break new ground and train the life sciences workforce of tomorrow," said Jack M. Wilson, President of the University of Massachusetts.

"The University of Massachusetts is excited to play such an important role in implementing this landmark life sciences legislation. The Governor, the House and the Senate have placed a great deal of trust in our research prowess and technology transfer abilities and every UMass campus will now be positioned to deliver," said Robert J. Manning, Chairman of the UMass Board of Trustees.

The signing comes just before Governor Patrick, key legislators and industry leaders head to San Diego for an international biotechnology convention. It was during the same convention held in Boston in May 2007 that Governor Patrick first took the stage with Senate President Murray and Speaker DiMasi to announce the \$1 billion Life Sciences Initiative.

06.16.08 - Life Science Bill Signing

Governor Patrick:

I can tell you that the Lieutenant Governor and I are very, very proud to be with all of you today to sign the Life Sciences Initiative into law. About a year ago, many of us here stood together to announce this 10-year, one billion dollar strategy to strengthen our position and extend our leadership in the world in this field, and here we are to make that commitment real.

Tomorrow, when the Life Sciences community gathers from around the world at the BIO Conference in California, Massachusetts will have a new and broader set of tools to help us compete. Massachusetts will have the largest registry of stem cell lines in the world, housed at the University of Massachusetts Medical Center in Worcester. Massachusetts will have a half-billion dollars in capital funding to offer entrepreneurs, for infrastructure investment and economic growth. Massachusetts will have 250 million dollars to offer researchers for fellowships, matching grants and loans to attract and retain rising stars in this field. Massachusetts will have incentives to offer companies to locate and expand here and five regional tech/innovation centers to extend these opportunities to every region of the Commonwealth.

And Massachusetts will have Dr. Harvey Lodish and his advisory board of distinguished scientists, educational and business leaders and the leadership of Dr. Susan Windham-Bannister to assure the Life Sciences funding decisions are based on sound science and not politics.

The people of Massachusetts have something too. They have the thousands of good jobs and good wages, from researchers to lab technicians to manufacturing workers, and the training opportunities to prepare for that world.

So, I want to thank the entire legislature for the overwhelming support you've given to this initiative. I'm grateful indeed. And I want to say a special thank you to Speaker DiMasi, my pal, to the Senate President who can-could not be here but is very much here in spirit today and to her predecessor Bob Travaligni, who has been a partner in this from the beginning and has stayed focused even after leaving office-I'm very glad to see you here today Bob. I want to acknowledge and thank Chairman Jack Hart, Chairman Dan Bosley, Chairman Mike Rodrigues, the House and Senate conferees, and people who don't often get thanked but their respective staffs, who we worked nearly to death to get this right. I appreciate very much all of you.

And I want to thank the members of the administration who toiled so hard and so well and with such dedication to get these results, including Secretary Dan O'Connell, Stan McGee, Maureen Flynn of his staff and David Simas, and most especially David Morales from my staff who's here, thank you.

[applause] Very, very proud of all of you.

Sometimes in this, in this business of ours people keep score in purely political terms. And there is no denying of the fact that signing this bill today makes clear, a clear and important political point that the legislature and the administration can work together on big and complex initiatives when we set our mind to it, but there are other measures, beyond political ones, arguably more lasting ones.

Over a century ago when Dr. Elliott P. Joslin founded this Center where we gather today, the life expectancy of patients diagnosed with diabetes was two years. Today, in thanks to large part to the work done here, people with type 1 and type 2 diabetes can live rich, full and long lives. Tomorrow there may be a cure for diabetes and that cure may well come right here in Massachusetts. That is an enormously important thing. [applause]

The point is that this initiative is about so much more than putting researchers and resources together; it's about Massachusetts advancing human healing. Yes, there will be many thousands of jobs for scientists and manufacturing workers, for researchers to lab technicians alike and we look forward to those. But there will also be the chance to apply the creativity and ingenuity of the people of Massachusetts, to relieving suffering and giving comfort and hope to millions of people around the world.

So I am proud and excited to sign this legislation, and of the means it offers through this bill, in this field today. But I am even more excited about what miracles may come tomorrow. I am delighted you could all be a part of this today. Thank you very much.

Governor Patrick Receives "Governor of the Year" Award from International Biotechnology Industry Organization

SAN DIEGO, CALIF. -Tuesday, June 17, 2008 - One day after signing his 10-year, \$1 billion Life Sciences Initiative, Governor Deval Patrick today received the Biotechnology Industry Organization's (BIO) Governor of the Year Award in recognition of his leadership and support of the biosciences industry.

"I am honored to receive this award from BIO, and I share it proudly with the many people who helped us move the Life Sciences Initiative forward," said Governor Patrick. "Since our announcement of the Massachusetts Life Sciences Initiative at BIO 2007, it has been one of the most important priorities of my administration. It is wonderful to know that the international community recognizes that we in Massachusetts are doing things differently, doing them well, and making a real difference in the life sciences cluster and in real people's lives."

The award was presented to the Governor by Joshua Boger, PhD., Chairman of BIO's Board of Directors and President & CEO of Cambridge-based Vertex Pharmaceuticals Incorporated during a keynote luncheon before 3,000 people at the BIO 2008 International Convention.

"The Governor has demonstrated unflinching dedication to our state's tradition as a welcoming home to research institutions and companies dedicated to combating the diseases that plague mankind," said Boger. "The signing of the Massachusetts Life Sciences Initiative is yet another example of the comprehensive approach Governor Patrick and his staff take to ensure the long-term success of life sciences in Massachusetts."

"We are pleased to see that Governor Patrick has been awarded with this well-deserved recognition, and to watch his efforts coming to fruition," said Geoff McKay, CEO of regenerative medicine leader Organogenesis, Inc. "Governor Patrick has been instrumental, along with state House and Senate leadership, in directing the efforts to pass the new life sciences bill. Organogenesis is a spin-off of technology developed at MIT, and our living cell therapies have helped to treat hundreds of thousands of patients around the world. We have spent an incredible amount of time, energy and funds to pioneer the regenerative medicine industry, including the industry's first-ever FDA approvals. We had outgrown our existing facilities, and were ready to make a commitment to a major expansion. Governor Patrick was a major catalyst for Organogenesis' decision to remain and expand in Massachusetts, and he in fact helped reverse our decision to leave the state. The life sciences bill solidified the state of Massachusetts as the best place in the world to translate potentially life-saving research into viable, successful businesses."

Following the presentation of the award, Governor Patrick participated in a panel discussion with former Governor Jeb Bush of Florida, where the two spoke about the role of government in facilitating and fostering innovation and growth in the life sciences and biotechnology field. The panel was moderated by FOX Network's Neil Cavuto, host of Your World With Neil Cavuto.

During the panel discussion, Governor Patrick spoke about the need for a collaborative approach to investing in and attracting life sciences talent. Asked what the next President should do to advance life sciences, Governor Patrick spoke about the need to recognize the need to keep politics out of science and make investments for the long term.

GOVERNOR PATRICK HIGHLIGHTS JOB CREATION, RESEARCH AND DEVELOPMENT EXPANSION AT CUBIST PHARMACEUTICALS

Two new floors of lab space to be completed by early 2012



(Photo credit: Matt Bennett/Governor's Office). [View additional photos.](#)

LEXINGTON - Wednesday, September 8, 2010 - Governor Deval Patrick and Massachusetts Life Sciences Center President & CEO Susan Windham-Bannister today joined company employees and local officials at Cubist Pharmaceuticals, Inc. in Lexington to highlight the company's expansion in Massachusetts. The Governor participated in the company's "Raising the Roof" ceremony, marking the beginning of a construction project that will add an additional 104,000 square feet of lab and associated administrative space to Cubist's existing lab facility by early 2012.

The Life Sciences Center, charged with implementing the State's ten-year, \$1 billion Life Sciences Initiative proposed by Governor Patrick in 2007 and signed into law in June of 2008, awarded a tax incentive of \$1.7 million to Cubist last year to facilitate their expansion plans in Lexington. As part of the tax incentive agreement Cubist has committed to creating 58 new jobs this year.

"The Massachusetts economy is an innovation economy, and Cubist is one of the best examples of how that innovation translates into jobs and scientific advancement," said Governor Patrick. "This is just the sort of growth that we envisioned when we proposed the Life Sciences Initiative back in 2007 and I am confident there will be many more announcements like this to come."

"We are excited to support Cubist's ongoing expansion through the Life Sciences Center's Tax Incentive Program," said Windham-Bannister. "Cubist is a great example of a growing life sciences company - they are expanding their facilities, adding dozens of jobs, and keeping their pipeline of innovative new drugs and therapies strong."

"As a growing biopharmaceutical company, focused on developing and commercializing therapies administered in the acute care setting, we are driven by a desire to discover new medicines that will save lives," said Cubist President and CEO Mike Bonney. "We believe that the 21st century will be marked by enormous advances in all facets of the life sciences industry that will result in groundbreaking and lifesaving achievements in medical science, and will lead to brand new medical discoveries and therapies - that is our hope for additional lab space we are building here."

This expansion will position Cubist for continued success and further enhance its groundbreaking work in developing treatments for unmet medical needs in the acute care setting. The vertical expansion of the North Building will create two additional floors above the current floor for Research and Development, Technical Operations and related support functions. Once completed, the new space will accommodate both current and anticipated future needs of both groups. Specifically, new labs will be created for Medicinal Chemistry, Crystallography, High-Throughput Purification, Down-Stream Processing & Formulation, Toxicology and Discovery Biology. Other areas will include a new molecular modeling room, a suite of conference rooms and executive offices, administrative and break areas, and space for the future expansion of Discovery Biology and Non-Clinical Development. Also part of the expansion project will be the creation of a multi-story, glass atrium that will link the new upper floors of the North Building to the existing upper floors of the South Building. The atrium will contain a new main entrance, café, passenger & service elevators, walkways and informal meeting spaces.

"This expansion is good for the district and for the Commonwealth," said Senator Kenneth Donnelly. "It's yet another example of the Commonwealth's commitment to making Massachusetts the leader in this field."

"The whole Commonwealth benefits from this kind of partnership," said Senator Susan Fargo. "The commitment by the Massachusetts Life Sciences Center and Cubist Pharmaceuticals is a wonderful step forward for economic development and for our health and well-being."

"I am thrilled to see yet another ambitious expansion effort by a life sciences company committed to growing their business in the Commonwealth, an effort that will bring much-needed jobs and economic stability to our region," said Representative Jay Kaufman. "With Cubist's announcement coming on the heels of other recent expansion initiatives, Lexington is fast becoming a major player in the life sciences."

"Cubist's expansion is great news for our local economy in Lexington, and for the entire region," said Representative Thomas Stanley. "It is terrific to see the state's Life Sciences Initiative bringing new jobs and economic opportunity to our communities."

"The future growth of our economy is in the life sciences sector," said Representative Peter Koutoujian. "By providing the financial tools necessary for companies like Cubist to expand, we are keeping quality firms in Massachusetts and providing much needed business growth and good paying jobs."

In addition to the expansion underway at 65 Hayden Avenue, a building owned by Cubist, the company occupies approximately 180,000 square feet at both 55 Hayden Avenue and 45 Hayden Avenue where interior renovations are underway. When the expansion work is completed, Cubist will occupy a total of 373,000 square feet at its Lexington campus---up from 269,000 square feet today. The expanded facility is projected to be home to an additional 150 new scientists and support staff.

About the Massachusetts Life Sciences Center

The Massachusetts Life Sciences Center ("the Center") is a quasi-public agency of the Commonwealth of Massachusetts tasked with implementing the Massachusetts Life Sciences Act, a ten-year, \$1 billion initiative that was signed into law in June of 2008. The Center's mission is to create jobs in the life sciences and support vital scientific research that will improve the human condition. This work includes making financial investments in public and private institutions that are advancing life sciences research, development and commercialization as well as building ties between sectors of the Massachusetts life sciences community. For more information, visit www.masslifesciences.com.

About Cubist

Cubist Pharmaceuticals, Inc. is a biopharmaceutical company focused on the research, development, and commercialization of pharmaceutical products that address unmet medical needs in the acute care environment. In the U.S., Cubist markets CUBICIN® (daptomycin for injection), the first antibiotic in a class of anti-infectives called lipopeptides. The Cubist clinical product pipeline currently consists of a Phase 2 program, added with Cubist's acquisition of Calixa Therapeutics Inc. in December 2009, focused on the development of a novel cephalosporin to address certain serious infections caused by multi-drug resistant (MDR) Gram-negative organisms; a Phase 2 program for the treatment of CDAD (Clostridium difficile-associated diarrhea); and a Phase 1 program intended to address the unmet medical need for a treatment for serious infections caused by MDR Gram-negative pathogens. Cubist is also working on several pre-clinical programs being developed to address areas of significant medical needs. These include an anti-infective program for the treatment of respiratory syncytial virus (RSV) in children, therapies to treat various serious bacterial infections, and agents to treat acute pain. Cubist is headquartered in Lexington, Mass. Additional information can be found at Cubist's web site at www.cubist.com.

GOVERNOR PATRICK SIGNS AGREEMENT WITH ISRAEL TO STRENGTHEN PARTNERSHIP, ENCOURAGE COLLABORATION BETWEEN MASSACHUSETTS AND ISRAELI INNOVATION ECONOMIES



Governor Patrick and Shalom Simhon, Minister of Industry, Trade and Labor, sign a Memorandum of Understanding in Jerusalem. (Photo Credit: Alex Goldstein/Governor's Office)

JERUSALEM - Thursday, March 10, 2011 - Governor Deval Patrick today signed a Memorandum of Understanding (MOU) with Israel that will allow for further collaboration in research and development (R&D) programs between Massachusetts and Israeli companies.

During a meeting with Israeli Chief Scientist Avi Hasson at the Ministry of Industry, Trade and Labor in Tel Aviv this afternoon, Governor Patrick and Mr. Hasson discussed Israel and Massachusetts' mutual commitment to life sciences and clean and alternative energy research, and how this new agreement will strengthen the partnership between Massachusetts and Israel to facilitate greater economic development and job creation opportunities in the years ahead.

"Today, we take a new step that will ensure our mutual prosperity and leverage the talents of our uniquely skilled workforces," said Governor Deval Patrick. "This Memorandum of Understanding formalizes our already strong relationship and builds a framework to explore new research and development

opportunities in the innovation economy. The agreement will strengthen out ties to our partners in Israel and help support job growth in both Massachusetts' and Israel's innovation industries."

This agreement comes on the fourth day of the Massachusetts Innovation Economy Partnership Mission, a ten-day trade mission to Israel and the United Kingdom (UK) where Governor Patrick and a coalition of the state's leading business executives and senior government officials are exploring growth opportunities within the Commonwealth's innovation-based industries - technology, life sciences and clean energy - and areas of common interest between the state's established and emerging partners in Israel and the UK.

The MOU signed with Israel today will allow the Massachusetts International Trade Office and the Office of the Chief Scientist to work together to identify pre-existing programs in their respective jurisdictions and explore how those programs can partner resources to expedite and enhance both new and ongoing R&D projects. The MOU will enable entities like the Massachusetts Life Sciences Center and the Massachusetts Clean Energy Center (MassCEC) to work across international lines with counterparts in Israel to enhance their competitiveness in these key sectors.

"MassCEC is a unique public entity dedicated entirely to accelerating job growth and economic development in the Massachusetts clean energy industry," said Energy and Environmental Affairs Secretary Richard K. Sullivan Jr., who chairs MassCEC's board of directors. "Its role as a clearinghouse and support center for the Commonwealth's clean energy sector will be strengthened through this agreement, and we look forward to exploring new opportunities with our Israeli partners."

"This agreement builds upon a strong existing relationship between Massachusetts and Israel and will facilitate the identification of joint investment opportunities that will further that relationship," said Dr. Susan Windham-Bannister, President & CEO of the Massachusetts Life Sciences Center and a member of the official delegation. "By working with our counterparts in Israel, we will seek to promote research collaborations, industrial partnerships, and collaborative investment in early-stage technologies, all with the bookend objectives of job growth and scientific discovery."

The Massachusetts Life Sciences Center will pursue follow-up implementation projects with counterpart agencies in Israel involving collaborative programs that will provide economic and scientific benefit to both regions.

"Both Massachusetts and Israel share a strong research and development community that is key to our clean energy leadership," said MassCEC Executive Director Patrick Cloney. "We look forward to collaborating and partnering with Israel in clean tech research and development projects with the ultimate goal of helping clean energy enterprises achieve success faster."

Today there are nearly 100 companies with Israeli founders or Israeli-licensed technologies in Massachusetts. In 2009, these companies employed nearly 6,000 people and generated \$2.4 billion in direct revenue for the state. Local firms exported over \$180 million worth of goods to Israel in 2009 and, at 12.35 percent, the United States is Israel's largest source of imports. An important market for health-related technologies, Israel is home to 377 hospitals, and 37,000 practicing physicians.

GOVERNOR PATRICK CELEBRATES GRAND OPENING OF NEW THERMO FISHER SCIENTIFIC FACILITY IN TEWKSBURY

Additional center will add 100 jobs in research, development and manufacturing



Governor Patrick and U.S. Senator Kerry participate in a ribbon cutting ceremony at Thermo Fisher Scientific's Center for Excellence. (Photo credit: Eric Haynes / Governor's Office). [View additional photos.](#)

TEWKSBURY – Monday, June 11, 2012 – Governor Deval Patrick today celebrated the grand opening of Thermo Fisher Scientific's Center for Excellence for portable analytical instruments. Thermo Fisher's Tewksbury location currently employs 400, and the additional center will add another 100 jobs in research, development and manufacturing over the next five years. The grand opening served as another event in a series of Massachusetts life sciences growth announcements taking place in the days prior to the BIO International Convention, which opens June 18 at the Boston Convention & Exhibition Center. Last week, Governor Patrick celebrated the grand opening of Navidea Pharmaceuticals' new business and commercialization facility in Andover.

"Massachusetts leads the world in life sciences thanks to our growth strategy of investing in education, innovation and infrastructure," said Governor Patrick. "I want to congratulate Thermo Fisher on the

opening of their new facility in Tewksbury, and on their plans for future expansion in Massachusetts. We look forward to working with them to create more jobs and opportunities in the Commonwealth.”

The 156,000-square-foot Tewksbury facility is the new home to the company’s comprehensive line of Thermo Scientific portable and analytical instruments.

“Our Commonwealth, with its significant access to talent, investment and innovation, supports growth of life sciences, biotech and high-tech businesses unlike any other state or region,” said Marc N. Casper, president and chief executive officer of Thermo Fisher Scientific. “This new Center of Excellence creates a strong base for our continued growth in portable and handheld instruments – high-tech tools that are enabling our customers to make the world safer. We’ve been able to take analytical technologies that were typically only found in the laboratory, and adapt them for use in the field by non-scientists. Our \$20 million investment in this world-class facility reaffirms our commitment to Massachusetts and a growing economy that is fueled by new scientific discoveries.”

There are now more than 1,400 Thermo Fisher employees in Massachusetts. In addition to its global corporate headquarters in Waltham, businesses in the Commonwealth include Environmental and Process Monitoring in Franklin; Water Analysis Instruments in Beverly; and the BRIMS Center in Cambridge, which provides applications assistance in biomarker discovery and validation.

The BIO International Convention will provide Governor Patrick, Lieutenant Governor Timothy Murray, state and industry leaders with an opportunity to showcase Massachusetts as a global leader in the life sciences industry, and the preeminent place for life sciences companies to invest in and expand.

In 2008, Governor Patrick signed a 10-year, \$1 billion investment package to strengthen the state’s global leadership in the life sciences. The initiative melds all of the state’s key resources in order to spur research, investment, innovation and commercialization. Now, the life sciences industry in Massachusetts is thriving, with more than 52 percent job growth in the biopharma sector since 2001 and more than 80,000 employees working in the life sciences.

MASSACHUSETTS AND ISRAEL UNVEIL \$2 MILLION AGREEMENT TO FINANCE JOINT R&D PROJECTS THAT FOSTER ECONOMIC DEVELOPMENT

Bilateral State Agreement to Facilitate Technology Commercialization for Life Sciences, Clean Energy and Technology Industries

WASHINGTON, D.C. - Wednesday, June 29, 2011 - Governor Deval Patrick today joined Israel's Office of the Chief Scientist (OCS), the U.S.-Israel Science and Technology Foundation (USISTF), and three Massachusetts economic development agencies to announce a formal collaboration between the State of Israel and the Commonwealth of Massachusetts to encourage and support innovation and entrepreneurship between Massachusetts' and Israel's life sciences, clean energy and technology sectors. This partnership will be known as the Massachusetts-Israel Innovation Partnership ("MIIP").

The agreement includes a joint solicitation for industrial Research & Development (R&D) collaborations between Massachusetts and Israeli companies. The three participating Massachusetts agencies, the Massachusetts Life Sciences Center (the Center), the Massachusetts Technology Collaborative (MTC) and the Massachusetts Clean Energy Center (MassCEC), are committing nearly \$1 million in collective funding for Massachusetts companies that are engaged in cooperative industrial research and development projects with an identified Israeli partner company. The Office of the Chief Scientist will provide up to \$1 million in matching dollars for the corresponding Israeli partner companies. Massachusetts is the first U.S. state to enter into such an agreement with the State of Israel.

"Today we have made a significant commitment to the long-term success of our economy," said Governor Patrick. "This Agreement will promote research collaborations, industrial partnerships and commercialization of new technologies, expanding opportunity and job growth both in Massachusetts and in Israel."

The initiative comes as a direct result of Governor Patrick's Massachusetts Innovation Economy Partnership Mission, a ten-day trade mission in March that included travel to Israel, where a coalition of the state's leading business executives and senior government officials explored growth opportunities of common interest for Massachusetts' and Israel's innovation industries. During that mission Governor Patrick and Shalom Simhon, Israeli Minister of Industry, Trade and Labor, signing on behalf of their respective states, signed a Memorandum of Understanding (MOU) in Jerusalem. MIIP has been established to implement the spirit of the MOU's framework. The MIIP initiative will be officially launched once the Israeli Knesset ratifies the MOU.

The initiative will support joint investment opportunities that will further the Massachusetts/Israeli relationship in ways that bring mutual economic benefit to both states and that further scientific discovery.

A Request for Proposals (RFP) will be issued jointly by the Center, MTC and MassCEC seeking applications for funding. The OCS will concurrently issue a solicitation seeking applications for funding from Israeli companies wishing to engage in industrial R&D collaborations with Massachusetts counterparts.

"This Agreement serves as another example of the Office of Chief Scientist's mission to implement programs that establish Israel as a hub of hi-tech industry," said Chief Scientist Avi Hasson, Israel Ministry of Industry, Trade and Labor. "We will continue to build international partnerships like the one with Massachusetts that enable Israeli and international companies to engage in joint technology development projects that drive economic growth."

The R&D Cooperation Agreement is designed to help Massachusetts and Israeli companies accelerate development cycles, promote mutually beneficial business-to-business cooperation to enhance opportunities for marketplace success and expand their global reach. It proposes a flexible framework of parallel funding for each participating company, having its R&D expenses supported by its own state according to its respective laws, regulations, rules and procedures.

"The Economic Development Administration (EDA) is pleased to collaborate in this important public-private partnership to promote technology commercialization in the biotechnology and life sciences industries to increase economic and job growth," said U.S. Assistant Secretary of Commerce for Economic Development John R. Fernandez. "This partnership between Massachusetts and Israel will be a great boost to the many innovators and entrepreneurs who are tackling today's challenges in clean energy, medicine and other fields and fueling the innovation economy."

"Helping businesses move forward with R&D projects through strategic international partnerships is the mission of the U.S.-Israel Science and Technology Foundation," said Ann Liebschutz, executive director at USISTF. "This Agreement exemplifies how we are encouraging the U.S. to tap into Israel's zeal for developing highly advanced and in-demand technologies to facilitate the competitiveness of American companies in this challenging global economy."

"This Agreement stems directly from the Governor's recent trade mission to Israel," said Susan Windham-Bannister, President & CEO of the Massachusetts Life Sciences Center. "A strong collaboration between two of the world's leading centers for life sciences innovation -- Israel and Massachusetts -- will undoubtedly advance scientific research, as well as development and commercialization of important new advances in medical devices, biotechnology, pharmaceuticals and other fields. We also are confident that this collaboration between Israel and Massachusetts will deliver meaningful economic benefits to both states."

"Israel and Massachusetts share a parallel asset in our world-class academic and research institutions, which have led to numerous technological discoveries and business start-ups in the clean energy sector," said MassCEC Executive Director Patrick Cloney. "This partnership will strengthen Massachusetts' relationship with the Israeli clean energy industry, and promote Massachusetts as an international clean energy leader, while providing Massachusetts companies access to the cutting edge expertise of their Israeli collaborators. With partnerships such as this we are on our way to making clean energy a marquee industry in Massachusetts, just like life sciences and IT."

"During the Governor's recent Trade Mission, we were impressed by the many synergies between the Israeli and Massachusetts technology sectors in areas such as cybersecurity, social media and digital healthcare management," said Patrick Larkin, Director of the Massachusetts Technology Collaborative's John Adams Innovation Institute. "We believe this public-private collaboration can serve as a catalyst to energize our state's entrepreneurs and innovation-led industries to develop new products for global markets and create new economic opportunities for Massachusetts."

Today there are nearly 100 companies with Israeli founders or Israeli-licensed technologies in Massachusetts. In 2009, these companies employed nearly 6,000 people and generated \$2.4 billion in direct revenue for the state. Local firms exported over \$180 million worth of goods to Israel in 2009 and, at 12.35 percent, the United States is Israel's largest source of imports. An important market for health-related technologies, Israel is home to 377 hospitals and 37,000 practicing physicians.

Governor Patrick also announced today that Massachusetts has hired a new Trade Representative to Israel, Hadas Bar-Or. Ms. Bar-Or is an experienced international economic development expert with a strong background in business development within the innovation economy and building collaborations between the public and private sectors. The new Representative will be responsible for increasing trade, investment, and commercial partnerships between Massachusetts and Israel. Governor Patrick announced that Massachusetts would be hiring a Trade Representative to Israel as part of his Innovation Economy Partnership Mission to Israel in March. Ms. Bar-Or will report to Secretary Greg Bialecki, Governor Patrick's Economic Development Cabinet Secretary and Chairman of the Massachusetts Marketing Partnership.

"Massachusetts and Israel today have extensive business relationships, due to our region's common industrial focus areas of life sciences, IT, and clean energy," said Housing and Economic Development Secretary Greg Bialecki. "Building on a strong foundation, our new trade representative will extend these business collaborations to new customers and industries."

GOVERNOR PATRICK BREAKS GROUND ON ALEXANDRIA CENTER SCIENCE AND TECHNOLOGY CAMPUS IN CAMBRIDGE

Campus will be future headquarters of life sciences company Biogen Idec and its 530 employees



Governor Patrick highlights his Administration's job creation efforts at a groundbreaking ceremony for Alexandria Center at Kendall Square. (Photo: Matt Bennett/Governor's Office)

CAMBRIDGE -- Thursday, October 27, 2011 -- Governor Deval Patrick today joined state and local officials, business leaders and members of the life sciences community for the groundbreaking of the first building of the Alexandria Center science and technology campus at Kendall Square. The properties will be the future home of Biogen Idec, a global, biopharmaceutical company moving its headquarters, along with 530 employees, to Cambridge.

"The innovation economy is Massachusetts' global calling card and projects like Alexandria Center confirm that our investments are paying off," said Governor Patrick. "Alexandria's Kendall Square development will create new jobs for the region and strengthen our already robust innovation economy."

Alexandria Center at Kendall Square is a 1.73 million square foot, 11 acre world-class, build-to-suit science and technology campus located in the heart of Cambridge. The development will ultimately include five state-of-the-art buildings with flexible, modern laboratory and high-tech office settings, as well as a variety of innovative spaces designed to encourage collaboration.

"We are delighted that Biogen Idec is moving its headquarters to Cambridge and that the Alexandria Real Estate development in Kendall Square is commencing," said Cambridge Mayor David P. Maher. "This development promises to create more open space, retail space and housing opportunities, in addition to the new lab and commercial spaces. This project is further evidence that Cambridge remains the Innovation Hub of the region."

The Patrick-Murray Administration has made unprecedented investments in the life sciences industry. In June 2008, Governor Patrick signed the Massachusetts Life Sciences Act, a 10-year, \$1 billion initiative. The act tasked the Massachusetts Life Sciences Center with creating jobs in the life sciences and support vital scientific research that will improve the human condition. This work includes making financial investments in public and private institutions that are advancing life sciences research, development and commercialization, as well as building ties between sectors of the Massachusetts life sciences community.

"Biogen Idec's selection of Alexandria Center at Kendall Square for its executive offices demonstrates the unparalleled quality, flexibility and cutting-edge design that define Alexandria's properties worldwide," said Tom Andrews, senior vice president and regional market director of Alexandria Real Estate Equities, Inc. "Many leading biopharmaceutical companies are strategically locating in Alexandria's Cambridge-area properties because of their proven ability to support the development of scientific breakthroughs by providing outstanding facilities in this globally recognized center of life sciences research and development."

The six-story, 307,000 square foot, highly-sustainable building at 225 Binney is being designed specifically for Biogen Idec by award-winning firm Spagnolo Gisness & Associates, Inc. The innovative design will feature a glass and brick facade and will incorporate two historic buildings. The building at 17 Cambridge Center, being developed by Boston Properties, is a 190,000 square foot building. Both properties will be ready for Biogen Idec in 2013 and will be the first buildings of the Alexandria Center at Kendall Square and the future home of Biogen Idec, a global, investment-grade Biopharmaceutical company.

"Massachusetts is already seen as a leader in healthcare technology, life sciences and clean technology and in order to keep our economy moving forward, continued investment in these cutting-edge industries is crucial," said Senator Karen Spilka, Senate chair of the Joint Committee on Economic Development and Emerging Technologies. "By basing their headquarters in the Commonwealth, Biogen Idec will solidify our reputation as a leader in the biopharmaceutical industry and will also help to ensure continued economic development and job creation for the state."

"This project highlights the city of Cambridge's continued role as global center for innovation," said Senator Sal DiDomenico. "As life science companies continue to make this region their home, it will help grow the local economy and create long-term employment opportunities for our state's residents."

The Patrick-Murray Administration's strategy brings together industry, academic research hospitals and public and private colleges and universities to coordinate this effort, spur new research, strengthen investments, create new jobs and produce new therapies for a better quality of life. The initiative is focused on five points of the development cycle to ensure a comprehensive statewide strategy: funding, planning, research, development and commercialization. According to the MassBIO, the Commonwealth is home to 1,400-1,500 biotechnology and life sciences companies, including agricultural or industrial biotechnology, bioinformatics, contract research and manufacturing, drug development, human diagnostic development, medical device and research products and instrumentation.

"Alexandria has been a generous community partner, agreeing to provide an unprecedented level of sorely-needed parkland and community space to the residents of East Cambridge who will be directly impacted by the development," said Representative Timothy J. Toomey, Jr. "As Kendall Square continues its exciting, meteoric growth into what has been described as 'the most innovative square mile on the planet,' it is important to partner with responsible developers, like Alexandria, who demonstrate a vested interest in the surrounding neighborhood."

"Massachusetts has secured its position as a global leader in the life sciences through smart investments and effective partnerships between industry and state government," said Representative Joseph F. Wagner, House chair of the Joint Committee on Economic Development and Emerging Technologies. "With projects like Alexandria's Kendall Square development, we are seeing that commitment foster economic growth and create new jobs for our residents."

To learn more about the Massachusetts Life Sciences Center and how it is supporting job growth and helping support the Commonwealth's innovation economy, please be sure to visit www.masslifesciences.com.

GOVERNOR PATRICK CELEBRATES PFIZER EXPANSION IN CAMBRIDGE

Company to bring 400 new research jobs to Cambridge



Governor Deval Patrick today joined Pfizer and the Massachusetts Institute of Technology (MIT) to break ground on Pfizer's new facility in Cambridge's Kendall Square. The facility will allow the company to expand its footprint in the growing biopharmaceutical cluster in Cambridge and will create 400 new jobs. (Photo: Eric Haynes / Governor's Office)

CAMBRIDGE – Monday, November 21, 2011 – Governor Deval Patrick today joined Pfizer and the Massachusetts Institute of Technology (MIT) to break ground on Pfizer's new facility in Cambridge's Kendall Square. The facility will allow the company to expand its footprint in the growing biopharmaceutical cluster in Cambridge and will create 400 new jobs.

"It is welcome news that Pfizer is increasing its presence and bringing new jobs to Massachusetts," said Governor Patrick. "Companies like Pfizer know that Massachusetts is unmatched when it comes to providing a high-quality workforce, a high quality of life, and nation-leading investments in health care, education and innovation."

Pfizer announced in February 2011 that the company would be making a strategic shift in research and development. Part of this strategic plan included turning the company's focus on a smaller number of research areas where the potential impact is greatest. This included the company's CVMED and Neuroscience research units. To help accommodate these changes, Pfizer announced it would increase its presence in Cambridge by moving these two important research units there, making the company the second largest biopharmaceutical company in Massachusetts in terms of number of employees. In September, Pfizer announced it had entered into a 10-year lease agreement with MIT for more than 180,000 square feet.

"We deliberately chose to move to Cambridge as a key part of our research and development strategy, in order to foster productive collaborations between our drug discovery experts and the outstanding scientists of Cambridge's world-class institutions," said Pfizer Worldwide R&D President Mikael Dolsten.

"Global biopharma leaders like Pfizer continue to invest in Massachusetts and are helping to strengthen and grow our life sciences Super Cluster," said Susan Windham-Bannister, Ph.D., President & CEO of the Massachusetts Life Sciences Center. "The Patrick-Murray Administration and the Life Sciences Center are actively engaged in doing all that we can to ensure that this trend continues."

In June 2008, Governor Patrick signed the Massachusetts Life Sciences Act, a 10-year, \$1 billion initiative, which tasked the Massachusetts Life Sciences Center, a quasi-public agency of the Commonwealth with implementing the initiative. The center's mission is to create jobs in the life sciences and support vital scientific research that will improve the human condition. This work includes making financial investments in public and private institutions that are advancing life sciences research, development and commercialization as well as building ties between sectors of the Massachusetts life sciences community. As a result of these investments, Massachusetts has already created more than one million square feet of new laboratory and biomanufacturing space.

Pfizer also recently launched their newest Centers for Therapeutic Innovation (CTI) at Longwood Medical Center, which will serve as the worldwide headquarters for CTI, a network of partnerships between Pfizer and Academic Medical Centers (AMC) across the country that aim to accelerate and transform drug discovery and development. Pfizer intends to invest approximately \$85 million over the next five years and create approximately 50 new or newly funded research jobs in conjunction with CTI in Boston.

The Patrick-Murray Administration has made a commitment to growing the Massachusetts economy through investments in education, innovation and infrastructure. Today's groundbreaking demonstrates that these investments are working to help create jobs and support the Massachusetts economic recovery. As a result, Massachusetts leads the nation in biotechnology research and development employment according to the U.S. Bureau of Labor Statistics and has three cities, Boston, Worcester and Springfield, listed in the top 20 metropolitan areas for recovery performance.

For more information on the Massachusetts Life Sciences Initiative, visit www.masslifesciences.com.

GOVERNOR PATRICK CELEBRATES GRAND OPENING OF NEW THERMO FISHER SCIENTIFIC FACILITY IN TEWKSBURY

Additional center will add 100 jobs in research, development and manufacturing



Governor Patrick and U.S. Senator Kerry participate in a ribbon cutting ceremony at Thermo Fisher Scientific's Center for Excellence. (Photo credit: Eric Haynes / Governor's Office). [View additional photos.](#)

TEWKSBURY – Monday, June 11, 2012 – Governor Deval Patrick today celebrated the grand opening of Thermo Fisher Scientific's Center for Excellence for portable analytical instruments. Thermo Fisher's Tewksbury location currently employs 400, and the additional center will add another 100 jobs in research, development and manufacturing over the next five years. The grand opening served as another event in a series of Massachusetts life sciences growth announcements taking place in the days prior to the BIO International Convention, which opens June 18 at the Boston Convention & Exhibition Center. Last week, Governor Patrick celebrated the grand opening of Navidea Pharmaceuticals' new business and commercialization facility in Andover.

"Massachusetts leads the world in life sciences thanks to our growth strategy of investing in education, innovation and infrastructure," said Governor Patrick. "I want to congratulate Thermo Fisher on the

opening of their new facility in Tewksbury, and on their plans for future expansion in Massachusetts. We look forward to working with them to create more jobs and opportunities in the Commonwealth.”

The 156,000-square-foot Tewksbury facility is the new home to the company’s comprehensive line of Thermo Scientific portable and analytical instruments.

“Our Commonwealth, with its significant access to talent, investment and innovation, supports growth of life sciences, biotech and high-tech businesses unlike any other state or region,” said Marc N. Casper, president and chief executive officer of Thermo Fisher Scientific. “This new Center of Excellence creates a strong base for our continued growth in portable and handheld instruments – high-tech tools that are enabling our customers to make the world safer. We’ve been able to take analytical technologies that were typically only found in the laboratory, and adapt them for use in the field by non-scientists. Our \$20 million investment in this world-class facility reaffirms our commitment to Massachusetts and a growing economy that is fueled by new scientific discoveries.”

There are now more than 1,400 Thermo Fisher employees in Massachusetts. In addition to its global corporate headquarters in Waltham, businesses in the Commonwealth include Environmental and Process Monitoring in Franklin; Water Analysis Instruments in Beverly; and the BRIMS Center in Cambridge, which provides applications assistance in biomarker discovery and validation.

The BIO International Convention will provide Governor Patrick, Lieutenant Governor Timothy Murray, state and industry leaders with an opportunity to showcase Massachusetts as a global leader in the life sciences industry, and the preeminent place for life sciences companies to invest in and expand.

In 2008, Governor Patrick signed a 10-year, \$1 billion investment package to strengthen the state’s global leadership in the life sciences. The initiative melds all of the state’s key resources in order to spur research, investment, innovation and commercialization. Now, the life sciences industry in Massachusetts is thriving, with more than 52 percent job growth in the biopharma sector since 2001 and more than 80,000 employees working in the life sciences.

NXSTAGE MEDICAL OPENS NEW COMPANY HEADQUARTERS IN LAWRENCE

LAWRENCE – Monday, October 15, 2012 – Governor Deval Patrick today joined NxStage Medical, Inc., a leading manufacturer of innovative dialysis products, to officially open the company's new headquarters in Lawrence. Thanks to the Patrick-Murray Administration's commitment to life sciences, Massachusetts has become a global hub for life sciences development and research.

"Thanks to our growth strategy of investing in education, innovation and infrastructure, Massachusetts continues to lead the world in life sciences," said Governor Patrick. "I congratulate NxStage on this significant achievement and for reaffirming its commitment to Massachusetts."

The new 137,000 square foot facility replaces the company's prior 58,000 square foot Lawrence facility. The facility houses NxStage's corporate offices which include over 300 employees within research and development, sales and marketing, customer and technical support, among other functions, and is expected to accommodate the company's future growth.

"During the Industrial Revolution, our region's gateway cities led the way in pioneering American industry. Today, companies like NxStage pay homage to the Fifth District's long tradition of sparking progress," said Congresswoman Niki Tsongas. "By committing to Lawrence, NxStage ensures the presence of good jobs and continued innovation in the years ahead and I look forward to working with them as a federal partner to ensure that they are able to continue to grow and thrive here in the Commonwealth."

The Massachusetts Life Sciences Center (MLSC), the agency charged with implementing Governor Patrick's 10-year, \$1 billion Life Sciences Initiative, awarded approximately \$1.3 million in tax incentives to NxStage Medical in 2010 to encourage the company's growth in Massachusetts.

"As one of the largest and fastest growing medical device companies in Massachusetts, NxStage is proud to contribute to the growth and vitality of the area," said Jeffrey H. Burbank, Founder and Chief Executive Officer of NxStage Medical. "NxStage is revolutionizing renal care with innovative technologies including our System One, which provides life-changing therapy to thousands of patients. We are very appreciative that the Governor and others recognize the importance of what we're working to accomplish to ensure that this life-changing therapy option is available to all dialysis patients."

"Being at home and in control of my treatment is what was important to me when I sought home hemodialysis therapy with NxStage," said NxStage dialyzer Richard Sicurella of Winthrop. "But the health and quality of life benefits are what are helping me to live a good life, a life where my wife and I can enjoy our retirement and spend time together. This would not be possible without NxStage. This therapy has changed my life."

Governor Patrick strengthened Massachusetts' global leadership in life sciences in 2008 by signing a 10-year, \$1 billion life sciences investment package. Over the last four years, the Commonwealth has

invested more than \$300 million in the industry, leveraging more than \$938 million in third-party investments and creating thousands of jobs in both construction and the life sciences.

“NxStage Medical is a great example of the state’s investment in the life sciences paying off. This new, expanded headquarters will allow NxStage to grow its business and create jobs right here in the City of Lawrence,” said Senator Barry Finegold. “Additionally, the fact that this is only one of a dozen new businesses opening in the Riverwalk this year shows that the City of Lawrence is a great place to do business. Sal Lupoli should be commended for the work he has done here at the Riverwalk, bringing renewed life to this once thriving area.”

The Life Sciences Initiative melds all of the state’s key resources in order to spur research, investment, innovation and commercialization. Now the life sciences industry in Massachusetts is thriving, with more than 52 percent job growth in the biopharma sector since 2001 and more than 80,000 employees working in the life sciences.

Earlier this month Massachusetts hosted the AdvaMed Convention, the annual convention of the U.S. medical device industry. In June Massachusetts hosted the BIO International Convention, which brought more than 15,000 participants and 3,000 companies to Boston. Both AdvaMed and BIO gave Governor Patrick, Lieutenant Governor Timothy Murray, and state and industry leaders an opportunity to showcase Massachusetts as a global leader in the life sciences industry, and the preeminent place for life sciences companies to invest in and expand. During the BIO convention, Governor Patrick announced innovation partnerships with regions in Spain, and Denmark and Sweden, and the creation of a neuroscience consortium formed by seven companies.

"The Center is pleased to be supporting NxStage Medical as the company expands its facilities in the Commonwealth," said Susan Windham-Bannister, Ph.D., President & CEO of the MLSC. "NxStage's important technologies address the challenges of renal failure -- a condition with a rising incidence and prevalence but poor outcomes. Through NxStage, Massachusetts is leading the way in providing better solutions to patients."

GOVERNOR PATRICK VISITS ABIOMED, HIGHLIGHTS INNOVATION AND RESEARCH AS KEY PARTS OF MASSACHUSETTS' WORLD-LEADING LIFE SCIENCES INDUSTRY



Governor Patrick and Abiomed CEO Michael Minogue observe the original artificial heart prototype during the Governor's visit to Abiomed. (Photo Credit: Eric Hayes / Governor's Office) [View additional photos.](#)

DANVERS – Thursday, September 13, 2012 – Governor Deval Patrick today visited Abiomed, a Danvers life sciences company that creates instruments designed to help the pumping function of the heart, to promote the innovation and research programs that have made Massachusetts a world leader in the life sciences industry.

“With a growing industry of companies that are committed to innovation and making us healthier, Massachusetts has become a world leader in life sciences,” said Governor Patrick. “Abiomed’s pioneering work in heart technology is indicative of the kind of advancements Massachusetts companies are making on behalf of patients and doctors around the world.”

“Abiomed is proud to host Governor Deval Patrick and appreciates his continued support to the medical device industry,” said Michael R. Minogue, Chairman, President and Chief Executive Officer of Abiomed.

“Massachusetts, by design, is home to some of the leading hospitals, universities and medical device companies in the world. We must continue to collaborate in order to create policies that help small businesses and to sustain an environment that supports innovation for patients and cost-effective care.”

Governor Patrick strengthened Massachusetts’ global leadership in life sciences in 2008 by signing a 10-year, \$1 billion life sciences investment package. Over the last four years, the Commonwealth has invested more than \$300 million in the industry, leveraging more than \$938 million in third-party investments and creating thousands of jobs in both construction and in the life sciences.

The Life Sciences Initiative melds all of the state’s key resources in order to spur research, investment, innovation and commercialization. Now the life sciences industry in Massachusetts is thriving, with more than 52 percent job growth in the biopharma sector since 2001 and more than 80,000 employees working in the life sciences.

In June, Massachusetts hosted the BIO International Convention, which brought more than 15,000 participants and 3,000 companies to Boston. BIO gave Governor Patrick, Lieutenant Governor Timothy Murray, state and industry leaders an opportunity to showcase Massachusetts as a global leader in the life sciences industry, and the preeminent place for life sciences companies to invest in and expand. During the convention, Governor Patrick announced innovation partnerships with regions in Spain, and Denmark and Sweden, and the creation of a neuroscience consortium formed by seven companies.

Founded in 1981, Abiomed employs more than 400 people and maintains its corporate headquarters in Danvers with a European division in Aachen, Germany. The company focuses on developing new technologies designed to assist or replace the life-sustaining pumping function of the heart. Abiomed developed the first total replacement heart and the world’s smallest heart pump.

“Under the leadership of Governor Patrick, Massachusetts has firmly established its role as an international leader in life sciences,” said Senator Gale Candaras, Senate Chair of the Joint Committee on Economic Development and Emerging Technologies. “The Governor and the Legislature are dedicated to fostering the kind of innovative scientific work that advances technology and creates jobs within the Commonwealth. The success of Abiomed in Massachusetts is a model for other companies looking to call Massachusetts home.”

“I am so pleased the Governor is visiting Abiomed today,” said State Representative Ted Speliotis. “Abiomed is a world leader in innovation and they are one of several companies on the North Shore working to provide us with a longer and healthier life. No work is more important.”

“Thank you to the Patrick-Murray Administration’s commitment to the Life Sciences Initiative. With their support, companies like Abiomed are welcome to thrive in Massachusetts,” said Senator Frederick Berry

ISRAELI-FOUNDED ARGO MEDICAL TECHNOLOGIES SELECT MASSACHUSETTS AS U.S. HEADQUARTERS

Announcement at AdvaMed 2012 highlights Massachusetts life sciences industry with demonstration of ARGO's ReWalk exoskeleton that enables paraplegics to walk

BOSTON – Tuesday, October 2, 2012 – Governor Deval Patrick joined ARGO Medical Technologies at the AdvaMed 2012 conference today to announce that Israeli-founded exoskeleton technology leader ARGO has selected Massachusetts as its U.S. headquarters.

"Massachusetts is a global leader in the life sciences industry because of our strong investment in education and innovation," said Governor Patrick, who led a trade mission to Israel last spring to further strengthen ties between the innovation industries in Massachusetts and Israel. "I am pleased to welcome ARGO and their remarkable technology to Massachusetts and I look forward to the continued growth of their company as they bring new jobs into the Commonwealth."

ARGO Medical Technologies' product the ReWalk is an exoskeleton suit that enables persons with lower limb disabilities such as paraplegia to stand and walk independently without assistance. The company's founder, Dr. Amit Goffer, is a person with quadriplegia who was inspired to invent the exoskeleton device because of his own personal story. ARGO was founded in Israel, but has grown internationally. Along with its Massachusetts headquarters, it now has centers in Germany and Israel. The new Massachusetts headquarters, which the company expects to house up to 40 employees, will be located in Marlborough.

"As ARGO expands from a research and development firm to an international leader in commercial exoskeleton technology, we have selected Massachusetts with its strong commitment to the life sciences industry as our U.S. headquarters," said Larry Jasinski, CEO of ARGO Medical Technologies. "The ReWalk is a cutting edge device that will revolutionize the mobility industry and we are committed to making this technology commercially available to anyone who wants one here in the U.S. and around the world."

"ARGO's technology is truly life-changing," said Susan Windham-Bannister, Ph.D., President & CEO of the Massachusetts Life Sciences Center, the agency charged with implementing Governor Patrick's Life Sciences Initiative. "Millions of people with neurodegenerative diseases and spinal cord injuries, including many of our returning veterans, have been waiting for this kind of breakthrough technology. We are proud to welcome ARGO to the Massachusetts life sciences community."

At the press conference, U.S. Army Veteran Theresa Hannigan demonstrated the ReWalk exoskeleton technology. Hannigan is a former Army Sergeant who served during the Vietnam era and was left paralyzed two years ago as a result of a progressive autoimmune disease which she contracted while in the Army. Hannigan has been training with the ReWalk at the National Center of Excellence for the

Medical Consequences of Spinal Cord Injury at the James J. Peters VA Medical Center, Bronx, NY and is planning to use the exoskeleton on October 20, 2012 to walk a 1 mile road race in Lindenhurst, NY to raise money for the organization "Hope for the Warriors" which helps U.S. service men and women.

"I am very excited for the day I can take the ReWalk home to use in my daily life," said Hannigan. "It's the simple things that I miss that I can't do in my wheelchair. When I'm sitting on the couch it is difficult and time consuming to transition into my wheelchair for a simple task like getting a glass of water. With the ReWalk I can just stand up, walk in to the kitchen, get a glass in the cabinet, and pour it for myself."

The ReWalk is currently available in the U.S. at rehabilitation centers and is awaiting FDA clearance for personal use. In Europe it is also being used in rehabilitation facilities, and ARGO has recently announced its commercial availability to take home for personal use throughout the European Union.

Governor Patrick strengthened Massachusetts' global leadership in life sciences in 2008 by signing a 10-year, \$1 billion life sciences investment package. Over the last four years, the Commonwealth has invested more than \$300 million in the industry, leveraging more than \$938 million in third-party investments and creating thousands of jobs in both construction and in the life sciences.

The Life Sciences Initiative melds all of the state's key resources in order to spur research, investment, innovation and commercialization. Now the life sciences industry in Massachusetts is thriving, with more than 52 percent job growth in the biopharma sector since 2001 and more than 80,000 employees working in the life sciences.

In 2011, Governor Patrick led the Massachusetts Innovation Economy Partnership Mission, a 10-day trade mission that included travel to Israel, where a coalition of the state's leading business executives and senior government officials explored growth opportunities of common interest for Massachusetts' and Israel's innovation industries.

About ARGO Medical Technologies

ARGO Medical Technologies develops, manufactures and markets walk restoration devices for people with lower limb disabilities. The company's ReWalk™ exoskeleton allows an ambulation and rehabilitation alternative to wheelchair users, enabling people with lower limb disabilities, such as paraplegia, to stand and walk independently. ARGO is operated by a team of experts in the fields of rehab devices, control and computer sciences with decades of combined experience in R&D, engineering and manufacturing of multidisciplinary systems. The company is assisted by renowned international experts in the fields of medicine, biomedical engineering, robotics and marketing. Founded in 2001 in Israel, ARGO is today an international company with headquarters in the U.S., Germany and Israel. For more information, please visit <http://www.argomedtec.com/>.

About the Massachusetts Life Sciences Center

The Massachusetts Life Sciences Center is a quasi-public agency of the Commonwealth of Massachusetts tasked with implementing the Massachusetts Life Sciences Act, a ten-year, \$1 billion initiative that was signed into law in June of 2008. The Center's mission is to create jobs in the life

sciences and support vital scientific research that will improve the human condition. This work includes making financial investments in public and private institutions that are advancing life sciences research, development and commercialization as well as building ties among sectors of the Massachusetts life sciences community. For more information, visit www.masslifesciences.com.

GOVERNOR PATRICK CELEBRATES NEW GENZYME BIOMANUFACTURING FACILITY OPENING IN FRAMINGHAM

FRAMINGHAM – Monday, October 22, 2012 – Governor Deval Patrick today joined Genzyme, a Sanofi subsidiary and the world's third-largest biotechnology company, at an open house to celebrate the recent opening of the company's new biomanufacturing facility in Framingham. Genzyme's ability to locate the facility at Framingham Technology Park was enabled through infrastructure funding from the Massachusetts Life Sciences Center, the agency charged with implementing Governor Patrick's ten-year, \$1 billion Life Sciences Initiative.

"Thanks to our growth strategy of investing in education, innovation and infrastructure, Massachusetts continues to lead the world in life sciences," said Governor Patrick. "Genzyme's new facility represents Massachusetts competing successfully for jobs in advanced manufacturing. I congratulate Genzyme, and appreciate the company's ongoing commitment to growing in Massachusetts."

The Massachusetts Life Sciences Center (MLSC) awarded grant funding totaling \$14.3 million to the town of Framingham to upgrade its wastewater collection system in conjunction with Genzyme's large-scale biomanufacturing expansion project. Over the past four years, the Commonwealth has invested more than \$300 million in the state's life sciences cluster, leveraging more than \$1 billion in third-party investments and creating thousands of jobs in both construction and in the life sciences. The life sciences industry in Massachusetts is thriving, with more than 52 percent job growth in the biopharma sector since 2001 and more than 80,000 employees working in the life sciences.

Genzyme employs approximately 4,500 people in Massachusetts, with 2,300 employees at the Framingham campus. Approximately 500 of the Framingham jobs are at the new Framingham biomanufacturing facility.

"The state's commitment to the life sciences, partnership with industry, and the infrastructure grant for Framingham has helped us meet our most important commitment of restoring the supply of medicine to the patients who depend on us," said David Meeker, M.D., President and CEO of Genzyme. "The investments we have made to improve our Allston manufacturing plant and build the new facility here in Framingham are clear indicators of our commitment to meet that need for people living with rare diseases such as Fabry and Gaucher."

Earlier this month, Massachusetts hosted the AdvaMed Convention, the annual convention of the U.S. medical device industry. In June, Massachusetts hosted the BIO International Convention, which brought more than 15,000 participants and 3,000 companies to Boston. Both AdvaMed and BIO gave Governor Patrick, Lieutenant Governor Timothy Murray, and state and industry leaders an opportunity to showcase Massachusetts as a global leader in the life sciences industry, and the preeminent place for life sciences companies to invest in and expand. During the BIO convention, Governor Patrick announced innovation

partnerships with regions in Spain, and Denmark and Sweden, and the creation of a neuroscience consortium formed by seven companies.

"The Center is pleased to support the town of Framingham through a true public/private partnership that has enabled Genzyme to expand their biomanufacturing efforts in Massachusetts and create hundreds of new jobs," said Susan Windham-Bannister, Ph.D., President & CEO of the MLSC. "When we support biomanufacturing we create jobs that are available to people with a variety of skills and levels of education attainment. Genzyme is a company built on groundbreaking science that fundamentally changes the lives of patients with rare diseases, such as Fabry's disease. With the opening of Genzyme's new biomanufacturing facility we will see therapies reaching patients quicker – and that's what the Massachusetts life sciences industry is all about."

About Genzyme, a Sanofi Company

Genzyme has pioneered the development and delivery of transformative therapies for patients affected by rare and debilitating diseases for over 30 years. We accomplish our goals through world-class research and with the compassion and commitment of our employees. With a focus on rare diseases and multiple sclerosis, we are dedicated to making a positive impact on the lives of the patients and families we serve. That goal guides and inspires us every day. Genzyme's portfolio of transformative therapies, which are marketed in countries around the world, represents groundbreaking and life-saving advances in medicine. As a Sanofi company, Genzyme benefits from the reach and resources of one of the world's largest pharmaceutical companies, with a shared commitment to improving the lives of patients. Learn more at www.genzyme.com.

About the Massachusetts Life Sciences Center

The Massachusetts Life Sciences Center is a quasi-public agency of the Commonwealth of Massachusetts tasked with implementing the Massachusetts Life Sciences Act, a ten-year, \$1-billion initiative that was signed into law in June of 2008. The Center's mission is to create jobs in the life sciences and support vital scientific research that will improve the human condition. This work includes making financial investments in public and private institutions that are advancing life sciences research, development and commercialization as well as building ties among sectors of the Massachusetts life sciences community. For more information, visit www.masslifesciences.com.

Governor Patrick Announces Major Life Sciences Investment in Western Massachusetts

Grants to fund lab renovations, equipment and planning for community colleges and vocational schools, and expansion of life sciences capacity at MGHPCC

HOLYOKE – Thursday, February 28, 2013 – Governor Deval Patrick and the Massachusetts Life Sciences Center (MLSC) today announced more than \$9 million in grants for life-sciences-related capital projects in Western Massachusetts, including \$3.8 million to support the creation of a Center for Life Sciences at Holyoke Community College (HCC), and \$4.54 million that will allow the Massachusetts Green High Performance Computing Center (MGHPCC) in Holyoke to expand its capacity for life sciences-related research and data analysis. Through the Massachusetts Life Sciences Center, Massachusetts is investing \$1 billion over 10 years in the growth of the state's life sciences supercluster. These investments are being made under Governor Patrick's Massachusetts Life Sciences Initiative.

"Supporting innovation propels our economy forward and prepares our citizens for the 21st century global marketplace," said Governor Patrick. "Our innovation economy relies on a well-educated, well-skilled workforce, and these grants will expand opportunity and grow jobs in communities throughout the Commonwealth."

"Our Administration is committed to investing in innovation across the state, including the life sciences industry in Western Massachusetts," said Lieutenant Governor Timothy Murray. "These capital project investments will enhance research, workforce training and job creation, expand opportunities to develop improved medicine and support the region's long-term economic growth."

"Schools like Holyoke Community College and Springfield Technical Community College play major roles in training the next generation of our state's life sciences workforce, and they ensure that training for innovation economy jobs is inclusive and available all across the state," said Dr. Susan Windham-Bannister, President & CEO of the MLSC. "Our grants help ensure that these schools can provide students in Western Massachusetts with first-rate training facilities. Our grant to the MGHPCC leverages prior investments by the state and five of our top universities by expanding the MGHPCC's capacity to make advanced computing available to the life sciences community."

The largest grant awarded today went to the MGHPCC. This investment will build on an infrastructure for large-scale data analysis that is already in place in Holyoke and was created by a strong partnership among academia, industry and the Commonwealth. Boston University, Harvard University, the Massachusetts Institute of Technology, Northeastern University and the University of Massachusetts have teamed with Astra-Zeneca, Pfizer, Merck, Merrimack Pharmaceuticals, EMC and IBM, among others, to create this computing resource. The MLSC funding of \$4.54 million will allow the MGHPCC to create a cloud-based resource for data-driven biology.

“As with other scientific disciplines, discovery and innovation in the life sciences are dependent on high-performance computing,” said John Goodhue, Executive Director of the MGHPCC. “This investment will leverage the capabilities of the MGHPCC and its university partners to strengthen the state's position as a leader in life sciences research, an important driver of the Massachusetts economy. The MLSC's investment will also add a new dimension to the ongoing partnership between the MGHPCC and western Massachusetts business and educational institutions.”

“Biomedical sciences are in the midst of a revolution where many of the challenges are becoming large-scale data problems,” said Manuel Garber, Associate Professor in the Program in Bioinformatics and Integrative Biology at the University of Massachusetts Medical School. “The investment in this computer system will poise the state of Massachusetts as a leader in the development of computational methods to understand and a catalytic force in applying these discoveries to improve health care.”

HCC was granted \$3.8 million to support the renovation of 13,000 square feet of lab space and the creation of a Center for Life Sciences. This will include a clean room for the biological sciences, which will be the only clean room in Western Massachusetts to support training for students, faculty and industry partners.

“The importance of community colleges in providing access to life sciences education for minority, low-income and first-generation students cannot be overstated,” said HCC President William F. Messner. “This grant will enable us to expand our partnerships and establish a solid pipeline from high school, to college, to the workforce. It will allow HCC to strengthen articulations with Mount Holyoke and Smith College and increase the number of women in life sciences fields. It will provide the college with the resources necessary to support our industry partners, and ensure our curriculum aligns with their needs and equips our graduates with the knowledge and skills they need to pursue further education or enter the workforce.”

“This project at Holyoke Community College is absolutely essential for regional life science economic development,” said Steve Richter, President & Scientific Director of Microtest Labs in Agawam. “The caliber of this project adds to the force required for real change and job development. The focus on microbiology and clean room technology creates value for students and industry. The medical device, biotech and compounding pharmacies will benefit from future graduates.”

The MLSC also awarded two planning grants to academic institutions in the region. These grants allow institutions to propose and develop studies in order to further identify what types of life sciences resources would be most useful to them:

- Springfield Technical Community College (STCC) was awarded \$150,000, which will be used to update its equipment and labs to align with the needs of life sciences companies. MLSC funding will allow STCC to conduct a study to identify the most appropriate equipment that will best deliver a life sciences education leading to employment in the field.
- Bay Path College in Longmeadow recently received a \$2 million grant from the U.S. Department of Education aimed at improving undergraduate student retention, supporting curricular redesign, faculty professional development, and student academic and career support services. The MLSC planning grant

of \$50,000 will enable Bay Path College to engage key stakeholders from the life sciences industry, workforce development, and educational institutions to identify the capital needs and other resources needed to fully implement this initiative in the sciences at Bay Path College.

“STCC applauds Governor Patrick and the Massachusetts Life Sciences Center for their investment in life sciences education,” said Dr. Lisa Rapp, Chair of STCC's Biotechnology Department. “STCC's planning grant will allow the college to determine which capital resources we most need to create and furnish up-to-date, industry-aligned, teaching laboratories to educate and train a skilled life sciences workforce for the Commonwealth.”

“We have always been responsive to the workforce development needs of our region. As Bay Path continues to invest and grow our programs in the life sciences, our planning must be conducted in collaboration with the life sciences industry in Massachusetts where our students are most likely to pursue careers, thereby ensuring their success and also enabling the industry as a whole to flourish,” said Dr. Melissa Morriss-Olson, Provost and Vice President for Academic Affairs of Bay Path College.

In December, 2012, Lieutenant Governor Murray and the MLSC announced a round of equipment and supply grants for vocational and technical high schools and public high schools in gateway cities, with the idea of furthering STEM education. High schools in Western Massachusetts received more than \$500,000 toward lab renovation and equipment. The six schools in Western Massachusetts, the city or town in which they are located, and the amount of their respective grants are as follows:

About the Massachusetts Life Sciences Center

The Massachusetts Life Sciences Center (MLSC) is a quasi-public agency of the Commonwealth of Massachusetts tasked with implementing the Massachusetts Life Sciences Act, a 10-year, \$1-billion initiative that was signed into law in June of 2008. The MLSC's mission is to create jobs in the life sciences and support vital scientific research that will improve the human condition. This work includes making financial investments in public and private institutions that are advancing life sciences research, development and commercialization as well as building ties among sectors of the Massachusetts life sciences community. For more information, visit www.masslifesciences.com.

REPORT CONFIRMS THAT GOVERNOR PATRICK'S LIFE SCIENCES INITIATIVE IS CREATING JOBS AND ECONOMIC OPPORTUNITY

Massachusetts leads the nation in creating jobs in the life sciences sectors



Governor Patrick joins the Boston Foundation for an announcement relative to the Massachusetts Life Sciences sector. (Photo credit: Eric Haynes / Governor's Office)

[View more photos](#)

BOSTON – Tuesday, March 26, 2013 – The Boston Foundation today released a report showing that the Patrick-Murray Administration's investments in the life sciences sector are making a measurable impact on job creation and spurring economic growth across the Commonwealth. The report also encourages continued funding of the Life Sciences Initiative, the Administration's 10-year \$1 billion investment package in the Life Sciences industries that has helped make Massachusetts a national leader in this growing sector.

“The Life Sciences Initiative is meeting its growth objectives and then some,” said Governor Deval Patrick in an event announcing the report at the Boston Foundation earlier today. “Because we chose to shape the future we wanted, rather than just wait to see what happens, Massachusetts is now the world's leading life sciences supercluster, and we have the jobs and economic opportunity that come with that.”

In 2007, Governor Patrick proposed a 10-year, \$1 billion Massachusetts Life Sciences Initiative. The initiative was passed by the Legislature in 2008, and the Massachusetts Life Sciences Center (MLSC) was charged with implementing it. The goal of this initiative has been to make the Commonwealth home to the most vibrant life sciences supercluster in the world, attracting investment dollars, creating well-paying jobs, expanding a technically skilled workforce and supporting an energetic landscape for innovation and entrepreneurship.

The report, *Life Sciences Innovation as a Catalyst for Economic Development: The Role of the Massachusetts Life Sciences Center*, was unveiled earlier today at an Understanding Boston forum at the Boston Foundation. The research found that the MLSC has had a measurable impact on job creation through its over \$300 million in investments as of June, 2012. Over the last 10 years the state's life sciences cluster has created jobs in Massachusetts at a faster pace than any other industry sector in the Commonwealth, and since 2008, Massachusetts has overtaken all competitor states in the rate of life sciences job creation. The report also commends the MLSC for its administrative efficiency and sound judgment in its investments and applauds the Governor and the Legislature for its foresight in creating the Center.

The MLSC is driving job creation in Massachusetts through several different programs, including loans to early-stage companies, grants to support industry-academic research collaborations, cutting edge infrastructure, growth incentives, workforce training and internships that help smaller companies access Massachusetts workers. The research found that the MLSC's investments in start-up companies is an especially strong draw to Massachusetts for larger companies, which rely on smaller companies to help them access and develop new technologies at a faster rate. The MLSC's role in helping these start-up firms gain traction in Massachusetts has been instrumental in encouraging the larger bioscience companies to locate and create jobs in the Commonwealth.

Building on these targeted investments, Governor Patrick unveiled a budget proposal in January that includes new investments in education and transportation, investments that have proven to create new jobs and economic opportunities. The Governor's plan includes a \$1 billion annual investment in the Commonwealth's transportation system to maintain the transportation assets we have today and launch a number of high-impact transportation projects across Massachusetts that, if built, will create thousands of jobs and spur economic development across the Commonwealth. The plan also includes a \$550 million investment in education, reaching \$1 billion over four years, to expand access to high quality educational opportunities and make higher education more affordable for all students in Massachusetts.

The report was conducted through the Kitty and Michael Dukakis Center for Urban and Regional Policy at Northeastern University and authored by Barry Bluestone and Alan Clayton-Matthews. Click [here](#) to view the full report.

LIEUTENANT GOVERNOR MURRAY AND MASSACHUSETTS LIFE SCIENCES CENTER ANNOUNCE EQUIPMENT AND SUPPLY MATCHING GRANTS FOR PUBLIC HIGH SCHOOLS

Grants to fund new equipment for life sciences job training at vocational schools, high schools in Gateway Cities

WESTFORD – Thursday, December 20, 2012 – Lieutenant Governor Timothy Murray and the Massachusetts Life Sciences Center (MLSC) today announced \$3.2 million in grants to support the purchase of life sciences training equipment and supplies at vocational technical schools, public high schools in Massachusetts' Gateway Cities, and workforce training programs across the state.

Lieutenant Governor Murray launched the first round of the MLSC Equipment and Supplies for High Schools Grant Program at the 7th Annual Science, Technology, Engineering, and Math (STEM) Summit held in 2010. Building on the success of the first year of the program, Lieutenant Governor Murray visited the Nashoba Valley Technical High School, one of the recipients in this latest round, to award the vocational technical school with a \$96,665 grant to support the expansion of their Engineering Academy to include biotechnical engineering and robotic fabrication. In addition to Nashoba Valley, 30 other schools and programs were also awarded grants today.

“Our Administration continues to invest in STEM education, jobs, and workforce development to prepare the next generation of students and leaders in our economy,” said Lieutenant Governor Murray, Chair of the Governor’s STEM Advisory Council. “By partnering with the Massachusetts Life Sciences Center, we are delivering resources for schools to invest in advanced equipment and supplies. Students will gain more hands-on experience in the classroom, further engaging them in STEM fields that will get them excited about future careers in innovative industries.”

Awardees provide a breadth of training ranging from general STEM education curricula to biotechnology. The student population that will benefit from these equipment grants represents a diverse workforce, including workers seeking re-training and low-income individuals preparing for entry-level positions.

This grant program seeks to further the development of the state’s life sciences workforce by providing funding of up to \$250,000 per institution for life sciences equipment and supplies. To be eligible for an award of greater than \$100,000, applicants must have secured matching funds or in-kind donations from an industry partner that supports the training program for which the equipment and supplies are needed. Industry sponsors have contributed more than \$400,000 in matching funds and in-kind donations as part of this year’s program.

“Training students to enter the life sciences workforce is a critical part of the Center’s mission,” said Susan Windham-Bannister, Ph.D., President & CEO of the MLSC. “We want to make those opportunities available to all students across the state, which is why we are focusing resources in this round of grant awards on our voc/tech schools, and public high schools in our gateway cities. These investments will both strengthen and diversify our life sciences workforce in Massachusetts.”

“We as a career and technical school district, for the past two decades have changed our direction and mission to meet the highest skill standards of the global workplace,” said Dr. Judith Klimkiewicz, Superintendent of Nashoba Valley Technical High School. “We are focused on creating the newest technical programs necessary to meet the needs of the Commonwealth and the nation’s growing science, health, human services and biotechnology industries. We opened Engineering Technology ten years ago and have continued to expand STEM Education in all of our technical programs. Use of the equipment purchased through this grant will enable our students in our health sciences, Engineering Technology and Advanced Placement Biology programs to expand their core curriculums to address specific mathematic and scientific concepts unique to biotechnology.”

“Vocational technical and agricultural education is a blend of quality education, skill development, preparation for post-secondary education and preparation for the workforce of the future,” said Peter D. Dewar, Director of Professional Development, Massachusetts Association of Vocational Administrators. “The grants being awarded today will go far to enhance and in some schools introduce life sciences education as a workforce component. This will help us continue our quest as we seek to maintain our standing as one of the finest vocational technical and agricultural public education systems in the country.”

"I'm very excited that this grant has been awarded to Nashoba Valley Tech," said Timothy Blicharz, Senior Scientist for Seventh Sense Biosystems of Cambridge, a company that is collaborating with Nashoba Valley Technical on their biotechnology training programs. “It will be a huge help to foster the students' interest in the sciences and help shape them into the leading scientists and engineers of tomorrow.”

The 31 schools and programs that are receiving awards, the city or town in which they are located, and the amount of their grant are as follows:

School/Organization	City/Town	Award Amount
Assabet Valley Regional Technical High School	Marlborough	\$ 90,284.00
Blackstone Valley Regional Vocational Technical High School	Upton	\$ 99,984.00
Blue Hills Technical School District	Canton	\$ 100,000.00
Bristol-Plymouth Regional Technical School District	Taunton	\$ 99,940.20

Cape Cod Regional Technical High School	Harwich	\$ 77,738.02
Fall River Public Schools (Durfee High School)	Fall River	\$ 92,555.23
Greater Lowell Regional Vocational Technical High School	Tyngsboro	\$ 89,936.15
Haverhill High School	Haverhill	\$ 99,289.40
Holyoke Public Schools (Dean Tech & Holyoke High School)	Holyoke	\$ 195,019.93
Lynn English High School	Lynn	\$ 77,419.35
Massachusetts Biotechnology Education Foundation	Cambridge	\$ 249,777.00
Minuteman Regional Vocational Technical School District	Lexington	\$ 134,137.91
Montachusett Regional Vocational Technical School District	Fitchburg	\$ 248,274.76
Nashoba Valley Technical High School	Westford	\$ 96,665.20
Norfolk County Agricultural High School	Walpole	\$ 97,612.00
North Shore Technical High School	Middleton	\$ 99,999.52
Northeast Metropolitan Vocational School District	Wakefield	\$ 71,610.00
Quaboag Regional Middle High School	Warren	\$ 7,438.65
Quincy High School	Quincy	\$ 94,469.05
Revere High School	Revere	\$ 98,176.02
Rindge School of Technical Arts	Cambridge	\$ 100,000.00
Roger L. Putnam Vocational Technical Academy	Springfield	\$ 100,000.00
Shawsheen Valley Regional Vocational School District	Billerica	\$ 95,928.00

Smith Vocational and Agricultural High School	Northampton	\$ 100,000.00
South Shore Vocational Technical High School	Hanover	\$ 119,925.00
Taconic High School	Pittsfield	\$ 88,028.74
Taunton Public Schools	Taunton	\$ 99,384.00
The BioBuilder Educational Foundation	Cambridge	\$ 95,300.00
Westfield Public Schools	Westfield	\$ 44,333.00
Worcester North High School	Worcester	\$ 64,995.00
Worcester Technical High School	Worcester	\$ 99,982.82

"This funding will provide much needed supplies and equipment to Gateway City schools and Vocational-Technical programs across the Commonwealth to help train students in life sciences technology and research," said state Representative Alice H. Peisch, House Chair of the Education Committee. "I am grateful to the Administration and the Massachusetts Life Sciences Center for supporting this important initiative."

"The Patrick-Murray Administration has made a concerted effort to prioritize the needs of our Gateway Cities," said state Senator Eileen Donoghue. "I'm grateful for the emphasis they have placed on education in Gateway Cities, and I'm confident that this funding will go a long way for Nashoba Valley Technical High School."

"Our investments in the Life Sciences have been vital to the Massachusetts economy and the growth of new companies and technology in our state," state Senator Harriette Chandler. "I applaud the Patrick-Murray Administration for continuing to move forward with these important grants to these educational institutions."

"Thanks to the dedication of the Patrick-Murray Administration and the Massachusetts Life Sciences Center, our Vocational-Technical schools are leading the way in preparing our students to reignite the precision manufacturing industry in Massachusetts," said state Senator Gale Candaras. "Precision manufacturers across the state have stressed the need for more machinists in the next five years, and this funding will ensure that our students can fill these positions, which offer fair pay and benefits."

"I am so pleased once again with the results of the state's strong partnership with the Gateway Cities," said state Representative Tricia Farley-Bouvier. "Today we are coming together to support the important

life science training offered at Taconic High School. I appreciate the leadership that Department Chair Kristen Pearson has demonstrated in finding a way to provide the practical tools that are so crucial in preparing our students for career opportunities in STEM fields.”

“Representing two Gateway Cities, I am thrilled about this announcement and thankful to Governor Patrick for his steadfast commitment to provide all students across the Commonwealth an equal opportunity to learn,” said state Representative Kathi-Anne Reinstein. “These resources are critical in assisting disadvantaged children and their families overcome difficulties to gain a good education and lead successful lives.”

About the Massachusetts Life Sciences Center

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GOVERNOR PATRICK CELEBRATES GRAND OPENING OF ALBERT SHERMAN CENTER AT UMASS MEDICAL SCHOOL

\$90 million capital grant from the Massachusetts Life Sciences Center is the Center's largest investment to date

WORCESTER – Jan. 30, 2013 – Governor Deval Patrick and Lieutenant Governor Timothy Murray today joined UMass leadership, educators and state and local officials to celebrate the grand opening of the new Albert Sherman Center at the University of Massachusetts Medical School. Built in partnership with the University of Massachusetts Building Authority and funded in part with a \$90 million grant from the Massachusetts Life Sciences Center, investments of this kind are a key component of the Governor's plan to grow jobs and expand economic opportunity.

"Our investments in education, innovation and infrastructure have come together to support the completion of the Albert Sherman Center here at UMass Medical School," said Governor Patrick. "This landmark project is a testament to what is possible when we work together to invest in this generation and the next."

"As we continue to invest in innovation in all regions of the Commonwealth, the Sherman Center at UMass Medical School stands out as a leading research and educational institution not just for Worcester County but for the entire state," said Lieutenant Governor Timothy Murray. "We look forward to the tremendous knowledge and growth this institute will lend in finding cures to complex diseases, supporting the medical and life sciences industries, and creating jobs and investment in Massachusetts."

Named for UMass Medical School's former vice chancellor for university relations, the Albert Sherman Center has doubled the research capacity of the Worcester campus with 512,000 square feet of interdisciplinary research and education space designed to maximize collaboration among scientists, educators and students across multiple fields. It is the new home of the Advanced Therapeutics Cluster, comprising the RNA Therapeutics Institute, the Center for Stem Cell Biology and Regenerative Medicine and the Gene Therapy Center, and contains wet research space for more than 90 investigators. These translational scientists pursue novel bench-to-bedside research in emerging scientific fields with the goal of developing new innovative therapies for diseases ranging from cancer to amyotrophic lateral sclerosis (ALS), also known as Lou Gehrig's disease, and cystic fibrosis.

"The Albert Sherman Center was one of the MLSC's earliest investments, and at \$90 million remains our largest investment to date," said Susan Windham-Bannister, Ph.D., President & CEO of the Massachusetts Life Sciences Center. "The advanced therapeutic research that will be housed in this facility will generate promising new treatments as well as spin out new companies. UMMS, the state's first and only public medical school, is a science pioneer and the Center is very pleased to advance their work through this investment. With this investment we also are implementing the Patrick/Murray Administration's vision to grow the life sciences all across the Commonwealth."

Last week, Governor Patrick unveiled a budget proposal that includes new investments in education, innovation and infrastructure, areas that have proven to create new jobs and economic opportunities through increased public investments for every part of the Commonwealth. This includes \$25 million for the Massachusetts Life Sciences Center in the coming fiscal year to continue their landmark investments in innovation for the life sciences.

Through the Massachusetts Life Sciences Center, Massachusetts is investing \$1 billion over 10 years in the growth of the state's life sciences supercluster. These investments are being made under the Massachusetts Life Sciences Initiative, proposed by Governor Patrick in 2007, and passed by the State Legislature and signed into law by Governor Patrick in 2008.

"The completion of the Albert Sherman Center is a transformative event in the history of the Commonwealth's medical school," said Chancellor Michael F. Collins. "It would be hard to overstate the importance of this new center to our campus, or the positive impact of the work that will go on within it."

"We are honored and privileged to be part of this ground breaking, collaborative construction effort," said Peter Campot, Suffolk's president of Healthcare and Science-Technology and chief innovation officer. "This unique project gave us an opportunity to implement the most innovative planning and construction methods in the industry, including virtual design and construction and six-dimensional facility modeling. These state-of-the-art processes and tools, along with our 'build smart' approach to construction management, allowed us to deliver a facility that will set a new standard for biomedical research for generations to come."

Appendix B:

Legislation

**Acts****2008****CHAPTER 130** AN ACT PROVIDING FOR THE INVESTMENT IN AND EXPANSION OF THE LIFE SCIENCES INDUSTRY IN THE COMMONWEALTH.

Whereas, The deferred operation of this act would tend to defeat its purpose, which is to provide forthwith for the immediate investment in and expansion of the life sciences in the commonwealth, therefore it is hereby declared to be an emergency law, necessary for the immediate preservation of the public convenience.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same as follows:

SECTION 1. To provide for supplementing certain items in the general appropriation act and other appropriation acts for fiscal year 2008, the sums set forth in section 2 are hereby appropriated from the General Fund unless specifically designated otherwise in this act or in those appropriation acts, for the several purposes and subject to the conditions specified in this act or in those appropriation acts, and subject to the laws regulating the disbursement of public funds for the fiscal year ending June 30, 2008; provided, however that notwithstanding any general or special law to the contrary, appropriations made in this act shall not revert and shall be available for expenditure until June 30, 2009. These sums shall be in addition to any amounts previously appropriated and made available for the purposes of those items.

NO SECTION 2.

SECTION 2A.

EXECUTIVE OFFICE OF ADMINISTRATION AND FINANCE.

Small Business Capital Access Program.

1599-7107 For a capital access reserve to provide loan guarantees to small businesses pursuant to section 57 of chapter 23A of the General Laws \$5,000,000

SECTION 2B. To provide for a program of infrastructure development, improvements and various capital investments, the sums set forth in this section for the several purposes and subject to the conditions specified in this act, are hereby made available, subject to the laws regulating the disbursement of public funds and approval thereof.

EXECUTIVE OFFICE OF HOUSING AND ECONOMIC DEVELOPMENT.

Massachusetts Life Sciences Center.

7002-0015 For the Massachusetts Life Sciences Investment Fund established by section 6 of chapter 23I of the General Laws; provided, however, that not less than \$12,900,000 shall be expended for and used to assist in water and waste water infrastructure improvements for the proposed cell culture manufacturing facility and purification plant containing office and lab facilities in the town of Framingham; provided, further, that not less than \$12,600,000 shall be expended for the construction of supporting infrastructure, comprised of local arterial and connector roads for the I-93 interchange in the towns of Andover, Wilmington and Tewksbury; provided, further, that not less than \$6,500,000 shall be expended for the design, construction and development for a life science incubator building at the William Stanley Business Park in the city of Pittsfield; provided, further, that not less than \$10,000,000 shall be expended for a new nano and biomanufacturing facility at the University of Massachusetts at Lowell; provided, further, that \$5,500,000 shall be appropriated to the Baystate Medical Center for the purpose of executing a lease agreement with the Pioneer Valley Life Sciences Institute in the city of Springfield for costs associated with the capital expansion of a life sciences incubator; provided, further, that not less than \$1,100,000 shall be expended for the purchase and conversion of 3 vehicles into mobile science laboratories to support biotechnology education initiatives of the Massachusetts Academy for Life Sciences established by subsection (c) of section 2MMM of chapter 29 of the General Laws; provided, further, that said mobile science laboratories shall advance the goals of the Massachusetts Academy for Life Sciences; provided, further, that funds for those purposes shall be provided through a contract with the Massachusetts Biotechnology Education Foundation to provide grants, in consultation with the board of higher education, to public and private institutions of higher learning to purchase and convert vehicles into mobile science laboratories; provided, further, that each vehicle shall be fueled with an alternative fuel, as defined in 42 U.S.C. section 13211; provided, further, that amounts expended shall include the cost of vehicles, equipment, furniture and other costs associated with the conversion of the vehicles into mobile science laboratories; provided, further, that all 3 mobile science laboratories shall be owned and operated by each participating institution of higher learning and assigned to a specific region of the commonwealth, as designated by the Massachusetts Academy for Life Sciences, in consultation with each institution of higher learning; provided, further, that the designated regions shall not overlap; provided, further, that not less than \$9,500,000 shall be expended for construction and capital improvements at the Tufts University Cummings School of Veterinary Medicine New England Regional Biosafety Laboratory to improve public health, protect public safety, improve science education and stimulate economic development by providing the opportunity to translate laboratory discoveries into viable vaccines, therapies and cures for emerging infectious diseases and bioterrorist threats; provided, further, that not less than \$10,000,000 shall be expended for construction, renovations and infrastructure improvements for the Marine Biological Laboratory located in Woods Hole; provided, further, that said Marine Biological Laboratory shall collaborate with the Regional Technology Development Corporation of Cape Cod and the University of Massachusetts at Dartmouth to create and support a Center for Regenerative Biology and Medicine located at said Marine Biological Laboratory to develop commercial marine technology, provide research and development for life sciences including, but not limited to, marine-based stem cell research, and expand life science and marine technology education; provided, further, that not less than \$5,000,000 shall be expended for

the design, construction, development and related infrastructure improvements for a regional incubation center for life science initiatives to be located in the city of New Bedford and operated in conjunction with the University of Massachusetts at Dartmouth and Bristol Community College; provided, further, that not less than \$5,000,000 shall be expended for the design, construction, development and related infrastructure improvements for a life sciences center which shall be located at the former Paul A. Dever State School in the city of Taunton and managed by a board of directors consisting of 13 members: 1 of whom shall be the chancellor of the University of Massachusetts at Dartmouth or his designee, 1 of whom shall be the president of Bridgewater State College or his designee, 1 of whom shall be the president of the Massachusetts Maritime Academy or his designee, 1 of whom shall be the president of Massasoit Community College or his designee, 1 of whom shall be the president of Cape Cod Community College or his designee, 1 of whom shall be the president of Bristol Community College or his designee, 1 of whom shall be the president of Wheaton College or his designee, 1 of whom shall be the commissioner of mental retardation or his designee, 1 of whom shall be the president of the Massachusetts Federation of Teachers or his designee, 1 of whom shall be the president of the Massachusetts Teachers Association or his designee, 1 of whom shall be the president of the Massachusetts AFL-CIO or his designee, 1 of whom shall be the president of the Taunton Area Chamber of Commerce or his designee, and 1 of whom shall be the director of Southeastern Regional Planning and Economic District or his designee; provided, further, that the life sciences center shall include, but not be limited to, an education and training facility and a laboratory research facility with state-of-the-art equipment offering research and development facilities for collaboration with industry partners; provided, further, that not less than \$10,000,000 shall be deposited in the Massachusetts Small Business Matching Grant Fund established in section 9 of said chapter 23I of the General Laws; provided, further, that not less than \$5,000,000 shall be deposited in the Massachusetts Life Sciences Education Fund established in section 10 of said chapter 23I of the General Laws; provided, further, that not less than \$90,000,000 shall be expended for the design, construction, development and related infrastructure improvements for an advanced therapeutics cluster to be constructed at the University of Massachusetts Medical School in Worcester, which shall be named the Albert "Albie" Sherman Center, and shall include a RNAi institute, a stem cell biology cluster, cord blood bank and a gene therapy cluster; provided, however, that said funds shall not be used for faculty salaries; provided, further, that not less than \$95,000,000 shall be expended for the design, construction, development and related infrastructure improvements of a life science laboratory research center complex including a laboratory research facility with state-of-the-art equipment offering research and development facilities for collaboration with industry partners to develop methods and technologies that may be translated into new commercial services and products at the University of Massachusetts at Amherst; provided, however, that said funds shall not be used for faculty salaries; provided, further, that not less than \$10,000,000 shall be expended for the purchase of state-of-the-art equipment, renovations and related expenses to support the Center for Personalized Cancer Therapy at the University of Massachusetts at Boston, a collaboration of the University of Massachusetts at Boston and the Dana-Farber Harvard Cancer Center; provided, however, that said funds shall not be used for faculty salaries; provided, further, that funds

appropriated for the design, construction, development and related infrastructure improvements for an advanced therapeutics cluster to be constructed at the University of Massachusetts Medical School in Worcester, for the design, construction, development and related infrastructure improvements of a life science laboratory research center complex at the University of Massachusetts at Amherst, for the design, construction, development and related infrastructure improvements for a nano and biomanufacturing facility at the University of Massachusetts at Lowell and for the renovations and related expenses for the Center for Personalized Cancer Therapy at University of Massachusetts at Boston shall be transferred to the University of Massachusetts Building Authority for these infrastructure improvements and design and construction; provided, further, that no funds shall be transferred from this item for a phase of construction until the secretary of administration and finance certifies in writing to the board of the Massachusetts Life Sciences Center established by section 3 of said chapter 23I of the General Laws and to the house and senate committees on ways and means that all sources of funding for that phase of the facility have been committed and are available as necessary for commencement of design and construction; provided, further, that said written certification shall include copies of all business plans, letters of financial commitment and other documentation as said secretary and said board deem necessary to certify that all other sources of funding have been secured; provided, further, that the University of Massachusetts Building Authority shall submit to the clerks of the house of representatives and the senate a report which shall include the following: (1) a detailed list of all private donors and amounts donated for each facility, (2) a plan for design, construction, operation and maintenance and all associated costs and revenues of the facility, including the projected timeline for the completion of all phases of said projects, and (3) a description of proposed title to any and all assets associated with each facility; provided, further, that said secretary and said board shall not expend any funds until such report is filed with the clerks of the house and senate who shall forward the same to the house and senate committees on ways and means; provided, further, that notwithstanding any general or special law to the contrary, in the construction and financing of said nano and biomanufacturing facility, said advanced therapeutics cluster, said life science laboratory research center complex and said Center for Personalized Cancer Therapy, said authority may use an alternative method for procurement of design and construction including, but not limited to, sequential construction management, turnkey, design and build procurement and the phasing of such procurement including, but not limited to, approval of design and construction stages separate from combined phases; provided, further, that said building authority shall require the assurance of labor harmony during all phases of development, including construction, reconstruction and capital and routine maintenance and shall provide adequate remedies to address the failure to maintain labor harmony which shall include, but not be limited to, assessment of liquidated damages and contract termination; provided, further, that the payment of prevailing wages, pursuant to sections 26 to 27F, inclusive, of chapter 149 of the General Laws, shall be required for all phases of said projects; and provided further, that not less than \$11,400,000 shall be expended as a grant for the acquisition of land pursuant to section 37 of this act to the University of Massachusetts at Dartmouth..... \$500,000,000

SECTION 3. Chapter 23I of the General Laws is hereby amended by striking out section 2, as

appearing in section 24 of chapter 123 of the acts of 2006, and inserting in place thereof the following section:-

Section 2. As used in this chapter, the following words shall, unless the context clearly requires otherwise, have the following meanings:-

“Affiliate”, any business which directly or indirectly controls or is controlled by or is under direct or indirect common control of another business including, but not limited to, any business with which a business is merged or consolidated, or which purchases all or substantially all of the assets of a business.

“Board”, the board of directors of the Massachusetts Life Sciences Center.

“Center”, the Massachusetts Life Sciences Center established by section 3.

“Certification proposal”, a written proposal submitted by a life sciences company for approval as a certified life sciences company pursuant to section 5.

“Certified life sciences company”, a company that has been certified by the center for participation in the commonwealth life sciences investment program and the life sciences tax incentive program, established by section 5.

“Company”, a business corporation, partnership, firm, unincorporated association or other entity engaged or proposing to engage in economic activity within the commonwealth, and any affiliate thereof, which is, or the members of which are, subject to taxation under chapter 62, 63, 64H or 64I.

“Department”, the department of revenue established pursuant to section 1 of chapter 14.

“Eligible new job”, a new job that shall not replace an existing job in the commonwealth and which may be a retained job; provided, however, that “eligible new job” may be further defined by rules, regulations or guidelines promulgated by the center pursuant to section 5; provided further, that an “eligible new job” shall be deemed to have been created in the commonwealth on the first day for which Massachusetts personal income tax withholding is required in connection with the compensation paid to an employee of a life sciences company or the first day for which Massachusetts estimated tax payments are payable by a partner of a partnership constituting a life sciences company.

“Enterprise”, a small business, as defined in chapters 23A or 40F, which has its principal place of business in the commonwealth and is, or proposes to be, engaged in research and development or manufacturing in the life sciences industry.

“Equity investment”, (a) a share in a life sciences company certified pursuant to section 5, whether or not transferable or denominated stock, or similar security; (b) interest of a limited partner in a limited partnership; or (c) warrant or right, other than a right to convert, to purchase, sell or subscribe to a share, security or interest of a kind specified in clauses (a) or (b); provided, however, that when making an equity investment in an enterprise pursuant to section 7, the center shall receive not less than 3 per cent of the equity in said enterprise.

“Independent research institution”, a nonprofit research organization that holds tax-exempt status granted under section 501(c)(3) of the Internal Revenue Code and shall be organized and operated exclusively for scientific or educational purposes; provided, however, that “independent research

institution” shall not mean a hospital, college, university or private foundation.

“Life sciences”, advanced and applied sciences that expand the understanding of human physiology and have the potential to lead to medical advances or therapeutic applications including, but not limited to, agricultural biotechnology, biogenerics, bioinformatics, biomedical engineering, biopharmaceuticals, biotechnology, chemical synthesis, chemistry technology, diagnostics, genomics, image analysis, marine biology, marine technology, medical devices, nanotechnology, natural product pharmaceuticals, proteomics, regenerative medicine, RNA interference, stem cell research and veterinary science.

“Life sciences company”, a business corporation, partnership, firm, unincorporated association or other entity engaged in life sciences research, development, manufacturing or commercialization in the commonwealth, and any affiliate thereof, which is, or the members of which are, subject to taxation under chapter 62, 63, 64H or 64I.

“New state revenue”, revenue derived from a life sciences company by the creation of any eligible new jobs or by new commercial activity that would otherwise not have taken place in the commonwealth or as may be defined by any rules or regulations promulgated by the center pursuant to section 5.

“Permanent full-time employee”, an individual who: (i) is in an employment relationship which, at its inception, does not have a termination date which is a date certain or which is determined with reference to the completion of some specified scope of work; (ii) works a minimum number of weekly hours as the center may specify by rule, regulation or guideline; and (iii) receives employee benefits at least equal to those provided to other full-time employees of the employer, which shall be a life sciences company.

“Person”, a natural person, corporation, association, partnership or other legal entity.

“Program”, the commonwealth life sciences investment program established by section 5.

“Professional investor”, a bank, bank holding company, savings institution, trust company, insurance company, investment company registered under the federal Investment Company Act of 1940, pension or profit-sharing trust or other financial institution or institutional buyer, licensee under the federal Small Business Investment Act of 1958 or any person, partnership or other entity of whose resources a substantial amount shall be dedicated to investing in securities or debt instruments and whose net worth exceeds \$250,000.

“Qualified security”, a note, stock, treasury stock bond, debenture, evidence of indebtedness, certificate of interest or participation in a profit-sharing agreement, preorganization certificate or subscription, transferable share, investment contract, certificate of deposit for a security, certificate of interest or participation in a patent or application therefor, or in royalty or other payments under such a patent or application; in general, any interest or instrument security, so-called, or any certificate for, receipt for, guarantee of, or option, warrant or right to subscribe to or purchase any of the foregoing; and debt of and partnership interest in, as a general or limited partner, any general or limited liability partnership organized under the laws of the commonwealth, and debt of and membership interest in any limited liability company organized under the laws of the commonwealth.

“Real estate project”, real property where, after a life sciences company is certified, construction or renovation shall be initiated which, when completed, shall result in an increase in the assessed value

of the real property of at least 100 per cent over its assessed value as of the date of certification; provided, however, that if a real estate facility is a business incubator facility and is designated as a certified life sciences company pursuant to section 5, each business which executes a binding lease for space in that facility after the date on which the construction or renovation activity begins shall be eligible for separate designation as a certified life sciences company.

“Revenue”, receipts, fees, rentals or other payments or income received or to be received on account of obligations to the center including, but not limited to, income on account of the leasing, mortgaging, sale or other disposition of a project or proceeds of a loan made by the center in connection with any project, and amounts in reserves or held in other funds or accounts established in connection with the issuance of bonds and the proceeds of any investments thereof, proceeds of foreclosure and any other fees, charges or other income received or receivable by the center.

“Seed capital”, financing that is provided for the development, refinement and commercialization of a product or process and other working capital needs.

“Taxpayer”, a certified life sciences company or person subject to the taxes imposed by chapter 62, 63, 64H or 64I.

“Vocational technical school”, education institutions established pursuant to sections 14 and 15 of chapter 71, providing vocational-technical education as defined in section 1 of chapter 74.

SECTION 4. Section 3 of said chapter 23I, as so appearing, is hereby amended by striking out subsection (b) and inserting in place thereof the following subsection:—

(b) The center shall be governed and its corporate powers exercised by a board of directors consisting of 7 directors: 1 of whom shall be the secretary of administration and finance or his designee; 1 of whom shall be the secretary of housing and economic development or his designee; 1 of whom shall be the president of the University of Massachusetts or his designee; and 4 of whom shall be appointed by the governor, 1 of whom shall be a physician licensed to practice medicine in the commonwealth and affiliated with an academic medical center, 1 of whom shall be a chief executive officer of a Massachusetts-based life sciences corporation which is a member of the board of directors of the Massachusetts Biotechnology Council, 1 of whom shall be a researcher involved in the commercialization of biotechnology, pharmaceuticals or medical diagnostic products and 1 of whom shall have significant financial experience in the life sciences sector. Each appointed member shall serve a term of 5 years, except that in making his initial appointments, the governor shall appoint 1 director to serve for a term of 1 year, 1 director to serve for a term of 2 years, 1 director to serve for a term of 3 years, 1 director to serve for a term of 4 years. The secretary of the executive office of administration and finance and the secretary of the executive office of housing and economic development, or their designees, shall serve as co-chairs of the board. Any person appointed to fill a vacancy in the office of an appointed director of the board shall be appointed in a like manner and shall serve for only the unexpired term of such director. Any director shall be eligible for reappointment. Any director may be removed from his appointment by the governor for cause.

SECTION 5. Subsection (c) of said section 3 of said chapter 23I, as so appearing, is hereby amended

by striking out the first paragraph and inserting in place thereof the following paragraph:-

Four directors shall constitute a quorum and the affirmative vote of a majority of directors present at a duly called meeting if a quorum is present shall be necessary for any action to be taken by the board. Any action required or permitted to be taken at a meeting of the directors may be taken without a meeting if all of the directors' consent in writing to such action and such written consent is filed with the records of the minutes of the meetings of the board. Such consent shall be treated for all purposes as a vote at a meeting. Each director shall make full disclosure, under subsection (d), of his financial interest, if any, in matters before the board by notifying the state ethics commission, in writing, and shall abstain from voting on any matter before the board in which he has a financial interest, unless otherwise permissible under chapter 268A.

SECTION 6. Said section 3 of said chapter 23I, as so appearing, is hereby further amended by striking out subsection (e) and inserting in place thereof the following:-

(e) The Board shall have the power to appoint and employ a president, and to fix his compensation and conditions of employment. The president shall be the chief executive, administrative and operational officer of the center and shall direct and supervise administrative affairs and the general management of the center. The president shall appoint and employ a chief financial and accounting officer and may, subject to the general supervision of the board, employ other employees, consultants, agents, including legal counsel, and advisors, and shall attend meetings of the board. The chief financial and accounting officer of the center shall be in charge of its funds, books of account and accounting records. No funds shall be transferred by the center without the approval of the board and the signatures of the chief financial and accounting officer and the treasurer, as appointed by the board pursuant to subsection (g).

SECTION 7. The first sentence of subsection (g) of said section 3 of said chapter 23I of the General Laws, as so appearing, is hereby amended by striking out the word "chairperson," and inserting in place thereof the following words:— treasurer and.

SECTION 8. Said subsection (g) of said section 3 of said chapter 23I, as so appearing, is hereby further amended by striking out the last sentence.

SECTION 9. Clause (14) of subsection (a) of section 4 of said chapter 23I of the General Laws, as so appearing, is hereby amended by striking out the words ", issue bonds and apply the proceeds thereof as provided in section 8,".

SECTION 10. Clause (15) of said subsection (a) of said section 4 of said chapter 23I, as so appearing, is hereby amended by striking out the words ", all as provided in section 8".

SECTION 11. Said section 4 of said chapter 23I, as so appearing, is hereby further amended by striking out clauses (16) and (17) and inserting in place thereof the following 2 clauses:-

(16) to act as the central entity and coordinating organization of life sciences initiatives on behalf of the commonwealth and to work in collaboration with governmental entities, bodies, centers, institutes and facilities and promote all areas of life sciences to advance the commonwealth's interests and investments in the life sciences;

(17) to promulgate a code of ethics to address collaborative state and business research activities; provided, further, that said code of ethics shall include recommendations, and proposed legislation if necessary, addressing the issue of exclusive licensing agreements for intellectual property developed using state funds between state-funded colleges and universities and private companies and institutions. Said code shall be forwarded to the clerks of the house and senate who shall forward the same to the joint committee on economic development and emerging technologies.

SECTION 12. Said section 4 of said chapter 23I, as so appearing, is hereby further amended by adding the following 3 clauses:-

(30) to operate as a licensed small business investment corporation pursuant to the provisions of the Small Business Investment Act of 1958, 15 U.S.C. section 661 et seq., as amended; provided, however, that as an alternative, the board may establish a subsidiary corporation to operate as a licensed small business investment corporation pursuant to said Small Business Investment Act of 1958, 15 U.S.C. section 661 et seq., and to make investments in qualified securities of enterprises through such subsidiary;

(31) to track and report to the general court on federal initiatives that have an impact on life sciences companies doing business in the commonwealth; and

(32) to create award programs to acknowledge successful companies, public and private institutions and programs in industry-specific areas, as determined by the center.

SECTION 13. Said chapter 23I is hereby further amended by striking out sections 5 to 8, inclusive, as so appearing, and inserting in place thereof the following 13 sections:-

Section 5. (a) There shall be established a commonwealth life sciences investment program which shall be administered by the center. The purpose of the program shall be to expand life sciences-related employment opportunities in the commonwealth and to promote health-related innovations by supporting and stimulating research and development, manufacturing and commercialization in the life sciences. Life sciences companies certified pursuant to subsection (b) shall be eligible for participation in the program.

(b) The center may, upon a majority vote of the board, certify a life sciences company as a certified life sciences company upon: (i) the timely receipt, as determined by the center, of a certification proposal supported by independently verifiable information, signed under the pains and penalties of perjury by a person expressly authorized to contract on behalf of the life sciences company and which shall include, but not be limited to: (A) an estimate of the projected new state revenue the life sciences

company expects to generate during the period for which the company seeks certification, together with a plan, including precise goals and objectives, by which the life sciences company proposes to achieve the projected new state revenue, including for each tax year, an estimate of new commercial revenue that the commonwealth would not otherwise have received, an estimate of the number of permanent full-time employees to be hired or retained, an estimate of the year in which the company expects to hire or retain the employees, an estimate of the projected average salaries of said employees, an estimate of the projected taxable income pursuant to chapter 62 or 63 generated by said employees and an estimate of the methods by which the company shall obtain new employees and pursue a diverse workforce; (B) documentation of an agreement, if any, between the life sciences company and banking institutions with which the life science company shall have agreed to establish accounts and by which the banking institutions shall have agreed to commit a specified percentage of the funds deposited in the accounts for loans made thereby to companies under the small business capital access program established pursuant to section 57 of chapter 23A; and (C) if appropriate, documentation that the life sciences company has received approval for a certified project, pursuant to section 3F of chapter 23A; and (ii) findings made by the center, based on the certification proposal, documents submitted therewith and any additional investigation by the center, and incorporated in its approval, that: (A) the life sciences company shall meet all statutory requirements and any other criteria that the center may prescribe including, but not limited to criteria in the following areas: whether the life sciences company has sufficient business contacts with the commonwealth as evidenced by its business activity within the commonwealth including, but not limited to, the number of full-time employees employed in the commonwealth; the life sciences company's potential to further technological advancements in the life sciences; the life sciences company's potential to offer a breakthrough medical treatment for a particular disease, or medical condition; the life sciences company's potential for leveraging additional funding or attracting additional resources to the commonwealth; the life sciences company's potential to promote life sciences manufacturing in the commonwealth; and evidence of potential royalty income and contractual means to recapture such income for the purposes of this chapter, as the center considers appropriate; and (B) a certified life sciences company shall meet the new state revenue and employment growth projections, as specified in the certification proposal, over the period for which it receives benefits.

(c) A certified life sciences company may, upon a majority vote of the board, be eligible for the following benefits which shall be awarded by the board on a competitive basis: (1) benefits from the life sciences tax incentive program established by subsection (d); (2) grants, loans or other investments from the Massachusetts Life Sciences Investment Fund established by section 6; (3) equity investments from the Dr. Craig C. Mello Small Business Equity Investment Fund established by section 7; (4) assistance from the regional technology and innovation centers established by section 11; (5) assistance from the center to obtain designation as a certified project in an economic opportunity area pursuant to section 3F of chapter 23A; (6) assistance from the center in accessing economic incentive programs within the Massachusetts office of business development, including access to the technical, human, financial, training, educational and site-finding resources necessary to expand or locate in the commonwealth; (7) assistance from the center in obtaining federal grants; (8) assistance from the center in facilitating clinical trials; (9) preference for funding for life science job

training programs; or (10) preference for pre-permitted industrial land as identified by the Massachusetts Development Finance Agency.

(d) There shall be established a life sciences tax incentive program. The center, in consultation with the department, may annually authorize incentives, including incentives carried forward, refunded or transferred, pursuant to the following: subsection (m) of section 6 of chapter 62, subsection (n) of said section 6 of said chapter 62, paragraph 17 of section 30 of chapter 63, section 31M of said chapter 63, paragraph 6 of subsection (f) of section 38 of said chapter 63, the fourth paragraph of section 38C of said chapter 63, subsection (j) of section 38M of said chapter 63, section 38U of said chapter 63, section 38V of said chapter 63, section 38W of said chapter 63, the third paragraph of section 42B of said chapter 63, and subsection (xx) of section 6 of chapter 64H, in a cumulative amount, including the current year cost of incentives allowed in previous years, that shall not exceed \$25,000,000 annually. The center may, in consultation with the department, limit any incentive or incentives to a specific dollar amount or time duration, or in any other manner deemed appropriate by the department; provided, however, that the department shall only allocate said incentives among commonwealth certified life sciences companies pursuant to subsection (b) and shall award said tax incentives pursuant to subsection (c).

The center shall provide an estimate to the secretary of administration and finance of the tax cost of extending benefits to a proposed project before certification, as approved by the commissioner of revenue, based on reasonable projections of project activities and costs. Tax incentives shall not be available to any certified life sciences company unless expressly granted by the secretary of administration and finance in writing.

(e) (1) Certification granted pursuant to subsection (b) shall be valid for 5 years starting with the tax year in which certification is granted. Each certified life sciences company shall file an annual report with the center detailing whether it has met the specific targets established in the proposal pursuant to subclause (A) of clause (i) of subsection (b).

(2) The certification of a life sciences company may be revoked by the center after an independent investigation and determination that representations made by the certified life sciences company in its certification proposal are materially at variance with the conduct of the life sciences company after receiving certification; provided, however, that the center shall review the certified life sciences company at least annually; provided, further, that a project with an actual return on investment that is less than 70 per cent of the return on investment projected in the certification proposal shall be deemed to contain a material variance for a revocation determination. If the center determines not to revoke certification upon a finding that the actual return on investment for the project is less than 70 per cent, the center shall provide its reasons for the decision in writing to the secretary of administration and finance, the commissioner of revenue and the clerks of the house of representatives and the senate, who shall forward the same to the house and senate committees on ways and means, the joint committee on revenue and the joint committee on economic development and emerging technologies. The center shall post these reasons on the internet for public access.

(3) Under this subsection, revocation shall take effect on the first day of the tax year in which the center determines that a material variance commenced. The commissioner of revenue shall, as of the effective date of the revocation, disallow any credits, exemptions or other tax benefits allowed by the

original certification of tax benefits under this section. The department shall issue regulations to recapture the value of any credits, exemptions or other tax benefits allowed by the certification under this section; provided, however, that the recapture provisions in subsection (m) of section 6 of chapter 62 and section 38U of chapter 63 shall apply. If the original certification allowed sales and use tax exemptions pursuant to subsection (xx) of section 6 of chapter 64H, the purchaser shall accrue use tax as of the date of revocation on a portion of the sales price on which exemption was claimed that is proportionate to the remaining useful life of the property.

(4) Nothing in this subsection shall limit any legal remedies available to the commonwealth against any certified life sciences company.

(f) Capital funding may be revoked only by the center after an independent investigation and determination that representations made by the life sciences company in its certification proposal are materially at variance with the conduct of the life sciences company after certification; provided, further, that a life sciences company generating less than 70 per cent of the projected new state revenue in the certification proposal shall be deemed to contain a material variance for the purposes of a revocation determination. If the center does not revoke certification despite said material variance, the center shall provide its reasons for the decision in writing to the secretary of administration and finance, the commissioner of revenue and the clerks of the house of representatives and the senate, who shall forward the same to the house and senate committees on ways and means, the joint committee on bonding, capital expenditures and state assets and the joint committee on economic development and emerging technologies. A notice of revocation under this subsection shall specify the date on which the revocation is effective, which shall be the date of the notice or the date on which the center determined that the material variance commenced. The secretary of administration and finance shall, as of the effective date of the revocation, disallow any loans, grants or other benefits allowed by the original certification under this section. The department may issue regulations to recapture any grants or loans allowed by the certification under this section.

(g) The center shall revoke the certification of a life sciences company when independent investigations conducted in 2 consecutive years determine that representations made by the life sciences company in its project proposal are deemed materially at variance, pursuant to paragraph (2) of subsection (e) or subsection (f).

(h) The board, in consultation with the executive office of administration and finance and the executive office of housing and economic development, shall promulgate rules, regulations or guidelines necessary to carry out the provisions of this section.

Section 6. (a) There shall be established and placed within the center a fund to be known as the Massachusetts Life Sciences Investment Fund, hereinafter in this section referred to as the fund, to be held by the center separate and apart from its other funds, to finance the activities of the center. The fund shall be credited any appropriations, bond proceeds or other monies authorized by the general court and specifically designated to be credited thereto, such additional funds as are subject to the direction and control of the center, any pension funds, federal grants or loans, royalties or private investment capital which may properly be applied in furtherance of the objectives of the fund, any proceeds from the sale of qualified investments secured or held by the fund, any fees and charges

imposed relative to the making of qualified investments as defined by the center, secured or held by the fund and any other monies which may be available to the center for the purposes of the fund from any other source or sources. Any revenues, deposits, receipts, or funds received through the receipt of royalties, interest, dividends, or the sale of equity instruments shall be deposited in the fund, and shall be available to the center for the purposes described in this section, without further appropriation. All available moneys in the fund that are unexpended at the end of each fiscal year shall not revert to the General Fund and shall be available for expenditure in the subsequent fiscal year.

(b) The center shall invest and reinvest the fund and the income thereof only as follows: (1) making qualified investments pursuant to subsection (c); (2) defraying the ordinary and necessary expenses of administration and operation associated with the center; provided, however, that said administrative and operational expenses shall not exceed 15 per cent of the maximum amount authorized to be expended from the fund in a fiscal year; (3) investing any funds not required for immediate disbursement in the purchase of such securities as may be lawful investments for fiduciaries in the commonwealth; (4) paying binding obligations associated with such qualified investments which shall be secured by the fund as the same become payable; and (5) paying principal or interest on qualified investments secured by the fund or paying any redemption premium required to be paid when such qualified investments shall be redeemed prior to maturity; provided, however, that monies in the fund shall not be withdrawn at any time in such an amount as would reduce the amount of the fund to less than the minimum requirement thereof established by the board, except for the purpose of paying binding obligations associated with qualified investments which shall be secured by the fund as the same become payable.

(c) The fund shall be held and applied by the center, subject to the approval of the board, to make qualified investments, grants, research and other funding and loans designed to advance the following public purposes for the life sciences in the commonwealth: (1) to stimulate increased financing for the expansion of research and development by leveraging private financing for highly productive state-of-the-art research and development facilities, equipment and instrumentation and by providing financing related thereto including, but not limited to, financing for the construction or expansion of such new facilities; (2) to make targeted investments, including research funding, proof of concept funding and funding for the development of devices, drugs or therapeutics and to promote manufacturing activities for new or existing advanced technologies and life sciences research; (3) to make matching grants to colleges, universities, independent research institutions, nonprofit entities, public instrumentalities, companies and other entities in connection with support from the federal government, industry and other grant-funding sources related to the expansion of research and development and to increase and strengthen economic development, employment opportunities and commercial and industrial sectors in the field of life sciences; (4) to provide bridge financing to colleges, universities, independent research institutions, nonprofit entities, public instrumentalities, companies and other entities for the receipt of grants as described in clause (3) awarded or to be awarded by the federal government, industry or other sources; (5) to provide fellowships, co-ops, internships, loans and grants; (6) to provide workforce training grants to prepare individuals for life sciences careers; (7) to provide funding for development, coordination and marketing of higher education programs; (8) to make qualified grants to certified life sciences companies for site remediation, preparation and

ancillary infrastructure improvement projects; and (9) to otherwise further the public purposes set forth herein.

(d) Proceeds of the fund may be used by the center to fund life sciences initiatives including: (1) international trade initiatives; (2) qualified grants to graduate level and doctoral students and post-doctoral fellows for living expenses from the Dr. Judah Folkman Higher Education Grant Fund established by section 8; (3) equity investments from the Dr. Craig C. Mello Small Business Equity Investment Fund established by section 7; (4) joint academic and industrial research and development and commercial business exchanges between the commonwealth and Israel, in collaboration with the Massachusetts international trade council; (5) the Massachusetts Technology Transfer Center, established by section 45 of chapter 75; (6) the Massachusetts Science, Technology Engineering, and Mathematics Grant Fund, established by section 2MMM of chapter 29; or (7) a program to promote the research and development of plant-made pharmaceuticals and industrial products through field trials, in collaboration with the department of agricultural resources.

(e) The center shall make no such qualified investment pursuant to clause (1) of subsection (b) unless: (1) said investment has been approved by a majority vote of the board; (2) the recipient is a certified life sciences company pursuant to section 5 or a project or initiative listed in subsection (d); (3) the center finds, to the extent possible, that a definite benefit to the commonwealth's economy may reasonably be expected from said qualified investment; provided, further, that in evaluating a request or application for funding, the center shall consider the following: (i) the appropriateness of the project; (ii) whether the project has significant potential to expand employment; (iii) the project's potential to enhance technological advancements; (iv) the project's potential to lead to a breakthrough medical treatment for a particular disease or medical condition; (v) the project's potential for leveraging additional funding or attracting resources to the commonwealth; (vi) the project's potential to promote manufacturing in the commonwealth; and (vii) evidence of potential royalty income and contractual means to recapture such income for the purposes of this chapter, as the center considers appropriate; (4) to the extent said investment is a capital investment made pursuant to clause (8) of subsection (c), the investment has been approved by the secretary of the executive office of administration and finance upon request of the center; provided, however, that said request shall be submitted to the secretary in writing and shall, include but not be limited to: (i) a description of the project or program to be funded; (ii) the economic benefits to the commonwealth which can reasonably be expected from said project or program; (iii) a copy of the proposed contract or other document executing the transaction between the center and the recipient of the funds; (iv) a description of the contractual or other legal remedies available to the center upon non-performance of the contract or other document executing the transaction by the recipient including, but not limited to, any provisions for restitution or reimbursement of the funds granted, loaned or otherwise invested in or with the recipient; and (v) any other information as the secretary may determine; and (5) said qualified investment conforms with the rules approved by the board.

Said rules shall set the terms and conditions for investments which shall constitute qualified investments including, but not limited to, loans, guarantees, loan insurance or reinsurance, equity investments, grants awarded pursuant to clause (3) of subsection (c), other financing or credit enhancing devices, as established by the center directly or on its own behalf or in conjunction with

other public instrumentalities, or private institutions or the federal government. Said rules shall provide that qualified investments made pursuant to clauses (1) and (2) of said subsection (c) shall involve a transaction with the participation of at least 1 at-risk private party.

Said rules shall establish the terms, procedures, standards and conditions which the center shall employ to identify qualified applications, process applications, make investment determinations, safeguard the fund, advance the objective of increasing employment opportunities, oversee the progress of qualified investments and secure the participation of other public instrumentalities, private institutions or the federal government in such qualified investments. Said rules shall provide for negotiated intellectual property agreements between the center and a qualified investment recipient which shall include the terms and conditions by which the fund's support may be reduced or withdrawn.

(f) The center may solicit investments by private institutions or investors in the activities of the fund and may reach agreements with such private institutions or investors regarding the terms of any such investments including, but not limited to, the rights of such investors to participate in the income or appropriation of the fund. To further the objective of securing investments by private institutions or investors in the activities of the fund pursuant to the preceding sentence, the center may develop a proposal creating a separate investment entity which shall permit the commingling of the fund's resources with the maximum participation by such private institutions or investors in a manner consistent with the public purpose of the fund and under the terms and conditions established to protect and preserve the assets of the fund.

(g) Copies of the approved rules, and any modifications, shall be submitted to the clerks of the house of representatives and the senate, who shall forward the same to the house and senate committees on ways and means and the joint committee on economic development and emerging technologies.

(h) Qualified investment transactions made by the center pursuant to this section shall not, except as specified in this chapter, be subject to chapter 175, or any successor thereto, and shall be payable solely from the Massachusetts Life Sciences Investment Fund established by this section and shall not constitute a debt or pledge of the full faith and credit of the commonwealth, the center or any subdivision of the commonwealth.

(i) The center shall not make expenditure from or commitment of the assets of the fund including, but not limited to, the making of qualified investments secured by the fund, if following the making of said qualified investment, the amount of the fund shall be less than the minimum requirement established by the board.

Section 7. (a) There shall be established and placed within the center a fund to be known as the Dr. Craig C. Mello Small Business Equity Investment Fund, hereinafter in this section referred to as the fund, to be held by the center separate and apart from its other funds. The fund shall be credited any appropriations, bond proceeds or other monies authorized by the general court and specifically designated to be credited thereto, such additional funds as are subject to the direction and control of the center, any pension funds, federal grants or loans, royalties or private investment capital which may properly be applied in furtherance of the objectives of the fund, any proceeds from the sale of qualified investments secured or held by the fund, any fees and charges imposed relative to the

making of qualified investments as defined by the center, secured or held by the fund and any other monies which may be available to the center for the purposes of the fund from any other source or sources. Any revenues, deposits, receipts, or funds received through the receipt of royalties, interest, dividends, or the sale of equity instruments shall be deposited in the fund, and shall be available to the center for the purposes described in this section, without further appropriation. All available moneys in the fund that are unexpended at the end of each fiscal year shall not revert to the General Fund and shall be available for expenditure in the subsequent fiscal year.

(b) The center shall invest and reinvest the fund and the income thereof only as follows: (1) making qualified equity investments pursuant to subsection (c); (2) investing funds not required for immediate disbursement in the purchase of such securities as may be lawful investments for fiduciaries in the commonwealth; (3) paying binding obligations associated with such qualified investments which shall be secured by the fund as the same become payable; and (4) paying principal or interest on qualified investments secured by the fund or paying any redemption premium required to be paid when such qualified investments shall be redeemed prior to maturity; provided, however, that monies in the fund shall not be withdrawn at any time in such an amount as would reduce the amount of the fund to less than the minimum requirement thereof established by the board, except for the purpose of paying binding obligations associated with qualified investments which shall be secured by the fund as the same become payable.

(c) The fund shall be held and applied by the center to make qualified equity investments in enterprises seeking to raise seed capital; provided, however, that said qualified equity investments shall not exceed \$250,000 in any 1 enterprise. The center shall not make such qualified equity investments unless: (1) said investment has been approved by a majority vote of the board; (2) the recipient is a life sciences company certified pursuant to section 5; and (3) the center finds, to the extent possible, that a definite benefit to the commonwealth's economy may reasonably be expected from said qualified investment. In evaluating a request or application for funding, the center shall consider whether: (i) the proceeds of the equity investment shall only be used to cover the seed capital needs of the enterprise except as hereinafter authorized; (ii) the enterprise has a reasonable chance of success; (iii) the center's participation is necessary to the success of the enterprise because funding for the enterprise is unavailable in the traditional capital markets or contingent upon matching funds, or because funding has been offered on terms that would substantially hinder the success of the enterprise; (iv) the enterprise has reasonable potential to create a substantial amount of primary employment in the commonwealth; (v) the enterprise's principals have made or are prepared to make a substantial financial and time commitment to the enterprise; (vi) the securities to be purchased shall be qualified securities; (vii) there shall be a reasonable possibility that the center shall, at a minimum, recoup its initial investment; (viii) binding commitments have been made to the center by the enterprise for adequate reporting of financial data to the center, which shall include a requirement for an annual or other periodic audit of the books of the enterprise, and for such control on the part of the center as the board shall consider prudent over the management of the enterprise, to protect the investment of the center including the board's right to access, without limitation, financial and other records of the enterprise; and (ix) a reasonable effort has been made to find a professional investor to invest in the enterprise and such effort was unsuccessful; and (4) said qualified equity investment

conforms with the rules approved by the board.

Said rules shall establish the terms, procedures, standards and conditions which the center shall employ to identify qualified applications, process applications, make investment determinations, safeguard the fund, advance the objective of increasing employment opportunities, oversee the progress of qualified equity investments and secure the participation of other public instrumentalities, private institutions or the federal government in such qualified equity investments. Said rules shall provide that each recipient of a qualified investment shall be required to pay a fee as a condition of such receipt, and said fee may take the form of points, an interest rate premium or a contribution of warrants or other forms of equity or consideration to the fund. Said rules shall provide for negotiated agreements between the center and each recipient of a qualified investment regarding the terms and conditions by which the fund's support thereof could be reduced or withdrawn.

(d) The center may solicit investments by private institutions or investors in the activities of the fund and may reach agreements with such private institutions or investors regarding the terms of such investments including, but not limited to, the rights of such investors to participate in the income or appropriation of the fund. To further the objective of securing investments by private institutions or investors in the activities of the fund pursuant to the preceding sentence, the center may develop a proposal relative to the creation of a separate investment entity which shall permit the commingling of the fund's resources with the maximum participation by such private institutions or investors consistent with the public purpose of the fund and under the terms and conditions established to protect and preserve the assets of the fund.

(e) Copies of the approved rules, and any modifications thereto, shall be submitted to the clerks of the house of representatives and the senate, who shall forward the same to the house and senate committees on ways and means and the joint committee on economic development and emerging technologies.

(f) Qualified equity investment transactions made by the center pursuant to this section shall not, except as specified in this chapter, be subject to chapter 175, or any successor thereto, and shall be payable solely from the Dr. Craig C. Mello Small Business Equity Investment Fund established by this section and shall not constitute a debt or pledge of the full faith and credit of the commonwealth, the center or any subdivision of the commonwealth.

(g) The center shall not make expenditure from or commitment of the assets of the fund including, but not limited to, the making of qualified investments secured by the fund, if following the making of said qualified investment, the amount of the fund shall be less than the minimum requirement established by the board.

Section 8. (a) There shall be established and placed within the center a fund to be known as the Dr. Judah Folkman Higher Education Grant Fund, hereinafter in this section referred to as the fund, to be held by the center separate and apart from its other funds. The fund shall be credited any appropriations, bond proceeds or other monies authorized by the general court and specifically designated to be credited thereto, such additional funds as are subject to the direction and control of the center, any pension funds, federal grants or loans, royalties or private investment capital which may properly be applied in furtherance of the objectives of the fund, any proceeds from the sale of qualified investments secured or held by the fund, any fees and charges imposed relative to the

making of qualified investments as defined by the center, secured or held by the fund and any other monies which may be available to the center for the purposes of the fund from any other source or sources. Any revenues, deposits, receipts, or funds received through the receipt of royalties, interest, dividends, or the sale of equity instruments shall be deposited in the fund, and shall be available to the center for the purposes described in this section, without further appropriation. All available moneys in the fund that are unexpended at the end of each fiscal year shall not revert to the General Fund and shall be available for expenditure in the subsequent fiscal year.

(b) The center shall invest and reinvest the fund and the income thereof only as follows: (1) making qualified grants pursuant to subsection (c); (2) investing funds not required for immediate disbursement in the purchase of such securities as may be lawful investments for fiduciaries in the commonwealth; (3) paying binding obligations associated with such qualified investments which shall be secured by the fund as the same become payable; and (4) paying principal or interest on qualified investments secured by the fund or paying any redemption premium required to be paid when such qualified investments shall be redeemed prior to maturity; provided, however, that monies in the fund shall not be withdrawn at any time in such an amount as would reduce the amount of the fund to less than the minimum requirement thereof established by the center, except for the purpose of paying binding obligations associated with qualified investments which shall be secured by the fund as the same become payable.

(c) The fund shall be held and applied by the center to make qualified grants to graduate level and doctoral students and post-doctoral fellows studying or employed in the life sciences for living expenses; provided, however, that the center shall make no such qualified grants unless said grant has been approved by a majority vote of the board. Grants awarded from the fund shall, in addition to any restrictions adopted by the center, shall be awarded in \$5,000 increments not to exceed \$15,000 annually per recipient and further restrictions include: (1) recipients shall be enrolled in a graduate or doctorate level program or shall be working as postdoctoral fellows at a college, university, independent research institution or an academic medical center in the commonwealth; (2) recipients shall be commonwealth residents; and (3) the annual total household income of a recipient shall not exceed 300 per cent of the federal poverty level. The center shall make no such qualified grants pursuant to said clause (1) of said subsection (b) unless such qualified grant conforms with rules approved by the board.

Said rules shall establish the terms and conditions for grants which constitute qualified grants and shall establish the terms, procedures, standards and conditions which the center shall employ to identify qualified applications, process applications, make grant determinations, safeguard the fund, oversee the progress of qualified grants and secure the participation of other public instrumentalities, private institutions or the federal government in such qualified grants.

(d) The center may solicit investments by private institutions or investors in the activities of the fund and may reach agreements with such private institutions or investors regarding the terms of any such investments including, but not limited to, the rights of such investors to participate in the income or appropriation of the fund. To further the objective of securing investments by private institutions or investors in the activities of the fund pursuant to the preceding sentence, the center may develop a

proposal creating a separate investment entity which shall permit the commingling of the fund's resources with the maximum participation by such private institutions or investors in a manner consistent with the public purpose of the fund and under the terms and conditions established to protect and preserve the assets of the fund.

(e) Copies of the approved rules, and any modifications thereto, shall be submitted to the clerks of the house of representatives and the senate, who shall forward the same to the house and senate committees on ways and means and the joint committee on economic development and emerging technologies.

(f) Qualified grants and investment transactions made by the center pursuant to the provisions of this section shall not, except as specified in this chapter, be subject to the provisions of chapter 175, or any successor thereto, and shall be payable solely from the Dr. Judah Folkman Higher Education Grant Fund, established by this section and shall not constitute a debt or pledge of the full faith and credit of the commonwealth, the center or any subdivision of the commonwealth.

(g) The center shall not make expenditure from or commitment of the assets of the fund including, but not limited to, the making of qualified investments secured by the fund, if following the making of said qualified investment, the amount of the fund shall be less than the minimum requirement established by the board.

Section 9. (a) There shall be established and placed within the center the Massachusetts Small Business Matching Grant Fund, hereinafter referred to in this section as the fund, to be held by the center separate and apart from its other funds. The fund shall be credited any appropriations, bond proceeds or other monies authorized by the general court and specifically designated to be credited thereto, such additional funds as are subject to the direction and control of the center, any pension funds, federal grants or loans, royalties or private investment capital which may properly be applied in furtherance of the objectives of the fund, any proceeds from the sale of qualified investments secured or held by the fund, any fees and charges imposed relative to the making of qualified investments as defined by the center, secured or held by the fund and any other monies which may be available to the center for the purposes of the fund from any other source or sources. Any revenues, deposits, receipts, or funds received through the receipt of royalties, interest, dividends, or the sale of equity instruments shall be deposited in the fund, and shall be available to the center for the purposes described in this section, without further appropriation. All available moneys in the fund that are unexpended at the end of each fiscal year shall not revert to the General Fund and shall be available for expenditure in the subsequent fiscal year.

(b) The center shall invest and reinvest the fund and the income thereof only as follows: (1) making qualified grants pursuant to subsection (c); (2) investing any funds not required for immediate disbursement in the purchase of such securities as may be lawful investments for fiduciaries in the commonwealth; (3) paying binding obligations associated with such qualified investments which shall be secured by the fund as the same become payable; and (4) paying principal or interest on qualified investments secured by the fund or paying any redemption premium required to be paid when such qualified investments shall be redeemed prior to maturity; provided, however, that monies in the fund shall not be withdrawn at any time in such an amount as would reduce the amount of the fund to less than the minimum requirement thereof established by the center, except for the purpose of paying

binding obligations associated with qualified investments which shall be secured by the fund as the same become payable.

(c) Notwithstanding any provision of this chapter to the contrary, a company need not be a certified life sciences company, as established in section 5, to be eligible for matching grants pursuant to this section. The fund shall be held and applied by the center to make qualified loans, grants or other investments to stimulate increased financing for life sciences and high technology research and development, manufacturing and commercialization in the commonwealth by matching grants to public agencies, independent research institutions, nonprofits or to life sciences or high technology companies to increase and strengthen the commonwealth's economic development, employment opportunities and commercial and industrial sectors. The fund shall provide matching grants to commonwealth-based life sciences or high technology companies that receive small business innovation research or small business technology transfer grants from the Small Business Administration, pursuant to 15 U.S.C. section 638, to assist companies that have developed new commercialization-ready technologies to reach production and create manufacturing jobs in the commonwealth. Said matching grants shall be used to create manufacturing jobs and may be used for, without limitation, the creation of, and capital improvements for, production facilities, workforce training, product marketing and purchasing infrastructure for product manufacturing. Said matching grants shall be distributed to eligible companies that have commercialization-ready technologies developed with assistance from the Small Business Administration in the form of \$1 in matching funds for every \$1 granted from the small business innovation research phase IIB grants, phase III grants and the commercialization pilot project established by 15 U.S.C. section 638. Said matching grants shall be awarded in consultation with the Small Business Association of New England. No such grant to any company shall exceed \$500,000 annually and the center shall make no such qualified loan, grant or other investment unless: (1) said loan, grant or investment has been approved by a majority vote of the board; (2) the center finds that, to the extent possible, a definite benefit to the commonwealth's economy may reasonably be expected from said qualified loan, grant or investment; provided, however, that in evaluating a request or application for funding, the center shall consider whether: (i) the loan, grant or investment shall stimulate increased financing for life sciences and high technology research and development, manufacturing and commercialization; (ii) the enterprise has a reasonable chance of success; (iii) center participation is necessary; (iv) the enterprise has the reasonable potential to create a substantial amount of new employment in the commonwealth; (v) the principals of the enterprise have made or are prepared to make a substantial financial and time commitment to the enterprise; (vi) binding commitments have been made to the center by the enterprise for adequate reporting of financial data to the center, which shall include a requirement for an annual or other periodic audit of the books of the enterprise, and for such control on the part of the center as the board shall consider prudent over the management of the company to protect the investment of the center including the board's right to access, without limitation, financial and other records of the enterprise; and (vii) a reasonable effort has been made to find a professional investor to invest in the enterprise and whether such effort was unsuccessful; and (3) said loan, grant or other investment conforms with rules approved by the board.

Said rules shall define life sciences technology and high technology for purposes hereof; provided,

however, that such definition shall include companies engaging in research and development, commercialization or manufacturing in the commonwealth. Said rules shall establish the terms and conditions for investments which constitute qualified investments, and may include, but not be limited to, loans, guarantees, loan insurance or reinsurance, equity investments or other financing or credit enhancing devices, as made by the center directly or on its own behalf or in conjunction with other public instrumentalities, private institutions or the federal government. Said rules shall establish the terms, procedures, standards and conditions which the center shall employ to identify qualified applications, process applications, make investment determinations, safeguard the fund, advance the objective of increasing employment opportunities for the citizens of the commonwealth, oversee the progress of qualified investments and secure the participation of other public instrumentalities, private institutions or the federal government in such qualified investments. Said rules shall provide that each recipient of a qualified investment shall be required to pay a fee as a condition of such receipt, and said fee may take the form of points, an interest rate premium or a contribution of warrants or other forms of equity or consideration to the fund. Said rules shall provide for negotiated agreements between the center and each recipient of a qualified investment regarding the terms and conditions by which the fund's support thereof could be reduced or withdrawn.

(d) The center may solicit investments by private institutions or investors in the activities of the fund and may reach agreements with such private institutions or investors regarding the terms of any such investments including, but not limited to, the rights of such investors to participate in the income or appropriation of the fund. To further the objective of securing investments by private institutions or investors in the activities of the fund pursuant to the preceding sentence, the center may develop a proposal relative to the creation of a separate investment entity which shall permit the commingling of the fund's resources with the maximum participation by such private institutions or investors consistent with the public purpose of the fund and under the terms and conditions established to protect and preserve the assets of the fund; provided, however, that if the creation or operation of such a separate entity would require additional or clarifying amendments to the enabling act of the center, said proposal shall include proposed statutory language with regard thereto. Any additional clarifying amendments to the enabling act shall be submitted by the center to the clerks of the house of representatives and the senate, who shall forward the same to the house and senate committees on ways and means and the joint committee on economic development and emerging technologies.

(e) Copies of the approved rules, and any modifications thereto, shall be submitted to the clerks of the house of representatives and the senate, who shall forward the same to the house and senate committees on ways and means and the joint committee on economic development and emerging technologies.

(f) Qualified investment transactions made by the center pursuant to the provisions of this section shall not, except as specified in this chapter, be subject to the provisions of chapter 175, or any successor thereto, and shall be payable solely from the Massachusetts Small Business Matching Grant Fund, established by this section and shall not constitute a debt or pledge of the full faith and credit of the commonwealth, the center or any subdivision of the commonwealth.

(g) The center shall not make expenditure from or commitment of the assets of the fund including, but

not limited to, the making of qualified investments secured by the fund, if following the making of said qualified investment, the amount of the fund shall be less than the minimum requirement established by the board.

(h) The center shall develop a plan ensuring that fund disbursements made pursuant to this section shall be distributed throughout all regions of the commonwealth.

Section 10. (a) There shall be established and placed within the center a fund to be known as the Massachusetts Life Sciences Education Fund, hereinafter in this section referred to as the fund, to be held by the center separate and apart from its other funds. The fund shall be credited any appropriations, bond proceeds or other monies authorized by the general court and specifically designated to be credited thereto, such additional funds as are subject to the direction and control of the center, any pension funds, federal grants or loans, royalties or private investment capital which may properly be applied in furtherance of the objectives of the fund, any proceeds from the sale of qualified investments secured or held by the fund, any fees and charges imposed relative to the making of qualified investments as defined by the center, secured or held by the fund and any other monies which may be available to the center for the purposes of the fund from any other source or sources. Any revenues, deposits, receipts, or funds received through the receipt of royalties, interest, dividends, or the sale of equity instruments shall be deposited in the fund, and shall be available to the center for the purposes described in this section, without further appropriation. All available moneys in the fund that are unexpended at the end of each fiscal year shall not revert to the General Fund and shall be available for expenditure in the subsequent fiscal year.

(b) The center shall invest and reinvest the fund and the income thereof only as follows: (1) making qualified grants pursuant to subsection (c); (2) investing any funds not required for immediate disbursement in the purchase of such securities as may be lawful investments for fiduciaries in the commonwealth; (3) paying binding obligations associated with such qualified investments which shall be secured by the fund as the same become payable; and (4) paying principal or interest on qualified investments secured by the fund or paying any redemption premium required to be paid when such qualified investments shall be redeemed prior to maturity; provided, however, that monies in the fund shall not be withdrawn at any time in such an amount as would reduce the amount of the fund to less than the minimum requirement thereof established by the center, except for the purpose of paying binding obligations associated with qualified investments which are secured by the fund as the same become payable.

(c) The fund shall be held and applied by the center to make qualified grants to vocational and technical schools for purchasing or leasing necessary equipment to train students in life sciences technology and research; provided, however, that the center shall make no such qualified grants unless: (1) said grant has been approved by a majority vote of the board; (2) the grant recipient shall be a vocational technical school; provided, however, that if funds remain after consideration of grant applications submitted by vocational technical schools, the center may make qualified grants to community colleges established by chapter 15A or any other general or special law; (3) the grant recipient has identified and properly trained instructors to use the equipment to be purchased or leased; and (4) said qualified grants conform with the rules approved by the board.

Said rules shall set the terms and conditions for grants which constitute qualified grants and shall set

forth the terms, procedures, standards and conditions which the center shall employ to identify qualified applications, process applications, make investment determinations, safeguard the fund, advance the objective of increasing employment opportunities for the citizens of the commonwealth, oversee the progress of qualified grants, and secure the participation of other public instrumentalities, private institutions or the federal government in such qualified grants.

(d) The center may solicit investments by private institutions or investors in the activities of the fund and may reach agreements with such private institutions or investors regarding the terms of any such investments including, but not limited to, the rights of such investors to participate in the income or appropriation of the fund. To further the objective of securing investments by private institutions or investors in the activities of the fund as established in the preceding sentence, the center may develop a proposal relative to the creation of a separate investment entity which shall permit the commingling of the fund's resources with the maximum participation by such private institutions or investors in a manner consistent with the public purpose of the fund and under terms and conditions established to protect and preserve the assets of the fund.

(e) Copies of the approved rules, and any modifications thereto, shall be submitted to the clerks of the house of representatives and the senate and shall forward the same to the house and senate committees on ways and means and the joint committee on economic development and emerging technologies.

(f) Qualified grants and investment transactions made by the center pursuant to the provisions of this section shall not, except as specified in this chapter, be subject to the provisions of chapter 175, or any successor thereto, and shall be payable solely from the Massachusetts Life Sciences Education Fund, established by this section and shall not constitute a debt or pledge of the full faith and credit of the commonwealth, the center or any subdivision of the commonwealth.

(g) The center shall not make expenditure from or commitment of the assets of the fund including, but not limited to, the making of qualified investments secured by the fund, if following the making of said qualified investment, the amount of the fund shall be less than the minimum requirement established by the board.

Section 11. (a) The center, in consultation with the advisory board established by section 12, shall identify 1 existing life sciences entity with experience facilitating local or regional life science industry sectors to serve as a regional technology and innovation center in each of the following 5 regions: western Massachusetts, central Massachusetts, northeastern Massachusetts, southeastern Massachusetts and metropolitan Boston.

(b) The purpose of each regional technology and innovation center shall include, but shall not be limited to: (i) encouraging and facilitating collaboration between existing organizations dedicated to promoting the regional life science industry; (ii) inputting regional life science industry and educational data, including the documentation of regional lab space, into the life sciences industry database as designed and maintained by the center; (iii) organizing, facilitating and implementing regional workforce development initiatives; (iv) providing business management and resource training, including the dissemination of best business practices; (v) facilitating public and private investment; (vi) reviewing and providing recommendations to the center proposals; (vii) identifying property conducive to regional life science industry expansion; (viii) investigating and identifying specific

regions or municipalities that have the potential to be developed into a life sciences cluster; and (ix) facilitating the regional development and implementation of section 10A of chapter 23A.

(c) The executive director, or his equivalent, of the 5 regional technology and innovation centers shall meet from time to time with the center to exchange information; identify regional needs including, but not limited to, any assistance needed in fulfilling the regional centers' purposes as provided in subsection (b); and advise the center on the effectiveness of programs administered by the center.

(d) Each regional technology and innovation center shall provide an annual report to the center containing such information as may be required by the center to evaluate the progress of each regional center. The center may withdraw a designation as a regional technology and innovation center if a regional center does not satisfactorily meet the purposes of subsection (b), and as provided in any rules, regulations or guidelines established by the center.

Section 12. There shall be an 18-member advisory board to be appointed by the governor to advise the center. The members shall include: 10 of whom shall be active members of the Massachusetts Life Sciences Collaborative, at least 2 of whom shall represent small businesses; 5 of whom shall be the chancellors at the University of Massachusetts at Amherst, Boston, Dartmouth, Lowell and Worcester, or their designees; and 3 of whom shall be patient advocates with significant interaction or experience in the life sciences. The secretary of labor and workforce development or his designee, and the 5 executive directors of the regional technology and innovation centers, established pursuant to section 11, shall serve as ex-officio, non-voting members of the advisory board.

Each member shall serve for a term of 3 years, except that in making his initial appointments, the governor shall appoint 5 members to serve for a term of 1 year, 3 members to serve for a term of 2 years, 5 members for a term of 3 years. Any person appointed to fill a vacancy in the office of a member of the advisory board shall be appointed in a like manner and shall serve for only the unexpired term of the member who vacated. Members shall be eligible for reappointment. Any member may be removed by the governor for cause. The advisory board shall meet at least bi-annually, but shall meet as often as the members shall determine, or at such other intervals as established by the executive director to review recommendations made by the board. The members of the advisory board shall serve without compensation, but each member shall be entitled to reimbursement for his actual and necessary expenses incurred in the performance of his official duties.

The duties of the advisory board shall be to advise the center and the board concerning: research and development in the life sciences; development of products and the effectiveness of public and private initiatives to further product development; manufacturing and commercialization of biotechnology, pharmaceuticals, medical diagnostic products or such other areas within the life sciences; identifying candidates and providing recommendations for the 5 regional technology and innovation centers as established in section 11; and any other area as requested by the board.

The advisory board shall not be a state agency for the purposes of chapter 268A and shall not be subject to section 11A½ of chapter 30A or chapter 66.

Section 13. The center shall develop a comprehensive, internet-based life sciences sector database for the organization of all relevant information, as determined by the center, related to the life sciences

sector in the commonwealth. Access to said database shall be limited at the discretion of the center's executive director. Any documentary materials or data received by the center from any entity, private or public, for the express purpose of adding information to the life science database shall be exempt from section 10 of chapter 66 and the board may hold any discussion or consideration of database materials in executive session closed to the public, notwithstanding the provisions of section 11A½ of chapter 30A, but the purpose of any such executive session shall be set forth in the official minutes of the center and business not directly related to such purpose shall not be transacted nor shall any vote be taken during such executive session.

Section 14. (a) The exercise of the powers granted by this chapter shall be for the benefit of the people of the commonwealth and for the improvement of their health and living conditions; and as the operation of the center shall constitute the performance of essential governmental functions, the center shall not be required to pay any taxes or assessments, except as otherwise provided by this chapter, and the notes or bonds issued under this chapter, their transfer and the income therefrom, including any profit made on the sale thereof, at all times shall be free from taxation by and within the commonwealth.

(b) The lands and tangible personal property of the center shall be deemed to be public property used for essential public and governmental purposes and shall be exempt from taxation and from betterments and special assessments.

Section 15. The center shall annually complete a detailed report setting forth its operations and accomplishments; its receipts and expenditures during such fiscal year; its assets and liabilities at the end of its fiscal year; the anticipated return on investment to the commonwealth from the investment of funds administered by the center during such fiscal year; a complete report detailing all companies classified as a certified life sciences company; a complete list of grants awarded by the center; a list of other funding activities; reports of patents or products resulting from funded activities; the status of construction of any real estate project resulting from certification, including whether construction is on-time and on-budget; and a tracking of job creation as a result of funded projects. The center shall annually submit the report to the governor, the secretary of administration and finance, the state comptroller and the clerks of the house of representatives and senate, who shall forward the same to the house and senate committee on ways and means and the joint committee on economic development and emerging technologies on or before October 1. The report shall be posted on the internet in a manner accessible to the public.

Section 16. The books and records of the center shall be subject to a biennial audit by the auditor of the commonwealth.

Section 17. (1)(a) Notwithstanding the provisions of chapter 32, or of any general or special law to the contrary, the center shall establish 1 or more optional retirement programs that qualify under section 401, 408 or 457 of Internal Revenue Code, as may be amended from time to time, or contracts providing retirement and death benefits may be purchased by employees of the center who elect to participate in the program. The benefits offered to employees of the center in such optional retirement program shall be provided through such custodial accounts or individual or group annuity contracts, which may be fixed or variable in nature, or a combination thereof; provided, that at all times, those annuity contracts issued by licensed insurers under the optional retirement program shall provide the

minimum values and guarantees required by the laws governing such contracts in the commonwealth; and provided, further, that the benefits shall be payable only to employees of the center in the program or their beneficiaries, and such benefits shall be paid only by the selected providers in accordance with the terms of the custodial accounts, annuity contracts or certificates providing coverage to the employee of the center; and provided, further, that such optional retirement program shall not allow an employee of the center to withdraw contributions while an active participant in the center's optional retirement program.

(b) The center shall select at least 2 but no more than 4 providers for the optional retirement program and enter into contracts with them in accordance with the laws governing the procurement of services for executive agencies of the commonwealth, provided, further, that the selected providers shall be authorized to conduct business within the commonwealth, and each and every provider or issuer of annuity contracts under the optional retirement program which is a life insurance company shall hold a certificate of authority to do life insurance business in the commonwealth, maintain the minimum required capital and surplus required for life insurance companies under the laws of the commonwealth, be a member of the commonwealth's life and health insurance guaranty association and be a member of the life and health insurance guaranty associations in any and all jurisdictions where required by law with similar retirement programs funded in whole or in part through the provider's annuities in which employees of the center participating in the optional retirement program may participate upon transfer of employment; and provided, further, that said board shall coordinate the transfer of funds and information between payroll centers, the selected providers and employees of the center participating in the plan.

(2)(a) Participation in the optional retirement program provided by this section shall be limited to employees of the center who are otherwise eligible for membership in the state employees' retirement system as established under the provisions of chapter 32.

(b) Elections to participate in the optional retirement program shall be made as follows:

(i) Any eligible employee of the center who is initially appointed on or after the effective date of the optional retirement program may elect in writing to participate in the optional retirement program within 90 days of the effective date of the appointment. Any such election shall be effective as of the effective date of appointment. If an eligible employee of the center fails to make an election as provided in this paragraph, such employee shall become a member of the state employees' retirement system established under the provisions of said chapter 32.

(ii) Any eligible employee of the center who is a member of any retirement system established by the provisions of said chapter 32 on the effective date of the optional retirement program but who has less than 10 years of creditable service on the effective date of the optional retirement program may elect in writing to participate in the optional retirement program within 90 days after the effective date of the optional retirement program. Any such election shall become effective on the first day of the next pay period following such election, and shall constitute a waiver of all retirement benefits to which the individual may be entitled as an employee under any retirement system established under the provisions of said chapter 32.

(iii) Any employee of the center who is a member of any retirement system established by the provisions of said chapter 32 but who has less than 10 years of creditable service on the date such

employee becomes eligible to participate in the optional retirement program may elect in writing to participate in such optional retirement program within 90 days of the date said employee becomes eligible. Any such election shall become effective on the first day of the next pay period following such election, and shall constitute a waiver of all retirement benefits to which the individual may be entitled as an employee under any retirement system established by the provisions of said chapter 32.

(iv) Any eligible employee of the center electing to participate in the optional retirement program shall be ineligible for membership in the state employees' retirement system while he remains continuously employed by the center; provided, that the election by an eligible employee to participate in the optional retirement program shall be irrevocable while the employee continues to meet the eligibility requirements; provided, however, that if an employee becomes ineligible to continue in the optional retirement program, the employee shall thereafter participate in the state employees' retirement system established in accordance with the provisions of said chapter 32.

(3)(a) Any eligible employee of the center electing to participate in the optional retirement program shall not be required to make contributions to the state employee's retirement system but shall contribute to the optional retirement program an amount equal to the contribution which would have been required had such employee been a member of the state employees' retirement system.

(b) For each eligible employee of the center electing to participate in the optional retirement program, the center shall contribute an amount equal to 5 per cent of each employee's regular compensation, as defined in section 1 of chapter 32, to the optional retirement program and a plan established to provide life and disability benefits to all participants in the program; provided, however, that not more than 1 per cent of said contribution shall be made to the plan established to provide said life and disability benefits; provided, further, that the balance of said contribution shall be remitted to the appropriate provider for application to the participating employee's contract or custodial account, less any monthly fees established by the board in order to cover the reasonably necessary direct costs incurred by the board in establishing and administering the plan.

(c) If any eligible employee of the center is a member of any retirement system established by the provisions of said chapter 32 at the time such employee elects to participate in the optional retirement program, the employee may direct that the amount of the accumulated total deductions, and any interest to which the employee would be entitled under said chapter 32 if the employee withdrew from the system, credited to such employee's account in such retirement system be transferred directly to such employee's account in the optional retirement program. Any such transfer shall be made in the form of a direct trustee-to-trustee transfer in compliance with the requirements of subchapter D of chapter 1 of the Internal Revenue Code.

(d) The funds accumulated under the optional retirement program shall be exempt from taxation. The rights of a participant to a custodial account, an annuity, the annuity contracts or certificates providing coverage to participants, and all right in and to the funds accumulated under the custodial accounts, annuity contracts or certificates shall be exempt from taxation, including income taxes levied under the provisions of said chapter 62. No assignment of any right in or to any funds or annuities under the optional retirement program shall be valid except such assignment as may be made for the purpose of making restitution in the case of dereliction from duty by any participant as established in section 15 of

said chapter 32 if such assignment does not violate the restrictions of the Internal Revenue Code; provided that nothing in this section shall prevent a participant's custodial account or annuity from being attached, taken on execution, assigned, or subject to other process to satisfy a support order under chapters 208, 209, or 273 if such order constitutes a qualified domestic relations order under the terms of the Internal Revenue Code.

(e) Any eligible employee of the center enrolled in the optional retirement program who retires and wishes to retain his group insurance coverage as provided in chapter 32A, or retires and wishes to enroll in group insurance coverage pursuant to said chapter 32A, may do so in the same manner, and subject to the same limitations and requirements as an active employee member of the state employees' retirement system. Any eligible employee of the center enrolled in the optional retirement program who retains or enrolls in the group insurance coverage upon retirement shall be deemed to have authorized his optional retirement program plan provider to deduct from the retired employees account, on a monthly basis, and forward to the group insurance commission, an amount equal to the retired employee's share of the premium as set by said chapter 32A and each annual appropriation act. Each optional retirement program plan provider shall be required to deduct and forward said premium amounts, as determined by the group insurance commission, to the group insurance commission in advance of the month for which the premium is due and in a manner as may be prescribed by the group insurance commission. For group insurance commission purposes employees who were members of the state retirement system when they became eligible to participate in the optional retirement program, and who then enrolled in the optional retirement program, may add their time in the state retirement system to their time in the optional retirement program in determining years of creditable service.

(f) No contribution shall be made under any provision of this section in excess of, or on the basis of compensation in excess of, any limitation that may be imposed pursuant to federal law including, but not limited to, the limitations in 26 U.S.C. sections 401(a)(17), 402(g), 403(b) and 415, to the extent such limitations apply. The center may adopt rules and regulations as it deems necessary to carry out the purposes of this section including, but not limited to, rules or regulations establishing such limitations only when it determines that such limitations are necessary to comply with applicable provisions of the Internal Revenue Code.

SECTION 14. Section 5 of said chapter 23I, as appearing in section 14, is hereby amended by striking out subsection (d).

SECTION 15. Section 1 of chapter 32 of the General Laws, as appearing in the 2006 Official Edition, is hereby amended by inserting after the word "connector", in line 211, the following words:- , the Massachusetts Life Sciences Center, except those employees of the center opting to participate in an optional retirement plan established by the center pursuant to section 17 of chapter 23I.

SECTION 16. Section 2 of chapter 32A of the General Laws is hereby amended by inserting after the word "authority", in line 12, as so appearing, the following words:- , the Massachusetts Life Sciences Center.

SECTION 17. Section 6 of chapter 62 of the General Laws, as most recently amended by section 4 of chapter 63 of the acts of 2007, is hereby further amended by adding the following 2 subsections:-

(m) (1) As used in this subsection and in subsection (n), the following words shall, unless the context clearly requires otherwise, have the following meanings:-

“Life sciences”, advanced and applied sciences that expand the understanding of human physiology and have the potential to lead to medical advances or therapeutic applications including, but not limited to, agricultural biotechnology, biogenetics, bioinformatics, biomedical engineering, biopharmaceuticals, biotechnology, chemical synthesis, chemistry technology, diagnostics, genomics, image analysis, marine biology, marine technology, medical devices, nanotechnology, natural product pharmaceuticals, proteomics, regenerative medicine, RNA interference, stem cell research and veterinary science.

“Person”, a natural person, corporation, association, partnership or other legal entity.

“Primarily”, more than 50 per cent.

“Research and development costs”, in-house research expenses within the meaning of section 41(b) (2) of the Internal Revenue Code.

“Taxpayer”, a certified life sciences company or person subject to the taxes imposed by chapters 62, 63, 64H or 64I.

“User fees”, the monetary amount actually paid by a taxpayer to the U.S.F.D.A. that constitutes the fee due upon the submission of a human drug application or supplement pursuant to 21 U.S.C. section 379h(a)(1) for a human drug, the research and development costs of which, were primarily incurred in the commonwealth.

“U.S.F.D.A.”, the United States Food and Drug Administration.

(2) A taxpayer may, to the extent authorized pursuant to the life sciences tax incentive program established by section 5 of chapter 23I, take a credit against the taxes imposed by this chapter in an amount equal to 10 per cent of the cost of qualifying property acquired, constructed, reconstructed or erected during the taxable year and used exclusively in the commonwealth.

Qualifying property shall be tangible personal property and other tangible property including buildings and structural components of buildings acquired by purchase, as defined by section 179(d) of the Internal Revenue Code, as amended and in effect for the taxable year, but not including property that is taxable under chapter 60A; provided, however, that such property shall be depreciable under section 167 of the Internal Revenue Code and have a useful life of 4 years or more. With respect to property which is disposed of or ceases to be in qualified use prior to the end of the taxable year in which the credit is to be taken, the amount of the credit shall be that portion of the credit provided for in this paragraph which represents the ratio which the months of qualified use bear to the months of useful life. If property on which credit has been taken is disposed of or ceases to be in qualified use prior to the end of its useful life, the difference between the credit taken and the credit allowed for actual use must be added back as additional taxes due in the year of disposition; provided, however, if such property is disposed of or ceases to be in qualified use after it has been in qualified use for more than twelve consecutive years, it shall not be necessary to add back the credit, as provided in this paragraph. The amount of credit allowed for actual use shall be determined by multiplying the original

credit by the ratio which the months of qualified use bear to the months of useful life. For the purposes of this paragraph, useful life of property shall be the same as that used by the corporation for depreciation purposes when computing federal income tax liability.

A taxpayer taking a credit allowed under this subsection may not take the credit allowed by subsection (g) except to such extent, not to exceed 2 per cent of the cost of any qualifying property, as may be provided in a certification pursuant to said section 5 of chapter 23I.

Nothing in this section shall limit the authority of the commissioner to make adjustments to a taxpayer's liability upon audit or limit any other legal remedies available to the commissioner or the commonwealth against said taxpayer.

(3) Any taxpayer entitled to a credit under this section for any taxable year may, to the extent authorized pursuant to the life sciences tax incentive program established by said section 5 of said chapter 23I, carry over and apply to its tax for any 1 or more of the next succeeding 10 taxable years, the portion, as reduced from year to year, of those credits which exceed the tax for the taxable year.

(4) The commissioner in consultation with the Massachusetts Life Sciences Center established by section 3 of chapter 23I, shall promulgate regulations necessary for the administration of this subsection; provided, further, that said regulations may provide the adjustment of intercompany prices and elimination of intercompany transactions to ensure that all amounts upon which the credit is based reasonably reflect fair market value; and provided, further, that said regulations shall include provisions to prevent the generation of multiple credits with respect to the same property.

(5) If a credit allowed under this subsection, or such credit as may be allowed under subsection (g) as limited in this subsection, exceeds the tax otherwise due under chapter 62, 90 per cent of the balance of such credit may, at the option of the taxpayer and to the extent authorized pursuant to the life sciences tax incentive program established by section 5 of chapter 23I, be refundable to the taxpayer for the taxable year in which qualified property giving rise to that credit is placed in service. If such credit balance is refunded to the taxpayer, then the credit carryover provisions of paragraph (3), and paragraph (2) of subsection (g), shall not apply.

(n) (1) Except as otherwise limited by subsection (4), a taxpayer may, to the extent authorized pursuant to the life sciences tax incentive program established by said section 5 of said chapter 23I, be allowed a refundable credit against the tax liability imposed under this chapter in an amount equal to 100 per cent of the cost of user fees paid by such taxpayer.

(2) A taxpayer shall claim the credit in the taxable year in which its application for the licensure of an establishment to manufacture the human drug in the commonwealth is approved by the U.S.F.D.A.

(3) If a credit allowed to a taxpayer exceeds the tax otherwise due under chapter 62, 90 per cent of the balance of that credit may, to the extent authorized pursuant to the life sciences tax incentive program established by section 5 of said chapter 23I, be refundable to the taxpayer for the taxable year in which the credit is claimed.

(4) The deduction from gross income that may be taken with respect to any expenditures qualifying for the credit under this section shall be disallowed to the extent of the credit.

(5) Only user fees paid by a taxpayer to the U.S.F.D.A. on or after the effective date of this section shall be eligible for the credit.

SECTION 18. Said section 6 of said chapter 62 is hereby further amended by striking out subsections (m) and (n), inserted by section 17.

SECTION 19. Section 30 of chapter 63 of the General Laws, as appearing in the 2006 Official Edition, is hereby amended by adding the following paragraph:-

17. Notwithstanding the last sentence in subparagraph (b) of paragraph 5, to the extent authorized pursuant to the life sciences tax incentive program established by section 5 of chapter 23I, losses sustained in any taxable year by a taxpayer engaged in business as a life sciences company as defined by section 2 of chapter 23I may, to the extent approved pursuant to said life sciences tax incentive program, be carried forward for not more than 15 years; provided, however, that said losses shall not be carried back.

SECTION 20. Said section 30 of said chapter 63 is hereby further amended by striking out paragraph 17, inserted by section 19.

SECTION 21. Said chapter 63 is hereby further amended by inserting after section 31L the following section:-

Section 31M. (a) As used in this section, the following words shall, unless the context otherwise requires, have the following meanings:-

“Life sciences”, advanced and applied sciences that expand the understanding of human physiology and have the potential to lead to medical advances or therapeutic applications including, but not limited to, agricultural biotechnology, biogenetics, bioinformatics, biomedical engineering, biopharmaceuticals, biotechnology, chemical synthesis, chemistry technology, diagnostics, genomics, image analysis, marine biology, marine technology, medical devices, nanotechnology, natural product pharmaceuticals, proteomics, regenerative medicine, RNA interference, stem cell research and veterinary science.

“Person”, a natural person, corporation, association, partnership or other legal entity.

“Primarily”, more than 50 per cent.

“Research and development costs”, in-house research expenses within the meaning of section 41(b) (2) of the Internal Revenue Code.

“Taxpayer”, a certified life sciences company or person subject to the taxes imposed by chapters 62, 63, 64H or 64I.

“User fees”, the monetary amount actually paid by a taxpayer to the U.S.F.D.A. that constitutes the fee due upon the submission of a human drug application or supplement pursuant to 21 U.S.C. section 379h(a)(1) for a human drug, the research and development costs of which, were primarily incurred in the commonwealth.

“U.S.F.D.A.”, the United States Food and Drug Administration.

(b) Except as otherwise limited by subsection (e), a taxpayer may, to the extent authorized pursuant to the life sciences tax incentive program established by said section 5 of chapter 23I, be allowed a refundable credit against the tax liability imposed under this chapter in an amount equal to 100 per

cent of the cost of user fees paid by such company.

(c) A taxpayer shall claim the credit in the taxable year in which its application for the licensure of an establishment to manufacture the human drug in the commonwealth is approved by the U.S.F.D.A.

(d) The credit allowed may reduce the excise due under subsection (b) of section 32, or subsection (b) of section 39. The credit allowed to a taxpayer shall not be subject to the provisions of section 32C. Where such credit allowed to a taxpayer exceeds the excise otherwise due under said subsection (b) of section 32 or subsection (b) of said section 39, 90 per cent of the balance of that credit may, at the option of the taxpayer and to the extent authorized pursuant to the life sciences tax incentive program established by said section 5 of said chapter 23I, be refundable to the taxpayer for the taxable year in which the credit is claimed.

If a taxpayer files as a member of a combined group and applies its excess credit against the excise of another group member, then the credit as applied to corporations other than such taxpayer is not subject to section 32C and may reduce to zero the excise due under subsection (b) of section 32, or subsection (b) of section 39 and under any act in addition thereto. Where such credit allowed to a taxpayer that is applied against the excise liability of such other corporations exceeds the excise otherwise due to such corporations under this chapter, 90 per cent of the balance of that credit may, at the option of the taxpayer and to the extent authorized pursuant to the life sciences tax incentive program, be refundable to the taxpayer for the taxable year in which the credit is claimed.

(e) For the purposes of section 30, the deduction from gross income that may be taken with respect to any expenditures qualifying for the credit under this section is disallowed to the extent of the credit.

(f) Only user fees paid by a taxpayer to the U.S.F.D.A. on or after the effective date of this section shall be eligible for the credit.

SECTION 22. Section 31M of said chapter 63 is hereby repealed.

SECTION 23. Section 38 of said chapter 63, as appearing in the 2006 Official Edition, is hereby amended by striking out, in line 162, the word "and".

SECTION 24. Said section 38 of said chapter 63, as so appearing, is hereby further amended by inserting after the word "contracts", in line 169, the following:- ; and (6) to the extent authorized pursuant to the life sciences tax incentive program established by section 5 of chapter 23I, a certified life sciences company, as defined by section 5 of chapter 23I, may be deemed to be taxable in the state of the purchaser if the property of the project is delivered or shipped to a purchaser in another state.

SECTION 25. Said section 38 of said chapter 63 is hereby further amended by striking out clause (6), inserted by section 24.

SECTION 26. Section 38C of said chapter 63, as appearing in the 2006 Official Edition, is hereby amended by adding the following paragraph:-

To the extent authorized pursuant to the life sciences tax incentive program established by section 5

of chapter 23I, a certified life sciences company may be deemed a research and development corporation for purposes of exemptions under chapters 64H and 64I.

SECTION 27. Said section 38C of said chapter 63 is hereby further amended by striking out the fourth paragraph, inserted by section 26.

SECTION 28. Section 38M of said chapter 63, as appearing in the 2006 Official Edition, is hereby amended by adding the following subsection:-

(j)(1) As used in this section, the following words shall, unless the context clearly requires otherwise, have the following meanings:-

“Life sciences”, advanced and applied sciences that expand the understanding of human physiology and have the potential to lead to medical advances or therapeutic applications including, but not limited to, agricultural biotechnology, biogenerics, bioinformatics, biomedical engineering, biopharmaceuticals, biotechnology, chemical synthesis, chemistry technology, diagnostics, genomics, image analysis, marine biology, marine technology, medical devices, nanotechnology, natural product pharmaceuticals, proteomics, regenerative medicine, RNA interference, stem cell research and veterinary science.

“Person”, a natural person, corporation, association, partnership or other legal entity.

“Taxpayer”, a certified life sciences company or person subject to the taxes imposed by chapter 62, 63, 64H or 64I.

(2) If a credit claimed under this section by a taxpayer exceeds the amount that may otherwise be allowed under this section for a taxable year, 90 per cent of the balance of that credit may, at the option of the taxpayer and to the extent authorized pursuant to the life sciences tax incentive program established by section 5 of chapter 23I, be refundable to the taxpayer for the taxable year. If such credit balance is refunded to the taxpayer, then the credit carryover provisions of paragraph (f) shall not apply.

SECTION 29. Said section 38M of said chapter 63 is hereby further amended by striking out paragraph (j), added by section 28.

SECTION 30. Said chapter 63 is hereby further amended by inserting after section 38T the following 3 sections:-

Section 38U. (a) As used in this section, section 38V and section 38W, the following words shall, unless the context clearly requires otherwise, have the following meanings:-

“Life sciences”, advanced and applied sciences that expand the understanding of human physiology and have the potential to lead to medical advances or therapeutic applications including, but not limited to, agricultural biotechnology, biogenerics, bioinformatics, biomedical engineering, biopharmaceuticals, biotechnology, chemical synthesis, chemistry technology, diagnostics, genomics, image analysis, marine biology, marine technology, medical devices, nanotechnology, natural product

pharmaceuticals, proteomics, regenerative medicine, RNA interference, stem cell research and veterinary science.

“Person”, a natural person, corporation, association, partnership or other legal entity.

“Taxpayer”, a life sciences company or person subject to the taxes imposed by this chapter or chapter 62, 64H or 64I.

(b) A taxpayer may, to the extent authorized pursuant to the life sciences tax incentive program established by section 5 of chapter 23I, take a credit against the taxes imposed by this chapter in an amount equal to 10 per cent of the cost of qualifying property acquired, constructed, reconstructed or erected during the taxable year and used exclusively in the commonwealth.

Qualifying property shall be tangible personal property and other tangible property including buildings and structural components of buildings acquired by purchase, as defined under section 179(d) of the Code, as amended, and in effect for the taxable year, but not including property that is taxable under chapter 60A; provided, however, that such property shall be depreciable under section 167 of the Code and shall have a useful life of 4 years or more.

With respect to property which is disposed of or ceases to be in qualified use prior to the end of the taxable year in which the credit is to be taken, the amount of the credit shall be that portion of the credit provided for in this paragraph which represents the ratio which the months of qualified use bear to the months of useful life. If property on which credit has been taken is disposed of or ceases to be in qualified use prior to the end of its useful life, the difference between the credit taken and the credit allowed for actual use must be added back as additional taxes due in the year of disposition; provided, however, if such property is disposed of or ceases to be in qualified use after it has been in qualified use for more than twelve consecutive years, it shall not be necessary to add back the credit, as provided in this paragraph. The amount of credit allowed for actual use shall be determined by multiplying the original credit by the ratio which the months of qualified use bear to the months of useful life. For the purposes of this paragraph, useful life of property shall be the same as that used by the corporation for depreciation purposes when computing federal income tax liability.

The credit allowed under this section may be taken by an eligible corporation; provided, however, that neither credit allowed by section 31A nor section 31H is taken by such corporation; and provided, further, that the credit allowed by section 38N shall not be taken except to such extent, not to exceed 2 per cent of the cost of any qualifying property.

Nothing in this section shall limit the authority of the commissioner to make adjustments to a taxpayer's liability upon audit or limit any other legal remedies available to the commissioner or the commonwealth against said taxpayer.

(c) The credit allowed by this section shall not be subject to section 32C.

(d) If a taxpayer that is subject to a minimum excise under this chapter, the amount of the credit allowed by this section shall not reduce the excise to an amount less than such minimum excise.

(e) A taxpayer entitled to a credit under this section for any taxable year may, to the extent authorized pursuant to the life sciences tax incentive program established by section 5 of chapter 23I, carry over and apply to its excise for any 1 or more of the next succeeding 10 taxable years, the portion, as reduced from year to year, of those credits which were not allowed by subsection (c) or which exceed the excise for the taxable year.

(f) For corporations filing a combined return of income under section 32B, a credit generated by an individual member corporation under this section shall first be applied against the separately determined excise attributable to that member, subject to the limitations of subsection (d). A member corporation with an excess credit may apply its excess credit against the excise of another group member, to the extent that such other member corporation may use additional credits under the limitation of paragraph (d). Unused, unexpired credits generated by member corporations shall be carried over from year to year by the individual corporation that generated the credit.

(g) The commissioner shall promulgate regulations necessary to implement this section. Said regulations may provide for the adjustment of intercompany prices and elimination of intercompany transactions to ensure that all amounts upon which the credit is based reasonably reflect fair market value and shall include provisions to prevent the generation of multiple credits with respect to the same property.

(h) If a credit allowed to a taxpayer under this section, or such credit as may be allowed under section 38N of this chapter as limited in this subsection, exceeds the excise otherwise due under this chapter, 90 per cent of the balance of such credit may, at the option of the taxpayer and to the extent authorized pursuant to the life sciences tax incentive program established by section 5 of chapter 23I, be refundable to the taxpayer for the taxable year in which qualified property giving rise to that credit is placed in service. If such credit balance is refunded to the taxpayer, the credit carryover provisions of subsection (e) and said section 38N shall not apply.

Section 38V. A taxpayer which is a certified life sciences company pursuant to section 5 of chapter 23I may, to the extent authorized pursuant to the life sciences tax incentive program established by said section 5 of chapter 23I, be allowed a deduction under paragraph 4 of section 30 for that portion of qualified clinical testing expenses paid or incurred for the taxable year equal to the amount of the credit allowable for the taxable year under section 45C of the Internal Revenue Code and otherwise disallowed as a deduction under section 280C(b) of said Code.

Section 38W. (a) A taxpayer may, to the extent authorized pursuant to the life sciences tax incentive program established by section 5 of chapter 23I, be allowed a credit against its excise due under this chapter equal to the sum of 10 per cent of the excess, if any, of the qualified research expenses for the taxable year, over the base amount, and 15 per cent of the basic research payments determined pursuant to section 41(e)(1)(A) of the Internal Revenue Code. The terms “qualified research expenses”, “base amount”, “qualified organization base period amount”, “basic research” and any other terms affecting the calculation of the credit shall, unless the context otherwise requires or unless otherwise stated in this section, have the same meanings as under said section 41 of said Code.

In determining the amount of the credit allowable under this section, the commissioner of revenue may aggregate the activities of all corporations that are members of a controlled group of corporations, as defined by 41(f)(1)(A) of said Code, and may aggregate the activities of all entities, whether or not incorporated, that are under common control, as defined in section 41(f)(1)(B) of said Code.

(b) For a qualified life science company, research and development costs, within the meaning of section 41 of said Code, shall include, to the extent they relate to legally mandated clinical trial activities, those qualified research expenditures that are performed both inside and outside of the commonwealth.

(c) For purposes of section 30, the deduction from gross income that may be taken with respect to any expenditures qualifying for a credit under said section 41 of said Code shall be based upon its cost less the credit allowable under this section; provided, however, that section 280C(c) of said Code shall not apply.

(d) The credit allowed hereunder for any taxable year shall not reduce the excise to less than the amount due under subsection (b) of section 32, subsection (b) of section 39, section 67 or under any other general or special law.

(e) The credit allowed under this section shall be limited to 100 per cent of a corporation's first \$25,000 of excise, as determined before the allowance of any credits, plus 75 per cent of the corporation's excise, as so determined in excess of \$25,000. The commissioner of revenue shall promulgate regulations similar to those authorized under section 38(c)(2)(B) of the Internal Revenue Code for purposes of apportioning the \$25,000 amount among members of a controlled group. Nothing in this section shall alter section 32C, as it affects other credits under this chapter.

(f) If a corporation files a combined return of income under section 32B, a credit generated by an individual member corporation under this section shall first be applied against the excise attributable to that company under sections 32 or 39, subject to the limitations of subsections (d) and (e). A member corporation with an excess research and development credit may apply its excess credit against the excise of another group member if such other member corporation may use additional credits under the limitations of said subsections (d) and (e). Unused, unexpired credits generated by a member corporation shall be carried over from year to year by the individual corporation that generated the credit and shall not be refundable. Nothing in this section shall alter subsection (h) of section 31A.

(g) A corporation entitled to a credit under this section for any taxable year may carry over and apply to its excise for any of the next succeeding 15 taxable years that portion, as reduced from year to year, of its credit which exceeds its excise for the taxable year. A corporation may carry over and apply to its excise for any subsequent taxable year that portion, as reduced from year to year, of those credits which were not allowed by subsection (f).

(h) The commissioner of revenue shall promulgate regulations necessary to carry out this section.

SECTION 31. Sections 38U, 38V and 38W of said chapter 63 are hereby repealed.

SECTION 32. Section 42B of said chapter 63, as appearing in the 2006 Official Edition, is hereby amended by adding the following paragraph:-

To the extent authorized pursuant to the life sciences tax incentive program established by section 5 of chapter 23I, a certified life sciences company may be deemed a research and development corporation for purposes of exemptions under chapters 64H and 64I.

SECTION 33. Said section 42B of said chapter 63 is hereby further amended by striking out the last paragraph, added by section 32.

SECTION 34. Section 6 of chapter 64H of the General Laws, as amended by section 12 of chapter 63

of the acts of 2007, is hereby further amended by adding the following paragraph:-

(xx) (1) Sales of tangible personal property purchased for a certified life sciences company, to the extent authorized pursuant to the life sciences tax incentive program established by section 5 of chapter 23I, for use in connection with the construction, alteration, remodeling, repair or remediation of research, development or manufacturing facilities and utility support systems. Only purchases made on or after the effective date of this section shall be eligible for this exemption.

(2) As used in this section, the following words shall, unless the context clearly requires otherwise, have the following meanings:-

“Life sciences”, advanced and applied sciences that expand the understanding of human physiology and have the potential to lead to medical advances or therapeutic applications including, but not limited to, agricultural biotechnology, biogenetics, bioinformatics, biomedical engineering, biopharmaceuticals, biotechnology, chemical synthesis, chemistry technology, diagnostics, genomics, image analysis, marine biology, marine technology, medical devices, nanotechnology, natural product pharmaceuticals, proteomics, regenerative medicine, RNA interference, stem cell research and veterinary science.

“Life sciences company”, a business corporation, partnership, firm, unincorporated association or other entity engaged in life sciences research, development, manufacturing or commercialization in the commonwealth, and any affiliate thereof, which is, or the members of which are, subject to taxation under this chapter.

“Utility support systems”, all areas of utility support systems including, but not limited to, site, civil, mechanical, electrical and plumbing systems.

SECTION 35. Said section 6 of said chapter 64H is hereby further amended by striking out paragraph (xx), added by section 34.

SECTION 36. Notwithstanding any general or special law to the contrary, the University of Massachusetts at Dartmouth shall acquire from the Massachusetts Development Finance Agency the land and improvements thereon located at 151 Martine street in the city of Fall River together with the accessory parking lot owned by the Massachusetts Development Finance Agency located on the north side of Martine street, hereinafter collectively referred to as the Advanced Technology Manufacturing Center, for an amount not to exceed \$11,400,000 and pursuant to such other terms as the parties may mutually agree; provided, however, that said conveyance shall be approved by the board of trustees of the University of Massachusetts and the board of directors of Massachusetts Development Finance Agency. The conveyance shall be subject to a restrictive covenant prohibiting the University of Massachusetts at Dartmouth from occupying more than 60 per cent of the total square footage of the Advanced Technology Manufacturing Center at any time. The University of Massachusetts at Dartmouth shall retain any rent, license fees, appropriations, grants, fees, or such other monies earned in connection with owning and operating the Advanced Technology Manufacturing Center and shall apply such revenues solely to offset the costs associated with owning, operating, improving, leasing, licensing, managing and maintaining the land and improvements that constitute the Advanced

Technology Manufacturing Center.

SECTION 37. Notwithstanding any general or special law to the contrary, the Massachusetts Life Sciences Center, established by section 3 of chapter 23I of the General Laws, in collaboration with the Massachusetts International Trade Council shall, subject to appropriation, facilitate and support joint academic and industrial research and development and commercial business exchanges between the commonwealth and Israel in the area of life sciences; provided, further, that subject to appropriation, there shall be established a trade and incubator facility in Israel and a trade and incubator facility in Massachusetts facilitated by the Massachusetts International Trade Council in consultation with the Massachusetts office of international trade and investment, established by section 24 of chapter 23A of the General Laws, for collaborative, joint and pilot projects with the Government of the State of Israel, the Boston Haifa International Life Sciences Institute and other organizations working with Israel.

SECTION 38. Notwithstanding any general or special law to the contrary, the term of any member appointed prior to the effective date of this act to the board of directors of the Massachusetts Life Sciences Center, established by section 3 of chapter 23I of the General Laws, shall expire upon the effective date of this act; provided, however, that any appointed board member whose term has expired pursuant to this section shall be eligible for reappointment to the board. Such appointments shall be made in accordance with section 3 of chapter 23I of the General Laws.

SECTION 39. Notwithstanding any general or special law to the contrary, the Massachusetts Life Sciences Center established by section 3 of chapter 23I of the General Laws, in consultation with the department of agricultural resources, shall, subject to appropriation, establish a program to promote the research and development of plant-made pharmaceuticals and industrial products through field trials approved under a permit or approved notification by the Biotechnology Regulatory Service of the Animal and Plant Health Inspection Service of the United States Department of Agriculture.

SECTION 40. Notwithstanding any general or special law to the contrary, the Massachusetts Life Sciences Center established by section 3 of chapter 23I of the General Laws, in conjunction with the office of the state treasurer, shall conduct an investigation and study of the feasibility of vetting and bundling life sciences enterprises for the purpose of securitization of enterprises to create investment opportunities to provide seed capital for enterprises. For the purposes of this study, “enterprise” shall be defined as a small business, as defined in chapter 40F of the General Laws, with its principal place of business in the commonwealth and which is, or proposes to be, engaged in manufacturing or research and development in the area of life sciences. Said center shall report to the general court the results of its investigation and study and its recommendations, if any, together with drafts of legislation necessary to carry its recommendations into effect by filing the same with the clerks of the house of representatives and the senate, who shall forward the same to the house and senate committees on ways and means and the joint committee on economic development and emerging technologies on or before March 31, 2009.

SECTION 41. Notwithstanding any general or special law to the contrary, the Massachusetts Life Sciences Center, established by section 3 of chapter 23I of the General Laws, shall conduct an investigation and study the feasibility of increasing the number of clinical trials conducted or expediting the process of conducting clinical trials in the commonwealth, by life sciences companies in the commonwealth. Said center shall report to the general court the results of its investigation and study and its recommendations, if any, together with drafts of legislation necessary to carry its recommendations into effect by filing the same with the clerks of the house of representatives and the senate who shall forward the same to the house of representatives and the senate committees on ways and means, the joint committee on economic development and emerging technologies, the joint committee on public health and the joint committee on health care financing on or before March 31, 2009.

SECTION 42. Notwithstanding any general or special law to the contrary, the Massachusetts Life Sciences Center, established by section 3 of chapter 23I of the General Laws, shall conduct an investigation and study of ways to enhance coordination between the angel investor community, so-called, and the life science industry. Said center shall report to the general court the results of its investigation and study and its recommendations, if any, together with drafts of legislation necessary to carry its recommendations into effect by filing the same with the clerks of the house of representatives and the senate, who shall forward the same to the house and senate committees on ways and means and the joint committee on economic development and emerging technologies on or before March 31, 2009.

SECTION 43. Notwithstanding any general or special law to the contrary, the Massachusetts Life Sciences Center, established by section 3 of chapter 23I of the General Laws, in conjunction with the appropriate state agencies, shall conduct an investigation and study to assess the feasibility of developing and implementing a program to engage and train community college students in the area of life sciences. Said center shall report to the general court the results of its investigation and study and its recommendations, if any, together with drafts of legislation necessary to carry its recommendations into effect by filing the same with the clerks of the house of representatives and the senate, who shall forward the same to the joint committee on economic development and emerging technologies, the joint committee on education and the joint committee on labor and workforce development on or before June 30, 2009.

SECTION 44. Notwithstanding any general or special law to the contrary, the total administrative and operational expenses of the Massachusetts Life Sciences Center established by section 3 of chapter 23I of the General Laws shall not exceed \$3,750,000 for fiscal year 2009; provided, further that said center shall conduct an investigation and study the center's annual operating expenses including, but not limited to, lease payments, payroll and contracted costs, to be used by the legislature to calculate annual operating expenses for future fiscal years. Said center shall report to the general court the

results of its investigation and study and its recommendations, if any, together with drafts of legislation necessary to carry its recommendations into effect by filing the same with the clerks of the house of representatives and the senate, who shall forward the same to the house and senate committees on ways and means and the joint committee on economic development and emerging technologies on or before December 31, 2008.

SECTION 45. Notwithstanding any general or special law to the contrary, the department of revenue shall conduct an investigation and study including a detailed description and a numerical accounting of all tax incentives awarded to life sciences companies certified by section 5 of chapter 23I of the General Laws, including the value of tax incentives authorized pursuant to the life sciences tax incentive program, as established by said section 5 of said chapter 23I, for each year for which the project was certified, and the value of tax incentives actually used as a result of the project. Said center shall report to the general court the results of its investigation and study and its recommendations, if any, together with drafts of legislation necessary to carry its recommendations into effect by filing the same with the clerks of the house of representatives and the senate, who shall forward the same to the house and senate committees on ways and means, the joint committee on economic development and emerging technologies and the joint committee on revenue annually on or before June 30. Such report shall be posted on the internet in a manner accessible to the public.

SECTION 46. To meet the expenditures necessary in carrying out the provisions of section 2B, the state treasurer shall, upon receipt of a request by the governor, issue and sell bonds of the commonwealth in an amount to be specified by the governor from time to time, but not exceeding, in the aggregate, \$500,000,000. All bonds issued by the commonwealth, as aforesaid, shall be designated on their face, Life Sciences Center Capital Improvement Loan Act of 2008, and shall be issued for a maximum term of years, not exceeding 20 years, as the governor may recommend to the general court pursuant to Section 3 of Article LXII of the Amendments to the Constitution; provided, however, that all such bonds shall be payable not later than June 30, 2033. All interest and payments on account of principal on such obligations shall be payable from the General Fund. Bonds and interest thereon issued under the authority of this section shall, notwithstanding any other provisions of this act, be general obligations of the commonwealth.

SECTION 47. Notwithstanding any general or special law to the contrary, only certified life sciences projects authorized under section 5 of chapter 23I of the General Laws shall be eligible for the available capital funding provided in item 7002-0015 in section 2B.

SECTION 48. Notwithstanding any general or special law to the contrary, a private entity engaged in a construction, development, renovation, remodeling, reconstruction, rehabilitation or redevelopment project receiving funds pursuant to this act shall properly classify individuals employed on the project and shall comply with all laws concerning workers' compensation insurance coverage, unemployment insurance, social security taxes and income taxes with respect to all such employees. All construction contractors engaged by an entity on any such project shall furnish documentation to the appointing

authority showing that all employees employed on the project have hospitalization and medical benefits that meet the minimum requirements of the connector board established in chapter 176Q of the General Laws.

SECTION 49. The value of any tax incentive award under the life sciences tax incentive program established in subsection (d) of section 5 of chapter 23I of the General Laws which extends beyond December 31, 2018, including carry-forwards of losses or credits, shall be taken into account during the year awarded and the full amount of such tax benefits potentially realized in periods after December 31, 2018 shall be counted against the annual ceilings for years ending prior to January 1, 2019. Tax incentives authorized pursuant to the life sciences tax incentive program shall count toward this \$25,000,000 annual ceiling only if they are not otherwise available to a taxpayer.

SECTION 50. Notwithstanding any general or special law to the contrary, the sales tax exemption in paragraph (xx) in section 6 of chapter 64H of the General Laws shall apply to sales of tangible personal property purchased for a certified life sciences company established in section 5 of chapter 23I of the General Laws on or after the effective date of this act.

SECTION 51. Notwithstanding any general or special law to the contrary, eligibility for a tax credit on user fees under paragraph (2) of subsection (n) of section 6 of chapter 62 of the General Laws and under subsection (f) of section 31M of chapter 63 of the General Laws shall apply to user fees paid on or after the effective date of this act.

SECTION 52. Subsection (d) of section 5 of chapter 23I of the General Laws, as appearing in section 14, shall take effect on January 1, 2009.

SECTION 53. Sections 17, 19, 21, 24, 26, 28, 30, 32, and 34 shall take effect on January 1, 2009.

SECTION 54. Sections 18, 20, 22, 23, 25, 27, 29, 31, 33, and 35 shall take effect on December 31, 2018.

Approved June 16, 2008

Appendix C:

Independent Reports and Documents

Life Sciences Innovation as a Catalyst for Economic Development:

The Role of the Massachusetts Life Sciences Center

Prepared by:

The Kitty and Michael Dukakis Center for Urban and Regional Policy at Northeastern University



Northeastern University
*Kitty and Michael Dukakis Center
for Urban and Regional Policy*

The Boston Foundation



**The Boston
Foundation**

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About the Boston Foundation

The Boston Foundation, Greater Boston's community foundation, is one of the oldest and largest community foundations in the nation, with net assets of more than \$800 million. In 2012, the Foundation and its donors made \$88 million in grants to nonprofit organizations and received gifts of close to \$60 million. The Foundation is a partner in philanthropy, with some 900 separate charitable funds established by donors either for the general benefit of the community or for special purposes. The Boston Foundation also serves as a major civic leader, provider of information, convener and sponsor of special initiatives that address the region's most pressing challenges. The Philanthropic Initiative (TPI), an operating unit of the Foundation, designs and implements custom philanthropic strategies for families, foundations and corporations around the globe. Through its consulting and field-advancing efforts, TPI has influenced billions of dollars in giving worldwide. For more information about the Boston Foundation and TPI, visit www.tbf.org or call 617-338-1700.

About the Kitty and Michael Dukakis Center for Urban and Regional Policy

The Kitty and Michael Dukakis Center for Urban and Regional Policy at Northeastern University conducts interdisciplinary research, in collaboration with civic leaders and scholars both within and beyond Northeastern University, to identify and implement real solutions to the critical challenges facing urban areas throughout Greater Boston, the Commonwealth of Massachusetts, and the nation. Founded in 1999 as a "think and do" tank, the Dukakis Center's collaborative research and problem-solving model applies powerful data analysis, a bevy of multidisciplinary research and evaluation techniques, and a policy-driven perspective to address a wide range of issues facing cities and towns. These include affordable housing, local economic development, workforce development, transportation, public finance, and environmental sustainability. The staff of the Dukakis Center works to catalyze broad-based efforts to solve urban problems, acting as both a convener and a trusted and committed partner to local, state, and national agencies and organizations. The Center is housed within Northeastern University's innovative School of Public Policy and Urban Affairs.

About the Authors

Barry Bluestone is a Founding Director of the Kitty and Michael Dukakis Center for Urban and Regional Policy and former Dean of the School of Public Policy and Urban Affairs at Northeastern University, where he is also the Stearns Trustee Professor of Political Economy. Previously, Professor Bluestone spent 12 years at the University of Massachusetts at Boston and 15 years at Boston College, where he directed the University's Social Welfare Research Institute. At the Dukakis Center, he has led research projects on housing, local economic development, state and local public finance, and the manufacturing sector in Massachusetts. He regularly consults with trade unions, business leaders, and serves on Gov. Deval Patrick's Economic Development Strategy Council. Professor Bluestone was raised in Detroit and attended the University of Michigan, where he received his Ph.D. in economics.

Alan Clayton-Matthews is an Associate Professor in Northeastern University's School of Policy Studies and Urban Affairs and in the Department of Economics. He is a contributing editor of *Massachusetts Benchmarks*, a joint publication of the University of Massachusetts and the Federal Reserve Bank of Boston that presents timely information and analysis about the performance of the Massachusetts economy. He is also a Director of the New England Economic Partnership (NEEP), a group of economists and managers from academia, business, and government who study and forecast the regional economy. He serves as the Massachusetts forecast manager for NEEP. Professor Clayton-Matthews also is currently serving on Governor Deval Patrick's Council of Economic Advisors. His applied research interests include analyzing the Massachusetts economy, including its structure, development, and short and long-run growth trends. His academic research includes the development of statistical procedures and tools for economic index construction and forecasting, and the relationship between higher education and economic development. Professor Clayton-Matthews holds a Ph.D. in economics from Boston College.

UNDERSTANDING BOSTON is a series of forums, educational events and research sponsored by the Boston Foundation to provide information and insight into issues affecting Boston, its neighborhoods, and the region. By working in collaboration with a wide range of partners, the Boston Foundation provides opportunities for people to come together to explore challenges facing our constantly changing community and to develop an informed civic agenda. Visit www.tbf.org to learn more about *Understanding Boston* and the Boston Foundation.

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Life Sciences Innovation as a Catalyst for Economic Development:

The Role of the Massachusetts Life Sciences Center

Authors

Barry Bluestone
Alan Clayton-Matthews

Editor

Kathleen Clute, The Boston Foundation

The Kitty and Michael Dukakis Center for
Urban and Regional Policy, Northeastern University

March 2013

Preface

In 2003, a distinguished group of university leaders, educators and business representatives came together for a unique and unprecedented summit, spearheaded by Harvard Business School professor Michael Porter and hosted by the presidents of MIT and Harvard, Susan Hockfield and Drew Gilpin Faust. This was the same year those two universities played a major role in the international team that cracked the human genome.

The summit's purpose was to discuss the state's life sciences "super cluster," meaning all of the many sectors that are involved in the life sciences. Everyone attending agreed that strengthening the life sciences was not only smart and played to our state's strengths, it was crucial to our future global competitiveness. It could mean jobs for hundreds of thousands and billions added to the Massachusetts economy.

While the summit was stimulating, there was no established vehicle to build on the momentum that it generated. And so, in 2005, the Boston Foundation provided a grant of \$125,000 to create the Massachusetts Life Sciences Collaborative. The Organizing Committee for the new group included the leaders of all of the Boston area's major universities, teaching hospitals, life-sciences companies and venture-capital firms.

In March of 2007, Governor Deval Patrick spoke at one of the Collaborative's meetings about the importance of the life sciences to the Commonwealth. He previewed an announcement he would make publicly later that year about the creation of a new Massachusetts Life Sciences Initiative, which represented a 10-year, \$1 billion investment to enhance and strengthen the state's leadership in the life sciences.

The Boston Foundation was honored to play a major convening role in bringing together the stakeholders for those early discussions. And now we are proud to publish this first report on the Massachusetts Life Sciences Initiative and the work of the quasi-public agency charged with carrying out its mission.

We have published many reports researched by the lead author of this report, Barry Bluestone, Director of the Kitty and Michael Dukakis Center for Urban Affairs at Northeastern. Reports from the Dukakis Center are always thorough and compelling, but not all of them carry good news. This one does, especially when it comes to economic impact. The \$56.6 million Massachusetts awarded in tax incentives to life sciences firms between 2009 and 2011 has created 2,500 jobs, which should generate more than \$266 million in wages and salaries during the next five years. In fact, the Commonwealth's life sciences super cluster has risen to number one in the nation in terms of per capita employment, with close to 14,300 jobs for every one million residents.

These jobs are not just for workers with advanced degrees: at least one in five require no more than a two-year associate's degree and another 48 percent require just a bachelor's degree. For the Boston Foundation, this confirms our deep investment in supporting the full education pipeline and the importance of preparing college students for well-paying jobs in a field that will only grow.

Estimating the economic impact of this life sciences super cluster is within our grasp. Evaluating its broader value to society is daunting because of the almost limitless potential it has for improving the lives and well-being of people here in Massachusetts and around the world.



Paul S. Grogan
President & CEO

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Executive Summary

This report provides an up-to-date, independent evaluation of the \$1 billion, 10-year Massachusetts Life Sciences Initiative and the Massachusetts Life Sciences Center (MLSC) charged with the responsibility of carrying out its mission. The initiative was established in July 2008 by Governor Deval Patrick's Administration and the Legislature to encourage the growth of discovery and production in the life sciences, including biotechnology, pharmaceuticals, medical diagnostics, medical devices and bioinformatics in the Commonwealth. Based on the region's existing comparative advantage in life sciences research and development (R&D) emanating from the laboratories of its leading universities and medical institutions, this substantial infusion of public funds was undertaken with the ambitious goal of making this cluster of industry sectors the most successful in the world.

This evaluation comes at a propitious time, given the state of fiscal affairs in the Commonwealth and the nation. Virtually every unit of government is scrutinizing the use of each tax dollar to ensure that public revenue is being spent effectively and efficiently. Put simply, our goal in this evaluation was to gather as much data as possible to assess whether the Commonwealth's sizeable commitment of public resources is paying off in the form of a life sciences "super cluster" capable of attracting massive amounts of investment dollars, generating well-paying jobs for Massachusetts residents and yielding additional tax revenue for the Commonwealth.

The Life Sciences Super Cluster and the MLSC

After it was created, the MLSC sought to develop as a key element of its strategy the creation of a collaborative "ecosystem" encompassing all aspects of the state's life sciences. It would do this by encouraging the development of a dense, highly connected community of scholars, entrepreneurs, industry leaders, venture capitalists and government officials who were all dedicated to the success of this sector. Unlike many narrowly focused state economic development initiatives, the Center has

chosen to guide its investments with a broad range of strategic priorities geared to enhance all aspects of the life sciences cluster. These include:

- funding translational research that converts new discoveries into marketable products and services
- investing in promising new technologies
- ensuring worker skill acquisition that aligns with the needs of life sciences industries
- creating new infrastructure with shared resources to accelerate life sciences innovation
- building partnerships among segments of the local and international life sciences communities

To accomplish these goals, the Center relies on a portfolio of seven distinct programs. These include:

Cooperative Research Grants to support industry-sponsored research at universities in order to facilitate scientific discoveries that lead to medical applications. These grants match industry contributions dollar for dollar.

Internship Challenge Program to provide funds for interns working at start-up and smaller Massachusetts life sciences companies.

New Investigator Grants to spur innovative research and advance the careers of new investigators working on cutting-edge research at academic research centers in Massachusetts.

Life Sciences Accelerator Loan Program to make loans available to early-stage companies and help leverage additional sources of capital.

Small Business Matching Grant (SBMG) Program to provide matching support to firms on the verge of commercializing new technologies developed with Phase II or Post-Phase II federal Small Business Innovation Research (SBIR) awards or federal Small Business Technology Transfer (STTR) grants.

Life Sciences Tax Incentive Program to offer a combination of 10 competitively awarded tax incentives available to companies that meet specified hiring goals.

TABLE 1
Distribution of MLSC Investments by Dollar Amount
(June 2008–June 2012)

Capital Projects (12)	\$186,950,000
Company Grants and Accelerator Loans (31)	\$22,907,000
Academic Research Grants (35)	\$23,346,344
Tax Incentives (56)	\$56,595,093
Interns Funded for Workforce Development (884)	\$6,903,164
Equipment and Supply Grants for Schools (32)	\$3,333,675
Other Grants/Business Plan Competitions	\$1,540,000
TOTAL	\$301,575,276

Source: Massachusetts Life Sciences Center, 2013

Capital Projects Fund to provide capital for equipment and supplies for high schools in Gateway Cities, vocational/technical schools, and community colleges; and for capital projects at academic/research institutions, business incubators, and other not-for-profit organizations.

Between 2008 and June 30, 2012, the Center directly invested or committed more than \$300 million in state funds that have leveraged more than \$1 billion in third-party investments by private businesses, the federal government and foundations, according to the MLSC *FY2012 Report*. **Table 1** provides a breakdown of these investments.

Special Features of the Massachusetts Life Sciences Center

Our analysis revealed that, aside from its extraordinarily broad mandate, there are other factors that make the MLSC quite different from most government subsidy programs.

First, the MLSC operates under a Board of Directors that includes state government officials, but also industry CEOs, leaders from academia and medicine, bioscience researchers and others who have great knowledge of the life sciences.

Second, MLSC accelerator loans and other investments are reviewed by a panel of more than 200 specialists who advise the Center's Scientific Advisory Board (SAB), which itself is dominated by academic researchers, industry scientists, and private venture-capital experts who together can judge both the scientific and economic

potential of an MLSC investment. Accelerator loans are also reviewed by private venture-capital experts who can assess the economic potential of recipient firms.

And third, the Center insists on accountability in terms of private sector investment matches. The Center also retains the power (and has utilized it) to "claw back" tax incentives if and when specific job creation goals are not reached by grant recipients.

We discovered from our interviews with life sciences executives, trade association leaders and members of the MSLC Scientific Advisory Board that the high level of professionalism associated with the Center's expert-based review process has resulted in MLSC investments that appear to have a high rate of return for the Commonwealth. We will return to this point, but must first touch upon a finding even more important than the measured rates of return to specific MLSC programs.

New vs. Old Growth Theory

To properly assess the value of the Life Sciences Initiative and the MLSC, it is useful to place its activities in the context of economic growth theory. What is now known as the "old growth theory" suggests that economic prosperity springs from the accumulation of ever greater stocks of the fundamental ingredients of production: capital, labor and natural resources. Those countries that find ways of increasing investment in plant and equipment, adding to labor supply and extracting more natural resources are the ones that will become more affluent.

While not completely discounting this approach to growth, a "new growth theory" has evolved that places technological progress at the very epicenter of growth dynamics—even more important than capital, labor and resource inputs. Advances in technology and interdependencies between new ideas and new investment provide the basis for entire new industries and products that generate additional wealth and raise living standards.

Innovation-based growth is so powerful because it avoids the classic problem of diminishing returns on any given investment. With this type of growth, once the fixed cost of creating a new technology has been incurred, the formula can be used over and over again at little or no cost. As such, there can be increasing returns paying enormous dividends to society.

Moreover, the new innovation-based growth theory

posits a strong reciprocity among the rate of skill acquisition by workers, investments in new capital and new inventions. Thus, programs that combine incentives for innovation along with resources to augment human capital should fuel rapid economic growth more than anything else society can do to promote prosperity.

What is special about the Massachusetts Life Sciences Initiative is that it focuses explicitly on increasing the rate of innovation by encouraging more research and development (R&D) in the life sciences and helping small firms in this super cluster convert basic research into marketable products and services. New growth theory posits that this activity is the very fountain of economic growth.

Has the MLSC Been Successful?

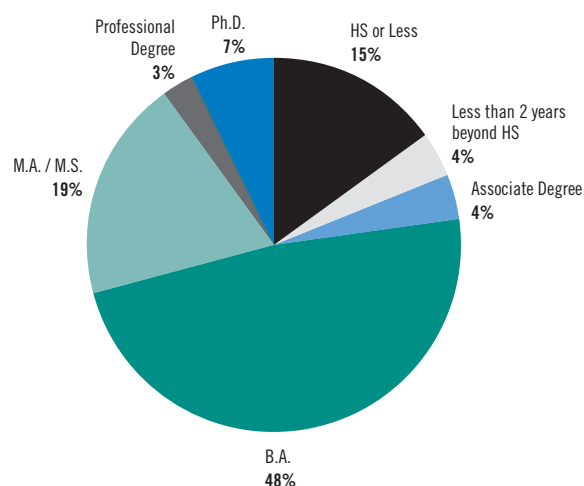
Unfortunately, keeping score on the success of innovation is difficult. Instead of a more-or-less certain return to a given infusion of capital under the old growth theory, under the new growth theory, innovation tends to deliver stronger long-term growth but it is “lumpy, discontinuous, and nonlinear.” There can be a long gap between the time a new innovation is first incorporated into production and the time that it pays off in terms of increased productivity, output and jobs. In the short term, it can be discouraging, as investments in fundamental innovation usually have little immediate payoff. It will take decades to realize the full benefits to humanity and the economy from the advances now being made in drug discovery, medical diagnostics and medical devices.

What we can do is measure the short-term direct benefits of MLSC investments and consider the views of experts as to whether the Center has indeed played a critical role in creating a life sciences “ecosystem” that attracts investment and generates jobs in this sector.

Short-Term Benefits

As for the short-term benefits, we conducted a cost-benefit analysis of the Center’s tax incentive program. According to our analysis based on MLSC data, the total value of tax incentives outstanding to Massachusetts life sciences firms as of June 30, 2012 was \$56.6 million. Our best estimate is that a little over 2,500 jobs were created as a result of these incentives. Given the average \$105,000 salary of these jobs, we predict they will generate more than \$266 million in wages and salaries during the next five years. If

FIGURE 1
Education Distribution of New Hires
by 2010 MLSC Tax Incentive Awardees



Source: Dukakis Center for Urban and Regional Policy

our analysis proves correct, these workers will pay more than \$93 million in state personal income and sales taxes during that period. As such, assuming all of these jobs were directly related to the tax incentives and that these jobs last at least five years, every dollar of tax incentive will repay \$1.66 to state coffers, as **Table 2** reveals. This is an outstanding rate of return.

What is more, our analysis suggests that these jobs will go to a broad array of workers, not just those with advanced degrees. As **Figure 1** reveals, more than one in five jobs in life sciences firms require no more than a two-year associate’s degree and nearly another half (48%) require no more than a bachelor’s degree. Thus, the short-term benefits of MLSC tax incentives seem to have heavily outweighed the costs and the job benefits are broadly shared.

The Unique Growth Pattern of Regional Life Sciences Clusters

The most important benefits stemming from MLSC activities, however, will come in the future. This is due to the unique growth pattern of highly innovative sectors like the life sciences. The regional concentration of life-sciences companies happens in a very different manner than in other industries. In the case of traditional industrial sectors such as auto, aircraft engine, financial services and the like,

TABLE 2
Economic Return on the MLSC Tax Incentive Program

	Program Year 2009	Program Year 2010	Program Year 2011	3 Years of Incentives
Total Value of MLSC Tax Incentives (\$) Outstanding	\$15,245,500	\$20,672,638	\$20,340,884	\$56,259,022
Net New Jobs Created	901	721	915	2,537
Tax Incentive per Job (\$)				\$22,175
Annual Tax Incentive per 5-year job (\$)				\$4,435
Average Salary per Job (\$)				\$105,037
Total Salaries Generated per Year (\$)				\$266,479,399
State Income Tax Revenue per Job per year (\$)				\$4,937
Total State Income Tax per year (\$)				\$12,524,532
Average Sales Tax per Job (\$)				\$2,404
Total State Sale Tax per year (\$)				\$6,099,447
Total Income+Sales Taxes per year (\$)				\$18,623,979
Average Income+Sales Tax/Job per year				\$7,341
Total Income+Sales Taxes per 5-year Job				\$36,705
Total Income+Sales Taxes over 5 years				\$93,120,585
Tax Revenue/Incentive Ratio over 5 years				1.66
	Pharma	Medical Devices	Scientific Research	Total
Jobs	1,843	481	213	2,537
Average Salary (\$)	\$115,222	\$66,913	\$103,009	\$105,037
Total Salary (\$)	\$212,353,256	\$32,185,280	\$21,940,863	\$266,479,399
Share of Salary	0.7969	0.1208	0.0823	1.0000
State Income Tax By Sector (\$)	\$9,980,603	\$1,512,708	\$1,031,221	\$12,524,532
Sales Tax by Sector (\$)	\$4,860,554	\$736,689	\$502,204	\$6,099,447

Source: Dukakis Center for Urban and Regional Policy

a region becomes dominant in a particular cluster once a large anchor enterprise or a small number of them establish operations in that locale. Once the anchor enterprise is established, an array of smaller firms is attracted to that region to serve as part of the supply chain for the large anchor enterprise(s). Essentially, the small firms in the industry are dependent on the large ones.

For the life sciences and other highly innovative sectors, the reverse is true. The large companies that depend on the development of breakthrough innovations and sophisticated medical devices prosper by being near a concentration of small start-up firms. Even the largest of the life sciences companies, with substantial research budgets, do not have the resources to generate more than a handful of breakthroughs in the biosciences, genomics and similar fields. These big firms grow and prosper by carefully monitoring the scientific discover-

ies under way in university research laboratories and in the translational research carried out by small start-ups.

Those few start-ups that develop potential blockbuster drugs or devices become prime targets for acquisition by the larger firms. The secret to success in the acquisition process is being where the small firms are located. This permits the large companies to closely monitor the progress of smaller firms and buy the most promising ones before "Big Pharma" competitors or other medical device manufacturers can make a bid. To use a metaphor from nature, the large, globally important life sciences firms want to feed in the waters where the minnows are swimming.

Because Massachusetts has so many small life sciences firms, nine of the world's ten major drug companies have now set up shop in the Commonwealth. They are

investing billions in plant and equipment and creating thousands of additional jobs. These include Pfizer, Novartis, Johnson & Johnson, GlaxoSmithKline, Sanofi (which absorbed Genzyme), AstraZeneca, Abbott Laboratories, Merck and Bristol-Myers Squibb.

And here is the key to understanding the central role of the MLSC: While the large firms can easily exist without the MLSC's direct investments, the small life-sciences ventures need the Center to provide them with accelerator loans, research and development funds, and interns who can help them translate their ideas into commercially viable products. While the private venture capital market may provide some funds for this purpose, venture capitalists often demand a quicker return than can be obtained from this sector, which often has long lag times between initial research, proof of concept and a final product approved by the U.S. Food and Drug Administration.

In this environment, the MLSC has become an important investment partner for smaller life sciences firms that grow out of local research universities and medical centers. By providing funds for translational research and development, the MLSC can help keep these growing companies in the Commonwealth instead of losing them to investment funds in other regions. To revert to metaphor again, it's because these minnows stay here

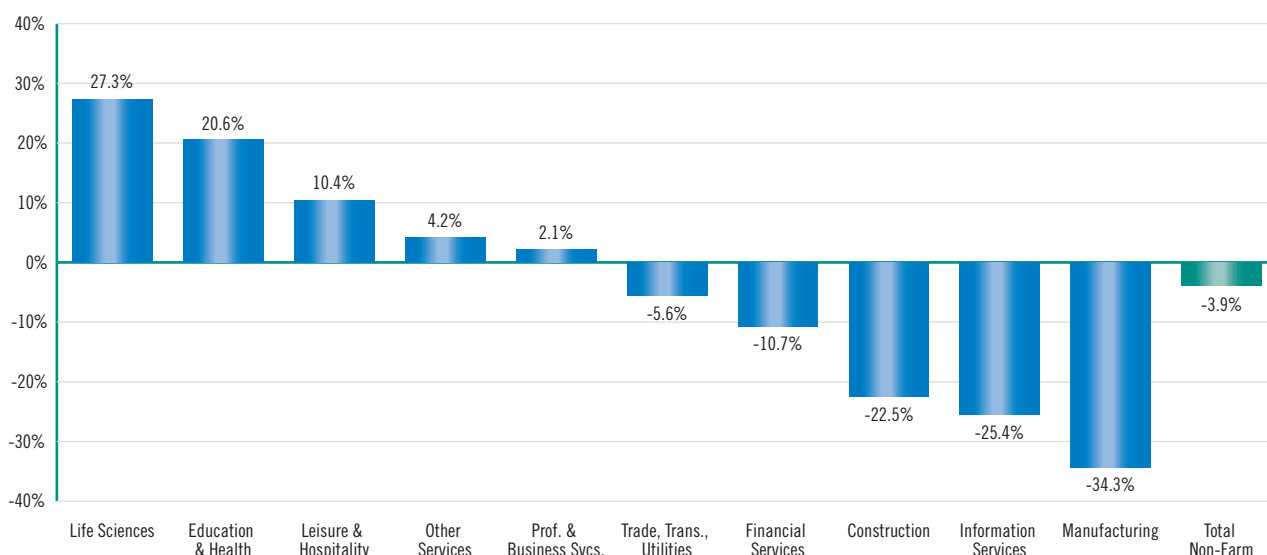
that Big Pharma has come to swim in this pond. In addition, Big Pharma benefits from the Center's investments in workforce development, shared infrastructure resources and cooperative research projects between industry and academia. The result has been extraordinary output and employment growth.

The Massachusetts Life Sciences: A Record of Output and Employment Growth

The numbers are, indeed, impressive. As of 2012, according to the Massachusetts Biotechnology Council (MassBio), 1,198 life sciences companies were operating in New England and employing 103,006 workers. More than half of these firms are located in Massachusetts. Of all the Massachusetts firms listed in the 2012 MassBio directory, about half (514) are medical device companies; 232 are drug development firms; 147 are contract research and manufacturing enterprises and 146 produce research products and instrumentation for the life sciences.

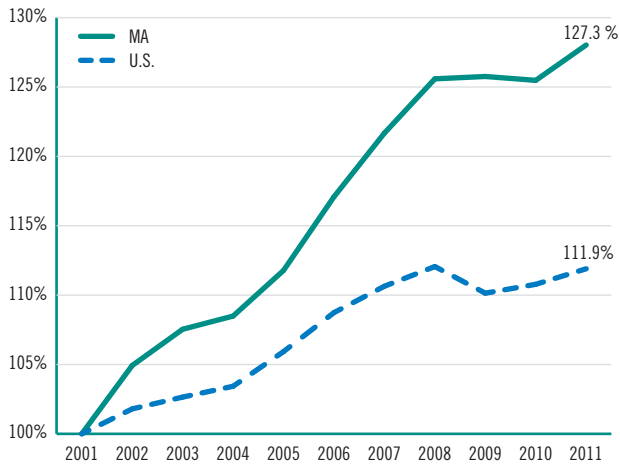
The rapid growth in employment in the life sciences in Massachusetts provides a strong indication of how rapidly this sector is expanding. As **Figure 2** reveals, the life sciences far outpaced all other industry sectors between 2001 and 2011.

FIGURE 2
**Massachusetts Employment Growth by Industry Sector
2001–2011**



Source: BLS, Author's Analysis

FIGURE 3
Employment in Life Sciences Indexed to 2001,
Massachusetts vs. the U.S.



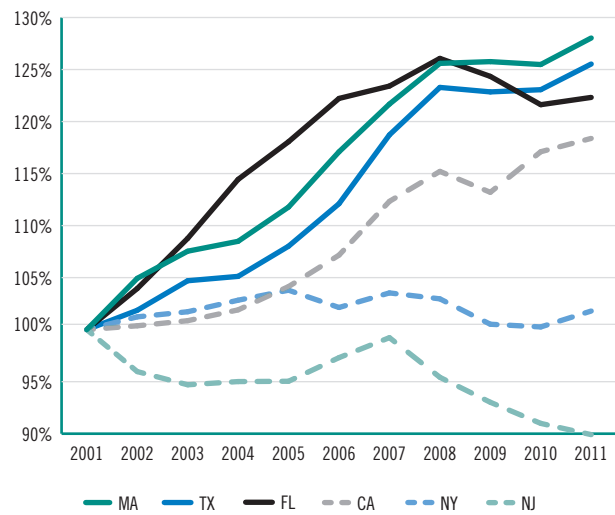
Source: Author's Analysis from BLS data

Even more impressive is the Boston-area super cluster's performance relative to the United States as a whole and to other states vying for supremacy in this rapidly evolving cluster of industries. The Commonwealth has indeed overtaken the rest of the nation in terms of employment growth in the life sciences, fulfilling an initial goal of the MLSC. **Figure 3** reveals the trend in life sciences employment in Massachusetts compared to that of the United States as a whole between 2001 and 2011. During this period, Massachusetts life sciences employment growth outperformed the nation by a factor of better than 2-to-1—growing by 27.3 percent vs. 11.9 percent for the nation.

The Commonwealth's main competitors in the life sciences are California, New Jersey, New York, Florida and Texas. But as **Figure 4** demonstrates, after 2008, the Commonwealth overtook all of these states in terms of the 2001-2011 employment growth rate.

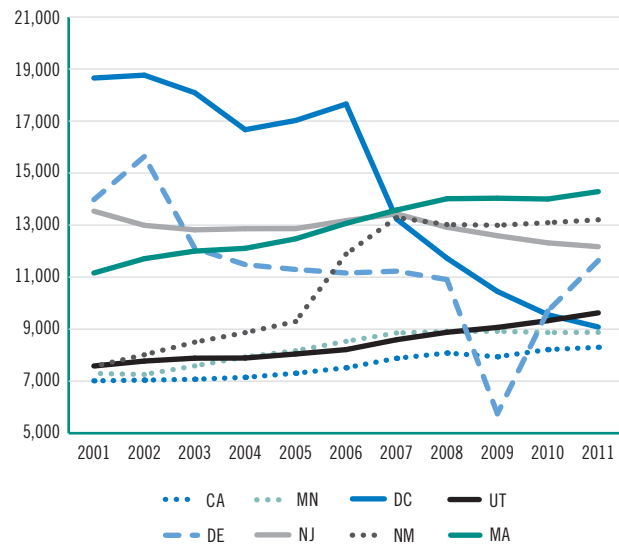
Moreover, when we control for population size, Massachusetts is the clear winner for the entire life sciences cluster of industries. In **Figure 5**, we have controlled for the size of population of each state by measuring the number of life sciences jobs per 1 million residents. By 2011, given its rapid growth rate, the Massachusetts cluster had risen to #1 in terms of per-capita life sciences employment. With nearly 14,300 life sciences jobs for every 1 million residents, Massachusetts eclipsed all other states on this measure.

FIGURE 4
Employment in Life Sciences Indexed to 2001,
Massachusetts vs. Big Competitor States



Source: Author's Analysis from U.S. Bureau of Labor Statistics (BLS) data

FIGURE 5
Life Sciences Jobs per 1 Million 2010 Population
Top 8 States in 2011, by Year



Source: Author's Analysis from BLS data

With this growth dynamic at work, Massachusetts appears well positioned to continue to attract new investment in the life sciences super cluster. In a 2011 analysis of the established life sciences clusters worldwide, the commercial developer Jones Lang LaSalle concluded that Boston had become the #1 region for the life sciences. The report noted the Boston area's concentration of high-tech research and hospital/medical employment, its many science and engineering graduate students, its plentiful funding from the National Institutes of Health and venture capitalists, its investment in R&D as a percentage of state GDP and its research facilities. Boston had a composite score of 7, ranking it #1 overall. New York/New Jersey was #2 with a composite score of 24, followed by the Bay Area and Los Angeles in California, each with a score of 25. Boston remained #1 in the developer's 2012 report, while San Diego, the San Francisco Bay area, Raleigh-Durham, N.C., and Philadelphia overtook New York/New Jersey and Los Angeles.

Why Has the MLSC Been So Successful at Building the Life Sciences Ecosystem?

According to our interviews, the Center's successful record of investments in the life sciences is grounded in its reliance on a Scientific Advisory Board (SAB) along with a large panel of experts to guide the Center's Board of Directors in determining which firms show the greatest promise. This approach to distributing public funds has created credibility within the super cluster and its ecosystem. Over and over again, we heard adjectives like "rigorous" and "diligent" when our informants described the processes MLSC uses in selecting awardees and providing a platform for collaboration.

The interviews we carried out also suggested that the Center itself is being run quite effectively and efficiently and in a highly professional manner. Virtually all of our informants praised the management team and expressed special appreciation for the leadership's refusal to permit political considerations to trump scientific merit. Because the Scientific Advisory Board (SAB) selects awardees, "There is not an ounce of boondoggle in this agency," one informant told us. Another observed that the MLSC has "lots of moving parts" and all of them are working well. Several of the interviewees observed that the Center remains responsive to industry needs, meets its deadlines and stays focused on its mission. In its report on creating fiscally sound state tax incentives, the Pew Center on the

States singled out the Massachusetts Life Sciences Tax Incentive Program for its focus on annual cost controls and its reliance on scientific merit in making awards.

Still another informant noted that the MLSC is successful because its leadership is committed to working "at the speed of business" and therefore has become a valued partner in the expansion of the industry.

Conclusions

All of our research suggests that the state will benefit from fully funding the remaining five years of the initiative in order to maintain the lead the life sciences super cluster has established in the Commonwealth. This is particularly important as other states ramp up their investments in hopes of creating their own life sciences ecosystems to entice the small and large firms Massachusetts has successfully attracted. California, Maryland, New Jersey, New York, Minnesota and Florida are not resting on their laurels, but continue to spend state funds on their own life sciences industries.

Over time, it should be possible for the Center to reach out to the private sector to help fund more of its initiatives, as it has done with the newly established Massachusetts Neuroscience Consortium. This consortium, established in September 2012, combines the efforts of the MLSC with seven global biopharmaceutical companies to jointly fund pre-clinical neuroscience research at Massachusetts academic and research institutions. Based on this model and with the plethora of larger, profitable firms coming to the state to expand their operations, one could imagine the Center funding more of its internships with private funds and having for-profit companies contribute to other programs (STEM: science, technology, engineering and math education, for example), allowing the Center to focus even more of its resources on accelerator loans and tax incentives for firms undertaking translational research.

We should also note that the success of the MLSC has lessons for other quasi-public entities in the Commonwealth. We can mention five of them here:

1. Long-term success in the use of tax incentives and business loans is most likely to occur when funds are focused on a cluster of firms and a set of technologies in a given industry, helping to create an industrial ecosystem which can attract new companies to the state.

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2. The use of expert panels to determine the awarding of loans assures that these funds will be well utilized. “Claw-back” provisions protect the taxpayers by requiring firms to repay funds advanced by the Commonwealth if they fail to meet hiring goals.
 3. A focus on encouraging firms in their early stage innovation activity is central to promoting economic growth and prosperity.
 4. Helping fund workforce development efforts for critical industries as part of the mandate of the quasi-public entity helps ensure a pipeline of skilled workers for the industry and this itself helps attract new firms to the region.
 5. Taking a “portfolio” approach to the entire range of activities in the life sciences—from investments in small innovative firms to helping train the future workforce to underwriting infrastructure—helps sustain the “ecosystem,” undergirding a virtuous cycle of discovery, innovation, investment, and employment opportunity.

In the end, we applaud the Governor and the Legislature for their foresight in creating the Massachusetts Life Sciences Center and the \$1 billion Life Sciences Initiative and we tip our hat to the MLSC for carrying out its public responsibilities in a most effective and efficient manner. The programs in place are fulfilling the goals set out in the original legislation and the Center’s leadership has ensured that these programs work to the full benefit of the Commonwealth and its residents.

Introduction

The Massachusetts Life Sciences Initiative, conceived by Governor Deval Patrick's Administration and passed into law by the Massachusetts Legislature in July 2008, is a bold 10-year, \$1 billion investment in the future of the state's economy. Based on the region's existing comparative advantage in the life sciences emanating from the laboratories of its leading universities and medical institutions, this substantial infusion of public funds was squarely aimed at making this cluster of industry sectors—including biotechnology, pharmaceuticals, medical diagnostics, medical devices, and bioinformatics—the most successful in the world. The Massachusetts Life Sciences Center (MLSC), founded two years earlier, was charged with the responsibility of implementing this bold experiment in public-private sector collaboration. If effective, the initiative was expected to boost investment and jobs in this evolving industrial sector, generating increased household income and tax revenue for the state.

In 2012, at the near halfway point of that 10-year initiative, the Dukakis Center for Urban and Regional Policy at Northeastern University was invited by the MLSC to measure the progress of the life sciences sector in Massachusetts and to carry out an evaluation of the Center's activities. We agreed to conduct such a study, but only under the condition that we would have full access to MLSC records, that our investigation would not be censored in any way by the MLSC staff, and that the staff of the Dukakis Center would have absolute control over the content of the final evaluation report. As a result, this report is being published by the Boston Foundation as part of its *Understanding Boston* series.

For the past year, Barry Bluestone, Director, and Alan Clayton-Matthews, Senior Research Associate at the Northeastern center, have carried out this evaluation. Both of us are economists who have extensive experience in industry studies and in program evaluation. Neither of us, however, was an expert on the life sciences sector when this evaluation project was first launched.

In the course of this research, we immersed ourselves in literature about the components of the life sciences industry cluster and about the role of public investment in innovation and economic growth. We analyzed existing employment data on each of the life sciences industries in the state; reviewed all of the annual reports of the MLSC; attended meetings of the MLSC Board of Directors where decisions over tax incentives and awards were made; and conducted lengthy interviews with leading executives of life sciences companies located in the state, industry trade association leaders, and members of the MLSC Scientific Advisory Board. This report is based on all of the data gathered over the year.

We began this research fully agnostic about what we might ultimately find, given the checkered record across the country of state industrial policy aimed at assisting other industries. But what we have found, based on our research, is that the Commonwealth's life sciences initiative is meeting, if not exceeding, the goals first established in 2008 by the Governor and the Legislature. Moreover, our interviews with key informants led us to the conclusion that the Massachusetts Life Sciences Center is executing its responsibilities in an effective, efficient, and professional manner. The initiative and the MLSC has performed exceptionally well in creating an *ecosystem* within which the cluster has prospered.

Moreover, we have concluded that the Center's mission, administration, and performance provide important lessons that can be applied to other state agencies charged with encouraging economic development.

This research could not have been carried out without the assistance of the staff of the MLSC and the many industry executives and experts who provided us with data and candid answers to our probing questions. We thank them all for their time and the information they afforded us.

CHAPTER ONE

About the Massachusetts Life Sciences Center

In June 2006, the Massachusetts Legislature created a new quasi-public agency, the Massachusetts Life Sciences Center (MLSC), to promote the life sciences within the Commonwealth. It was tasked with “investing in life sciences research and economic development . . . by making financial investments in public and private institutions.”¹ Its mandate was broad: to encourage basic research, development, and commercialization in the biosciences; ensure the preparation of a skilled workforce to meet the needs of the state’s bioscience industry cluster, and build stronger collaboration between the sectors of the local and international life sciences community.²

A year later, in May 2007, Governor Deval Patrick revealed an ambitious plan for a 10-year, \$1 billion public initiative to enhance the Commonwealth’s existing competitive advantage in this rapidly evolving and critically important sector of the U.S. economy. This would provide the funding for a major expansion in the activities of the Life Sciences Center. In June 2008, the legislature enacted the Governor’s Massachusetts Life Sciences Initiative with the aspiration of building on the existing strengths of the state’s research universities, its world-renowned health care sector, and its emerging private sector life sciences firms to promote the Commonwealth as the foremost center for the life sciences in the world.

With such a large commitment of state resources, how close has the Center come to meeting this goal? Has it helped attract life sciences companies to the Commonwealth, boosted R&D in the private life sciences arena, created job opportunities for Massachusetts workers and increased the state’s revenue base by boosting employment, household income, and corporate profits?

This analysis of the MLSC comes at a propitious time. Massachusetts, along with most of its cities and towns—not to mention the nation as a whole—faces growing fiscal constraints. The economic recession that officially began in late 2007 and officially ended in 2009 has given way to an extended period of sluggish economic

growth. This has diminished tax revenue just when the swelling cost of health care and public pensions is generating structural deficits.³ Without additional tax revenue from more vigorous growth, these potential deficits will require either raising taxes or cutting public services, or both.

In this new economic environment, virtually every unit of government is being forced to husband its resources and scrutinize its spending to assure that every tax dollar is spent effectively and efficiently. As such, it is not surprising that the nation, the Commonwealth, and most of its municipalities are considering ways to cut “unnecessary” or “wasteful” spending. At the same time, they want to preserve essential public programs that meet critical social needs and improve the targeting of incentives to the private sector to accelerate economic growth.

A prime target in this new era of public scrutiny is the extensive set of “subsidies” and “tax expenditures” that governments have traditionally used to encourage specific types of consumption or investment. Every tax dollar that a government agency transfers to a private business or individual in the form of a *subsidy* means a dollar less that can be used in the short-term for other purposes. Every dollar that a business or individual saves on its taxes is an “uncollected” dollar—a *tax expenditure*—that could have been used to pay for one or another public service.⁴ Because of the short-run “opportunity costs” attached to every dollar spent, there is a growing demand to ensure that public dollars are not being wasted on programs that have little payoff. Each program must be judged on whether the *long-term* gain from issuing a tax incentive, government grant, loan guarantee, or subsidy outweighs the *short-term* cost to the treasury.

Adding to the demand for more accountability has been a recent series of high-profile cases of “failed” government incentive programs. Solyndra, a manufacturer of solar photovoltaic systems, became the poster child for “misspent” federal funds during the last presidential campaign when it filed for bankruptcy after receiving

\$535 million in U.S. Energy Department loan guarantees.⁵ The same was true when A123, a manufacturer of lithium ion batteries for electric cars, went bankrupt after receiving a \$130 million federal grant to build a plant in Michigan. It was, according to a series of *Washington Post* reports, the fifth clean-energy firm the current Washington administration subsidized with loans or grants that filed for bankruptcy protection. During the campaign, Republicans claimed both Solyn-dra and A123 were prime examples of “cronyism” in President Obama’s stimulus program.⁶

Closer to home was the failure of Curt Shilling’s 38 Studios video-game firm. It closed its doors and laid off all of its employees after Rhode Island lured it from Massachusetts with a \$75 million loan guarantee. This case raised anew an old question. Under what circum-

stances should states use tax abatements, subsidies, and other inducements to encourage investment and create jobs in the private sector?⁷

As the Massachusetts Life Sciences Initiative approaches the halfway mark in its 10-year legislative life, it is altogether appropriate that this report attempt to ascertain whether, and to what extent, the Massachusetts Life Sciences Initiative has already produced tangible positive gains for the Commonwealth, and whether maintaining the initiative will likely produce even greater long-term benefits for the state’s residents and taxpayers.

For the purposes of this report, we define the Life Sciences cluster as consisting of sixteen (16) specific 6-digit NAICS industry sectors as shown in **Table 1**.⁸ These include two research and development industries, two laboratory industries, two medical distribution

TABLE 1
Life Sciences Sectors

Group	NAICS	Title
1	325411	Medicinal and Botanical Manufacturing
1	325412	Pharmaceutical Preparation Manufacturing
1	325413	In-Vitro Diagnostic Substance Manufacturing
1	325414	Biological Product (except Diagnostic) Manufacturing
2	334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
2	334516	Analytical Laboratory Instrument Manufacturing
2	334517	Irradiation Apparatus Manufacturing
3	339112	Surgical and Medical Instrument Manufacturing
3	339113	Surgical Appliance and Supplies Manufacturing
3	339114	Dental Equipment and Supplies Manufacturing
4	423450	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers
4	424210	Drugs and Druggists’ Sundries Merchant Wholesalers
5	541711	Research and Development in Biotechnology
5	541712	Research and Development in Physical, Engineering, and Life Sciences (except Biotechnology)
6	541380	Testing Laboratories
6	621511	Medical Laboratories

Source: Battelle and the Biotechnology Industry Organization (June 2012)

sectors, and ten different manufacturing industries.⁹ The cluster also includes the life sciences departments in universities and medical institutions in the Commonwealth.¹⁰

As of 2012, according to the Massachusetts Biotechnology Council (MassBio), there were 1,198 life sciences companies operating in New England employing 103,006 workers, the vast majority of these firms located in Massachusetts. More than one-third of these New England firms were founded after 2004 and 80 percent are relatively small with sales under \$100 million a year. More than two out of five of these firms (43%) have annual sales of less than \$5 million. Of all the Massachusetts firms listed in the 2012 MassBio directory, about half (514) are medical device companies; 232 are drug development firms; 147 are contract research and manufacturing enterprises; and 146 produce research products and instrumentation for the life sciences.¹¹

CHAPTER TWO

The Size and Scope of Public Tax Expenditures and Public Subsidies

To begin our assessment, it is useful to put the Commonwealth's \$1 billion investment in the life sciences into perspective. According to the Congressional Research Service, at the federal level there are over 200 separate tax expenditures which taken altogether are projected to cost the U.S. Treasury more than \$1.1 trillion in FY2014.¹² The bulk of these take the form of exemptions, deductions, and exclusions from the personal income tax such as the mortgage interest deduction. These tax provisions are intended to encourage such "virtuous" behavior as home ownership, charitable contributions, and family saving.¹³

While piling in comparison to these personal tax expenditures, federal corporate subsidies cost the Treasury almost \$100 billion a year, according to research conducted by the Cato Institute.¹⁴ A full quarter of these go to farmers in the form of agricultural subsidies and crop insurance, but other subsidies underwrite applied research and development under way at defense contractors, energy companies, housing developers, airlines, AMTRAK, universities and research labs, the National Institutes of Health, NASA, and small businesses.¹⁵ In searching for ways in 2013 to cut federal spending in order to reduce federal deficits, one can be certain that some, if not many, of these tax expenditures and subsidies will be reviewed for possible modification or elimination.

States and municipalities have also provided the private sector with billions in tax expenditures and subsidies. In a recent series of articles, a trio of *New York Times* investigative reporters found that across the nation, states, counties, and cities dole out over \$80 billion in "business incentives" each year.¹⁶ The key industries receiving such tax preferences and subsidies are manufacturing; agriculture; the oil, gas, and mining industries; and the film industry. Technology companies like Twitter and Facebook, according to the *Times* report, are not far behind.

The *Times* analysts collected data on all 50 states. In their review of Massachusetts, they found 48 state programs that provide nearly 1,500 grants or incentive packages to specific companies. The total annual cost to state and municipal governments for these programs was reported to be at least \$2.26 billion, equal to seven

percent of the state budget or \$345 per capita. Of this total, more than a third (\$786 million) take the form of corporation income tax credits, rebates, or reductions. Another \$130 million is paid out by the state treasury in the form of cash grants, loans, or loan guarantees.

The *Times* reporters listed a group of 94 Massachusetts companies that received nearly \$165 million in grants, tax incentives, and subsidies between 1994 and 2011. Of this total, 26 were life sciences companies accounting for \$48.7 million or nearly 30 percent of the total. Among the companies receiving these funds were Vertex Pharmaceuticals, Organogenesis, Shire Human Genetics Therapies, Sanofi, and Cubist Pharmaceuticals. The company receiving the largest state subsidy, however, was Liberty Mutual, an insurance company. Between 2006 and 2009 alone, the Massachusetts Film Office doled out nearly \$150 million in tax credits to film companies.¹⁷

States like Alaska, West Virginia, Texas, and Michigan spend two to three times as much per capita as Massachusetts on such business incentives, but other states including New Hampshire (\$30), North Carolina (\$69), California (\$112), South Carolina (\$194), New York (\$210), Florida (\$212), Oregon (\$226), Connecticut (\$241), and Ohio (\$281) spend less.

Obviously, in a time of tight fiscal budgets, such expenditures of tax revenue need to be carefully evaluated as elements of what is known as "industrial policy"—government support of private business.

To assure that this assessment of the Massachusetts Life Sciences Center is placed in proper context, we need to begin by considering the ways in which government can encourage private sector economic development in an efficient and effective way. In doing this, we need to pay particular attention to understanding the role of government-induced innovation in spurring economic growth. This foray into these theoretical issues will provide us with guidance as to what types of government tax expenditures and subsidies are more likely to yield positive benefits for society and thereby help us to assess the value of the MLSC.

CHAPTER THREE

Industrial Policy: Pros and Cons

For decades, economists have debated the role of government in the promotion of private industry. At various times in our history, the federal government has helped to establish industries that went on to be central to our economy. The growth of the nation's aircraft industry was aided by the U.S. Post Office, which subsidized airlines with lucrative air-mail contracts in the early days of air travel. In the aftermath of Sputnik, the federal government invested billions of research dollars into perfecting solid state guidance systems and software for rockets and missiles, helping to create what today is our high-tech universe of cell phones, the Internet, iPads, GPS devices, and a dizzying array of gadgets based on the integrated circuit and the software that runs them.

Yet, as a recent Center for Economic and Policy Research working paper put it, "For the past generation, the dominant view among economists was that giving businesses a free hand—that is, little regulation and low taxes—was the most important contribution governments could make to encourage productive investments. The corollary to this view was that, as much as possible, overall investments in the economy should be undertaken by the private sector, as opposed to any sort of government entity."¹⁸

The argument *against* a public "industrial policy" is that governments are not capable of "picking winners" and therefore too often waste tax dollars. The conservative Cato Institute claims that government subsidies inevitably distort economic activity and "create even larger failures than might have existed in the marketplace."¹⁹ By aiding some businesses, others are placed at a disadvantage either by reason of having to pay higher taxes or having to compete with subsidized firms. Hence, diverting resources from businesses preferred by the market to those preferred by policy makers leads to losses for the overall economy."²⁰

The argument *for* public investment in the private sector is that rather than "crowding out" private capital, public investments actually "crowd in" private investment and can be used to "incubate new technologies and help

private businesses bring these innovations to the stage where they can be effective in the marketplace."²¹ In brief, well-placed public funds in the private sector can yield large long-term gains at relatively modest short-term cost.

But what makes for "well-placed" public funds? A good part of the answer lies in whether the funds contribute significantly to a growing economy and increasing numbers of jobs.

New vs. Old Growth Theory

In economics, there are two fundamentally different views about what contributes most to growth. What is now known as the "old growth theory" suggested that economic prosperity emanates from the accumulation of ever greater stocks of the fundamental ingredients of production: capital, labor, and natural resources. Those countries that find ways of increasing investment in plant and equipment, adding to labor supply, and extracting more natural resources are the ones that will become more affluent. Just consider the United States or Saudi Arabia versus poor countries in Africa or Southeast Asia. Clearly, without capital, labor, and natural resources, output cannot be produced.

While not completely discounting this approach to growth, a "new growth theory" has evolved that "places technological progress at the very epicenter of growth dynamics, rather than capital investment per se."²² Advances in technology and interdependencies between new ideas and new investment provide the basis for entire new industries and products that create new wealth and raise living standards. "In the new model, technology provides the engine for sustained growth in the face of the diminishing productivity associated with additions to the stock of physical and human capital."²³

In addition to avoiding diminishing returns, innovation-based growth has an additional salutary feature relative to other ingredients in the growth equation: Once the fixed cost of creating a technology has been incurred,

the formula can be used over and over again at little or no cost. Indeed, this *spillover* property is taken to be the defining characteristic of technology. As Paul Romer, one of the founders of new growth theory puts it, “The idea behind the transistor, the principles behind internal combustion, the organizational structure of the modern corporation, the concepts of double-entry bookkeeping—all these pieces of information and many more like them have the property that it is technologically possible for everybody and every firm to make use of them at the same time without additional costs.”²⁴ As such, instead of diminishing returns to investment, there can be increasing returns.

Moreover, the new growth theory posits a strong reciprocity between the rate of skill acquisition among workers and the growth dividend society obtains from new capital and new inventions. *Thus, programs that combine incentives for innovation along with resources to augment human capital should, according to this theory, fuel rapid economic growth more than anything else society can do to promote prosperity.*

But here is the rub. Keeping score on the success of innovation is difficult. Instead of a more or less certain return to a given infusion of capital under the old growth theory, innovation under the new growth theory tends to deliver faster and stronger long-term growth, but it is “lumpy, discontinuous, and nonlinear.”²⁵ There can be long lags between the time a new innovation is first incorporated into production and the time that it pays off in terms of increased productivity, output, and jobs. The introduction of the steam engine in the mid-18th century did not pay off in terms of improved productivity until the early 19th century.²⁶ In the short term, it can be discouraging, as investments in fundamental innovation usually have little immediate payoff.

To be productive, innovation needs to be perfected and diffused, and this takes time. According to a study of 265 major and minor innovations over the past couple of centuries, it took a typical new innovation forty-one years, on average, to move from the 10 percent to the 90 percent diffusion level.²⁷ The diesel locomotive, for example, was clearly superior to the steam locomotive, yet twenty years after the first diesel was introduced in 1925, there were still nearly ten steam locomotives in service for every diesel-powered engine. The first integrated computer circuits were introduced in the 1960s,

but it was not until the 1990s that the full productivity premium of the computer generation was finally realized.²⁸ It will take decades to realize the full benefits to humanity and the economy from the advances now being made in drug discovery, medical diagnostics, and medical devices.

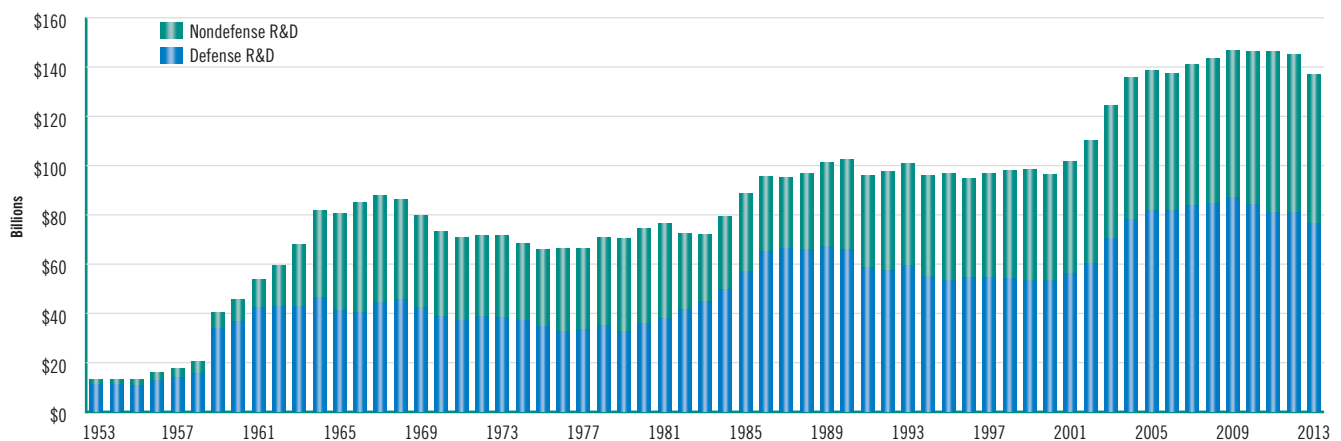
Unfortunately, in an era of intense concern over short-term deficits, it is often hard to marshal the patience needed to invest sufficiently in technological innovation or the firms that create it. As a corollary, investments made today in research and development (R&D) are often risky propositions from the perspective of the short-term balance sheet. Yet without massive infusions in R&D, continuous breakthrough innovation cannot occur. Nowhere is this truer than in the life sciences.

Public Investment in R&D

Worldwide, no country spends more than the United States on R&D, and this investment has played an important role in the nation’s economic development, at least since World War II.²⁹ According to the Battelle Institute, total R&D spending in the U.S. reached \$436 billion in 2012, of which about 29 percent (\$126 billion) was supplied by the federal government while 64 percent (\$280 billion) was provided by private industry. The remainder came from foundations and other non-profits (\$14.5 billion), university-owned funds (\$12.3 billion), and a tiny amount from state and local governments (\$3.8 billion).³⁰

Despite its smaller share of overall R&D funding relative to the private sector, the importance of the federal government in spurring innovation should not be underestimated. Without government investment, it is likely that private firms would underinvest in R&D, particularly basic research. The reason is that the social rate of return to investment in basic research often exceeds the private rate. Unlike investments in tangible capital such as machinery, the ideas flowing from R&D are, in the words of economists, “nonrival” and not fully “appropriable.” *Nonrival* means that my learning of a new innovation does not prevent you from using it. When returns are not fully *appropriable*, the original innovator cannot gain all the profit that flows from the eventual application, especially the commercialization, of the new process or product.³¹ In this case, firms will often wait for others to do the innovating. As Federal Reserve Bank Chair-

FIGURE 1
Federal Spending on Defense and Nondefense R&D
 Outlays for the conduct of R&D, FY 1953–2013, billions of constant FY 2012 dollars



Source: American Association for the Advancement of Science

man Ben Bernanke recently reminded an audience at a Washington, D.C. conference, “James Watson and Francis Crick received a minute fraction of the economic benefits that have followed from their discovery of the structure of DNA.”³² Without government-sponsored basic research, society loses out on innovation.

Public sector R&D also encourages private sector R&D spending. Research reveals that there is a strong positive correlation between the trajectory of private R&D spending in a given year following public expenditures a year earlier.³³

The Trend in Federal R&D Spending

Given (1) the importance of innovation as the prime driver of economic prosperity, (2) the role of R&D in promoting innovation, and (3) the fact that without public funding of R&D total research investment would be suboptimal because of the inability of private investors to fully appropriate its monetary benefit, how much has the federal government invested in this vital factor?

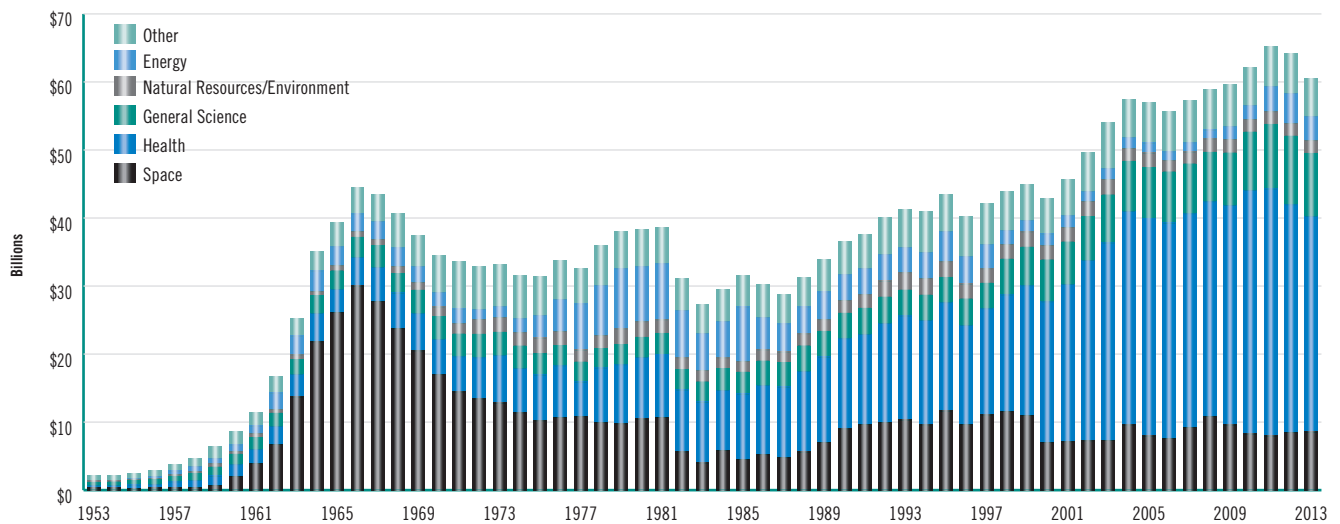
As **Figure 1** reveals, federal spending on defense and nondefense R&D (in inflation-adjusted FY2012 dollars) rose sharply between 1953 and 1965 from less than \$15 billion to more than \$80 billion before dipping back to just over \$60 billion in 1976. Spending was back to more than \$100 billion by 1989 and remained flat through 2001. It rose sharply after that, increasing to

over \$140 billion by 2009. In FY 2013, under pressure to reduce federal spending, total federal R&D spending once again declined.³⁴

As **Figure 2** demonstrates, virtually *all* of this growth in non-defense federal R&D spending has been in the health field, mainly through the National Institutes of Health. While federally sponsored health research only accounted for about seven percent of total non-defense federal R&D spending in 1965, by 2013 it accounted for more than half (52%). Much of this basic public investment is going into the life sciences, and of all fifty states, Massachusetts trails only California in NIH funding. In 2011, California institutions received \$3.5 billion in NIH funding; those in Massachusetts received \$2.5 billion.³⁵ Yet, on a per capita basis, the Commonwealth swamps all other states in NIH funding, obtaining four times as much as the Golden State.

This growth in federally sponsored R&D seems impressive, but as a share of the nation’s Gross Domestic Product (GDP), the federal government’s role is roughly half of what it was in the early 1960s (see **Figure 3**). Spending rose rapidly in the 1950s and 1960s, surpassing 1.9 percent of GDP in 1964, up from just 0.7 percent in the early 1950s.³⁶ Much of this was in direct response to the Soviet Union’s launching of Sputnik and President John F. Kennedy’s goal of sending a man to the moon before 1970. After reaching its nadir of just 0.67 percent in 2000, it has slowly climbed back to 0.85 percent today.³⁷

FIGURE 2
Trends in Nondefense R&D by Function, FY 1953–2013
 Outlays for the conduct of R&D, billions of constant FY 2012 dollars



Source: American Association for the Advancement of Science

As we have seen, new growth theory suggests that our nation's prosperity is intimately tied to the rate of innovative activity. If innovation slows down, growth will suffer. Hence, the big question is whether the United States can maintain its rate of innovation activity into the future and thereby sustain economic prosperity and full employment.

The Role of R&D Investment at the State Level

As noted above, states have historically played a minor role in funding research and development. Their \$3.8 billion spent in FY2012 amounted to less than 1 percent of total spending on R&D and no more than 3 percent of government-sponsored R&D. Indeed, given that the full benefits from basic research cannot be easily appropriated by the funder, it might seem foolish that an individual state would spend its own revenue on investments that can be appropriated by entities in other states.

So why should a state invest anything in R&D?

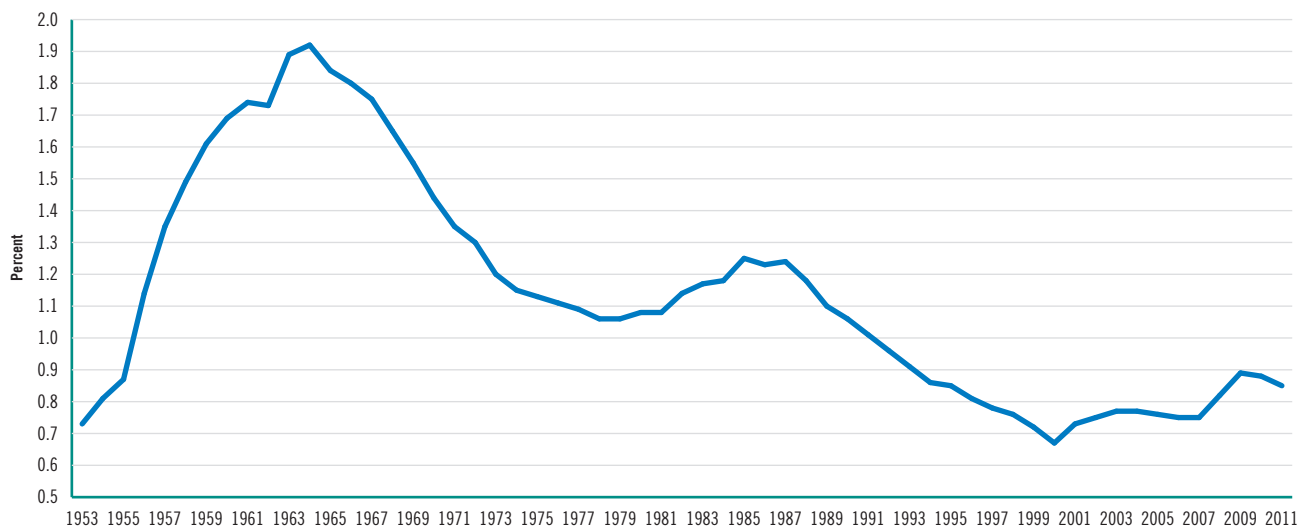
Invested in the appropriate industries, public funds can help encourage the growth of an industrial cluster in a given region that, once incubated, can maintain a self-sustaining locational advantage that provides a magnet for new private investment in the region's

cluster. Such locational advantages are called *agglomeration economies* and refer to the benefits, savings, or cost reductions resulting from the clustering of economic activities.³⁸ The clustering of such industries can give rise to an "industrial climate" or "ecosystem" that is self-perpetuating as the result of a regional congregation of specialized facilities, labor pools, education and training institutions, and specialized legal, accounting, and financial services.

Such agglomeration economies explain the economic success of most metropolitan areas. In New York City, for example, the cluster of financial industries and advertising is responsible for much of the growth in wealth. The birth of the early auto industry in and around Detroit in the early part of the 20th century would ultimately allow Detroit to take advantage of agglomeration economies and blossom into the world's "Motor City" by the end of World War II. By 1949, the median family income of Detroiters was higher than that of any other city in America except Chicago (whose residents enjoyed a 1949 median family income exactly one dollar higher), and 29 percent above the national figure.³⁹ Chicago's prosperity was built on being the transportation hub for America. Seattle became the center for jet aircraft production.

In the postwar period, the most successful new indus-

FIGURE 3
Federal Spending on R&D as Percent of GDP
FY1953–FY2012



Source: National Science Foundation "Science and Engineering Indicators 2012"

trial cluster was built in Silicon Valley in and around Palo Alto, California. Beginning in 1939 with the founding of Hewlett-Packard—the brainchild of two Stanford graduate students—the valley would attract a host of firms that would ultimately build the modern computer industry and make this region one of the wealthiest in the world.⁴⁰

In the case of Detroit, local, state, and the federal governments essentially subsidized the auto industry through the public provision of streets, roads, and highways. Chicago's prosperity was underwritten by public subsidies to the railroads. Seattle's aircraft industry has benefited not only from the early airmail contracts but from massive defense spending that provided most of the resources needed to develop both military and then commercial jet airframes and jet engines.⁴¹ While private venture capital has played a major role in the success of Silicon Valley, the federal government has played a significant role as well. From less than \$10 million in 1960, federal research funding of computer science climbed to almost \$1 billion by 1995, while the U.S. expenditure on research in electrical engineering (which includes semiconductor and communications technologies) has fluctuated between \$800 million and \$1 billion since the 1970s. According to the National Research Council, such funding "has constituted a

significant fraction of all research funds in the computing field, particularly underwriting academic research. Federal support has constituted roughly 70 percent of total university research funding in computer science and electrical engineering since 1976."⁴²

The lesson is that the prosperity of many metropolitan areas has been stimulated in large measure by public investments in particular industry clusters. Given an early start in an industry, public funds can help build the agglomeration economies that in turn cement a single region's leadership in that industry nationally and globally. The Massachusetts Life Sciences Center was established precisely to this end. How successful has it been?

CHAPTER FOUR

The Emergence of the Massachusetts Biotechnology Super Cluster

In 2010, four scholars at the Massachusetts Institute of Technology (MIT) developed a schematic to explore the complement of elements needed to produce a successful American biotechnology cluster.⁴³ This schematic is summed up in **Table 2**. The schematic includes three innovation stages and four critical factors. Based on this matrix, the team was able to describe all of the aspects of what they called the Massachusetts Biotechnology Super Cluster.

A thriving science-based cluster must take basic research and transition it into commercial products and services. To do this requires funding, skilled labor, a legal framework that protects intellectual property (IP), and a diverse set of industries that includes both new innovative firms as well as established ones. As the authors suggest, “inadequacies in any area can threaten the cluster.”⁴⁴

As a whole, the U.S. biotechnology cluster benefits from access to both public and private sources of funding. These include, on the public side, NIH, the Department of Defense (DOD), Small Business Innovation Rewards

(SBIR) to support basic research; foundation support from private nonprofits; and, on the for-profit side, angel and venture capital (VC) investors who provide funds for translating basic research into new products and services. The cluster is also supported by public and private customers for its end products, which at times are subsidized through tax expenditures and subsidies.

The talent pool for this sector ranges from creators and craftspeople who play the role of principal investigators on research grants and contracts, entrepreneurs who form new firms to commercialize the output of the sector and workers who range from those with just a high school diploma to those with Ph.Ds.

To be successful, the cluster must also enjoy a legal system that protects intellectual property through patents and licenses and IP enforcement in the courts.

Long-term success for the cluster also requires a diverse set of “tradable agglomerating” companies comprised of new innovative enterprises that can power future

TABLE 2
The Prototypical American Biotechnology Cluster

Critical Factors		Innovation Stages		
		Basic Research	Translation	Commercialization
Funding	Public	NIH	DOD, SBIR	Payers, Tax Policy
	Private	Foundations	Angel, VC, Industry	Customers
Talent	Creators	PIs	Entrepreneurs	Senior Execs
	Craftspeople	Grad Students	BA/MS/PhD	HS - PhD
Laws & Norms	Intellectual Property	Bayh-Dole	Patentability & Scope	IP Enforcement
	Experimentation	New Field Encouragement	Independence Over Security	Reinvention
Diversity	Tradable Agglomerating	Stem Cells	RNA, Interventional Imaging	Biologics
	Tradable Converging	Bio-processing	Molecular Diagnostics	Biomanufacturing
	Local Sustaining	Medical Centers	Science Parks	

Source: Trusheim, Berndt, Murray, and Stern, 2010

growth through the development of breakthrough products, “tradable converging” firms which remain globally competitive in existing products, and a set of local entities including medical centers and science parks that provide local services to the cluster.

A good deal of this requires a collaborative form of industrial policy with both the federal and state government playing major roles in the emergence of the cluster. In the 1950s, the federal government continued its funding of R&D in the biosciences as part of its Cold War strategy. The VC model was invented and the first high-tech firms founded. In the 1970s, the federal government declared a “War on Cancer” with NIH funding, while the first recombinant DNA experiments were undertaken in university laboratories and private research firms.

In 1980, the Bayh-Dole Act was adopted, giving universities IP ownership of the output from federally funded research while the first recombinant DNA products hit the market. In the Commonwealth, the Massachusetts Biotechnology Council was created in 1985, one of the first in the nation. In the 1990s, the first genomics companies were founded, led initially by Millennium Pharmaceuticals (established by a former Genentech executive).

Much of this early work came to fruition in the first decade of the 21st Century. During this period, the human genome was sequenced and the George W. Bush administration committed itself to doubling the NIH budget.

Here in the Commonwealth, a final piece of the cluster puzzle was put in place with the founding of the MLSC, followed by the state’s funding of the Life Sciences Initiative to help cement the region’s lead in this important cluster and maintain that lead into the future. With all of the other parts of the matrix in place in Massachusetts, the state became a magnet for Big Pharma.

By the end of the first decade of the 21st Century, Massachusetts was home to 9 of the top 10 major drug companies in America, surpassing New Jersey. Pfizer, Novartis, GlaxoSmithKline, Genzyme’s successor Sanofi, Astra-Zeneca, Abbot Laboratories, Merck and Bristol-Myers Squibb had all committed to operations in the Bay State. The largest of these big firms, in order of employment, are Genzyme (Sanofi), Pfizer, Biogen Idec, Novartis, Shire, Thermo Fisher Scientific, EMD Millipore, Vertex, Parexel International, and Hologic.⁴⁵ Only the Swiss

pharmaceutical giant, Roche—the world’s third-largest biopharma firm—has not moved into Massachusetts.⁴⁶

According to a separate comprehensive analysis of the global life sciences cluster completed in 2011, the commercial developer Jones Lang LaSalle concluded that Boston had become the #1 region for the biosciences based on its concentration of high tech research and hospital/medical employment, its number of scientific and engineering graduate students, its level of NIH and venture-capital funding, its investment in R&D as a percentage of state GDP, and its thousands of square feet of academic and research institute facilities. Boston had a composite score of 7 ranking it #1 overall. New York/New Jersey was #2 with a composite score of 24, followed by the Bay Area and Los Angeles each with a score of 25.⁴⁷

CHAPTER FIVE

The Massachusetts Life Sciences Center

What role does the MLSC play in the MIT schematic? Beginning with its creation, the MLSC took as its strategic mission the role of pulling together all of the parts of the matrix into a life sciences ecosystem, creating a dense, highly connected community of scholars, entrepreneurs, industry leaders, venture capitalists, and government officials dedicated to the success of the life sciences super cluster in the Commonwealth. Unlike many state economic development initiatives, the Center has a broad range of strategic priorities geared to enhance all aspects of the life sciences cluster. These include:

- funding translational research—research that converts basic research into marketable products and services
- investing in promising new technologies
- ensuring worker skill acquisition that aligns with the needs of the life sciences industries
- creating new infrastructure from shared resources that accelerates innovation
- building partnerships between sectors of the local and international life sciences communities

To accomplish these goals, the Center relies on a portfolio of seven distinct programs.⁴⁸ These include:

Cooperative Research Grants—Supports industry-sponsored research at universities and facilitates scientific discoveries that lead to medical applications. These grants of \$250,000 per year for up to two years match industry contributions dollar for dollar.

Internship Challenge Program—Provides up to \$7,200 in funds for interns working at Massachusetts companies with fewer than 100 employees and fewer than 250 globally.

New Investigator Grants—Spurs innovative research and advances the careers of new investigators who are working on cutting-edge research at Massachusetts academic research centers with grants of \$100,000 per year for up to three years.

Life Sciences Accelerator Program—Provides financing of up to \$1 million for early-stage companies to help leverage additional sources of capital.

Small Business Matching Grant (SBMG) Program—Provides matching support capped at \$500,000 per company to firms on the verge of commercializing new technologies developed using Phase II or Post-Phase II Small Business Innovation Research (SBIR) awards or Small Business Technology Transfer (STTR) grants from the federal government.

Life Sciences Tax-Incentive Program—Issues a combination of 10 competitively awarded tax incentives available to companies that meet specified hiring goals. These include:

- A refundable 10% investment tax credit⁴⁹
- A refundable in-state research tax credit
- A refundable job creation tax credit (50+ jobs)
- A refundable FDA user fee credit
- Extension of net operating losses to 15 years
- Deduction of orphan drug clinical testing
- Elimination of the sales factor throwback provision
- Special sales tax exemption
- Life sciences research credit for out-of-state costs
- Construction sales tax exemption

Capital Projects Fund—Provides capital for equipment and supplies for high schools in Gateway Cities, vocational/technical schools, and community colleges; and for capital projects in academic/research institutions, business incubators, and other not-for-profit organizations in the Commonwealth.

Between 2008 and June 30, 2012, the Center had directly invested or committed over \$300 million that has leveraged more than \$1 billion in third-party investment, according to the MLSC's report for fiscal year 2012. If none of that investment would have been made in Massachusetts in the absence of the MLSC commit-

ments, each dollar of taxpayer money spent by the Center resulted in the attraction of \$3.40 in additional, outside investment creating a public-private investment fund of more than \$1.3 billion.⁵⁰

There are four factors that make the MLSC quite different from most government subsidy programs:

- Instead of simply providing tax benefits to a few private firms to lure them to the Commonwealth, the MLSC has a portfolio of investment tools that include direct investments in life sciences companies; grants to academic organizations and medical centers and grants for “shovel ready” public and non-profit sector capital projects that help influence the location decisions of life sciences companies.
- The MLSC operates under a Board of Directors that includes state government officials, industry CEOs, leaders from academia and medicine, bioscience researchers and others who have great knowledge of the life sciences.
- Investments are reviewed by a panel of more than 200 experts who send their recommendations to the Center’s Scientific Advisory Board, which itself is dominated by academic researchers, industry scientists and private venture capital experts who together can judge the scientific and economic potential of an MLSC investment.
- The Center insists on accountability in terms of private sector investment matches and specific job creation goals and retains the power to “claw back” tax incentives and other investments when these goals are not reached by grant recipients.⁵¹

In the four-year period between June 2008 and June 2012, the Center invested nearly \$190 million in 12 capital projects, provided 31 company grants and loans worth nearly \$23 million, issued 35 academic research grants with a value in excess of \$23 million and 56 tax incentives (still outstanding) valued at close to \$57 million, invested \$7 million to fund 884 interns as part of the Center’s mission to help develop the life sciences workforce, provided more than \$3.3 million in equipment and supply grants to schools and spent \$1.5 million on other grants including the funding of business plan competitions. As of June 30, 2012 the Center was managing a portfolio of approximately 200 grants, loans, and tax incentives.⁵²

Examples of *infrastructure activity* as listed in MLSC’s FY2012 report include:

- \$5 million in support of the construction of the Joslin Center’s Translational Center for the Cure of Diabetes
- \$10 million to the Dana Farber Cancer Institute to support the expansion of its \$20 million Molecular Cancer Imaging Facility
- \$5 million to the Boston Museum of Science for the construction of its “Hall of Human Life,” which helped leverage \$11 million in private financing
- \$14.6 million to the University of Massachusetts Dartmouth to build its new Massachusetts Biomanufacturing Center in Fall River
- \$10 million to UMass Lowell to equip laboratories within its new Emerging Technologies and Innovation Center
- \$14.3 million to help build the Framingham Wastewater and Pumping Station that will allow bioscience firms to operate in that community

Examples of accelerator loans awarded in FY2012 to provide working capital to early stage life sciences companies include:

- \$750,000 to Allurion of Wellesley for developing a novel medical device for inducing weight loss in obese patients
- \$750,000 to Alcyone Lifesciences, Inc. for the development of a micro-catheter for treating neurological conditions
- \$245,000 to Strohl Medical for the creation of a medical device for accelerating the treatment of stroke victims

Subsequent to receiving accelerator loans, early stage firm recipients have raised more than \$100 million in either private or public funding to grow their firms or in acquisition proceeds. Already six firms that have received accelerator loans have paid them off early, permitting the MLSC to construct a revolving fund, thus expanding the resources the Center has for this purpose.

In addition to the accelerator loans, the MLSC has begun a Small Business Matching Grant Program (SBMG), which complements funds received by firms from NIH, the National Science Foundation (NSF), and DOD. In 2012, the Center awarded a \$500,000 grant to Firefly BioWorks, Inc. of Cambridge after full review by the

MLSC Scientific Advisory Board. The company has already been able to launch its first commercially viable product for help in diagnosing cancer, neurological disorders, and other diseases.

Examples of matching grants for academic research include:

- \$5.1 million in grants to early career investigators working in research institutions within the Commonwealth which have in turn helped generate over \$13 million in federal government, foundation, and private company research grants
- \$4.8 million in cooperative research grants (between 2008 and 2011) to encourage industry-sponsored research at Massachusetts institutions, resulting in more than \$8.6 million in research grants from other sources

Examples of the \$20.6 million in 2011 program tax incentives to 26 life sciences companies include \$3 million to Shire HGT, Inc.; \$2.45 million to Vertex; \$2.3 million to AVEO Pharmaceuticals; and \$1.84 million to Biogen Idec MA, Inc. Smaller tax incentives of less than \$500,000 went to such firms as Blueprint Medicines Corporation in Cambridge and T2 Biosystems, Inc. in Lexington. Under the Life Sciences Act, the Department of Revenue has the authority to “claw back” incentives from companies that the Center determines have not met the minimum job creation thresholds in their tax-incentive agreements.

In addition, the MLSC Internship Challenge Program has placed more than 1,000 interns in more than 290 companies across the state where host companies provide dedicated mentors to help expand the pool of prospective life sciences workers for the future. Those college students receiving MLSC internships are majoring in biology, engineering, chemistry, business, computer science and physics and end up interning in companies that produce medical devices, pharmaceutical products, diagnostic services, and biotechnology research. In FY2012, the Center also awarded \$180,000 to four programs to encourage science, technology, engineering and math (STEM) education, especially for women and minorities.

Table 3 provides a summary of the investments made by the MLSC between June 2008, when the Life Sciences Initiative funding first became available, and June 2012.

TABLE 3
**Distribution of MLSC Investments by Dollar Amount
June 2008–June 2012**

Capital Projects (12)	\$186,950,000
Company Grants and Accelerator Loans (31)	\$22,907,000
Academic Research Grants (35)	\$23,346,344
Tax Incentives (56)	\$56,595,093
Interns Funded for Workforce Development (884)	\$6,903,164
Equipment and Supply Grants or Schools (32)	\$3,333,675
Other Grants/Business Plan Competitions	\$1,540,000
Total	\$301,575,276

Source: Massachusetts Life Sciences Center, 2013

This comprehensive approach to an entire industry cluster differs significantly from other federal, state, and local incentive programs that target a single company or, at best, a single industry.

We can now ask: “*Has this approach, and the investments made through the MLSC, paid off?*”

We begin to answer this question by tracking output and employment in the life sciences cluster and consider the results in terms of the creation of the Center in 2006.

But given what we have learned about the role of innovation in spurring economic growth, we can ask a more fundamental question. “Has the creation of the Center and the Life Sciences Initiative paid off in terms of nurturing a rich ‘ecosystem’ within which the entire life sciences super cluster can flourish now and in the future, providing a platform for further growth in economic opportunity for Massachusetts residents?”

CHAPTER SIX

Output and Employment in the Massachusetts Life Sciences Super Cluster

The life sciences super cluster began to benefit the Commonwealth by the middle of the last decade, even before the MLSC was established. By 2006, publicly traded companies in Massachusetts were already generating \$30 billion in sales, an increase of nearly 50 percent in just four years. With \$7.5 billion in exports, the Massachusetts life sciences sector accounted for 30 percent of total state exports.⁵³ Between 2001 and 2006, employment in Massachusetts life sciences industries increased by 13,000—more than 16 percent. The life sciences were generating jobs during a period when total non-farm employment in Massachusetts was actually *declining* by 2.8 percent. While total employment in the life sciences in 2006 accounted for just 26 out of every 1,000 jobs in the state, this sector was growing faster than any other, including education and health services (See **Figure 4**).

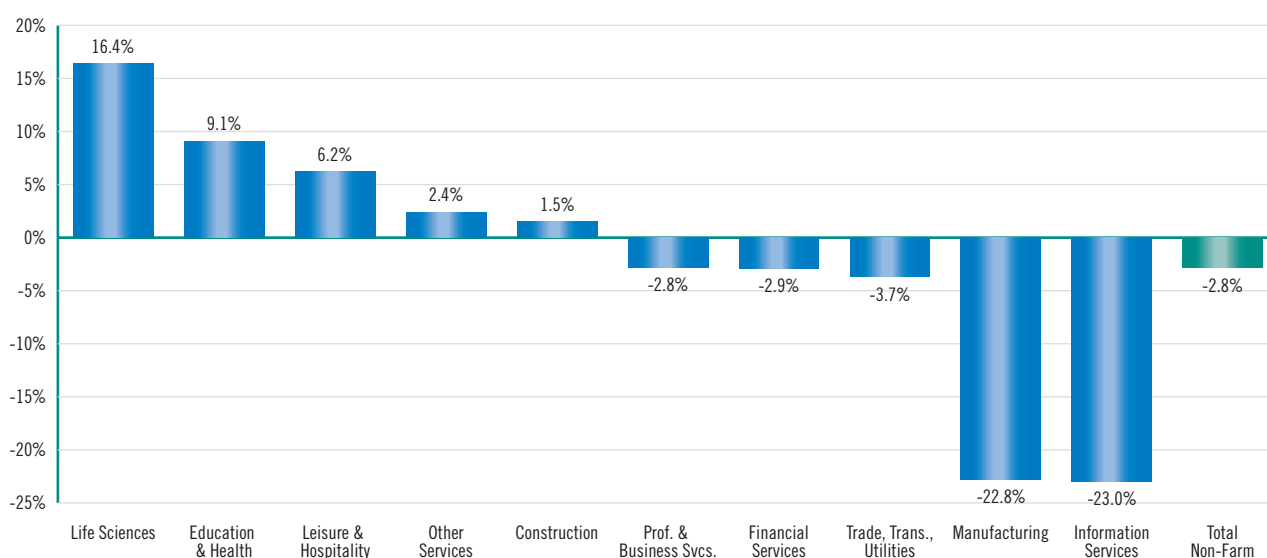
As **Figure 5** reveals, the life sciences cluster continued to generate jobs between 2006 and 2011, but not quite as rapidly as during the previous five years. However,

it was still faster than every other sector save education and health services. The national recession that began at the end of 2007 weighed on the life sciences sector, as it did most other industries. Life sciences remained a small sector in terms of overall non-farm state employment, but given its faster growth, accounted for nearly 30 jobs out of every 1,000 in the Commonwealth by 2011.

Taking the entire decade (2001–2011) as a whole, the life sciences far outpaced all other industry sectors in terms of its employment growth rate as shown in **Figure 6**.

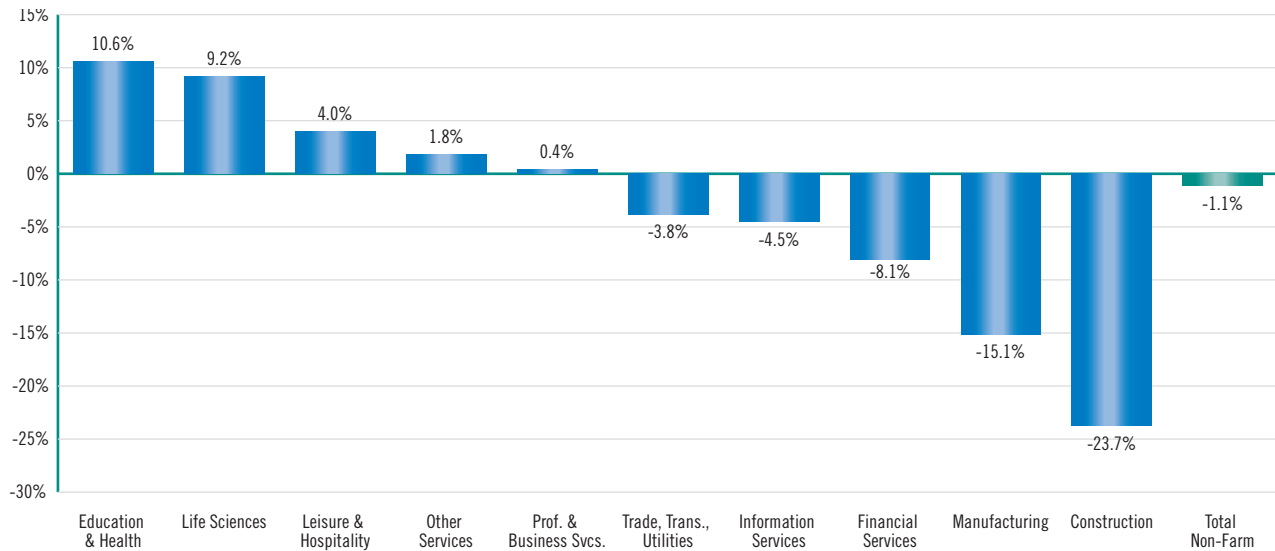
Within the cluster, however, the growth in employment has varied greatly across individual industry segments as shown in **Table 4**. During the entire period between 2001 and 2011, employment in research, testing, and medical laboratories increased by more than 50 percent, nearly twice as fast as the life sciences cluster as a whole (and 2½ times as fast as education and health services). Yet the production of medical devices—the

FIGURE 4
Massachusetts Employment Growth by Industry Sector
2001–2006



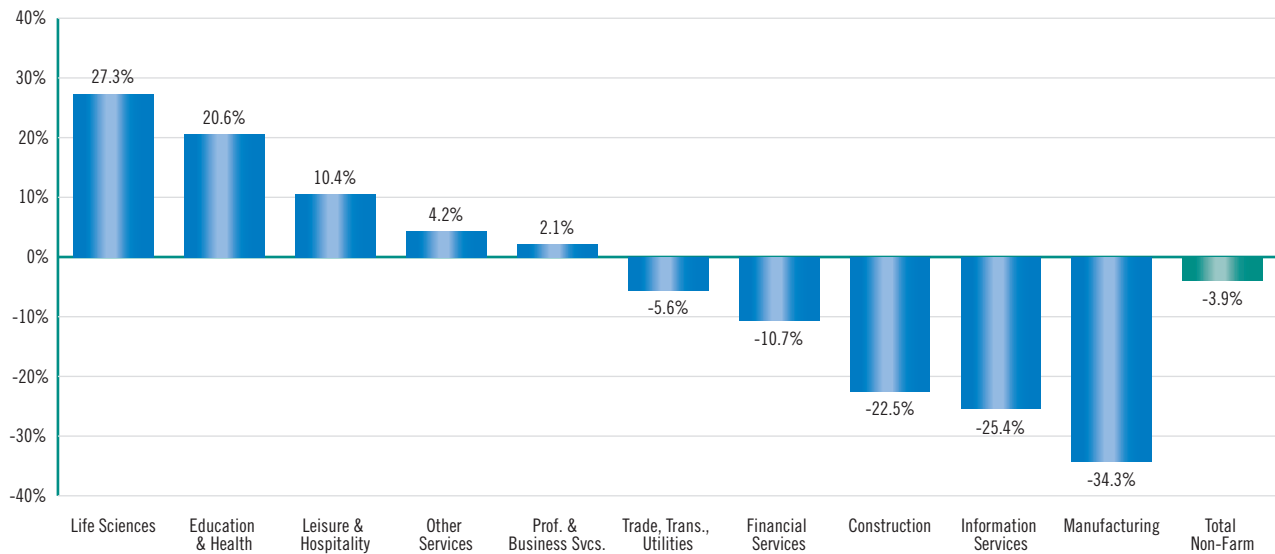
Source: Bureau of Labor Statistics, Author's Analysis

FIGURE 5
Massachusetts Employment Growth by Industry Sector
2006–2011



Source: Bureau of Labor Statistics, Author's Analysis

FIGURE 6
Massachusetts Employment Growth by Industry Sector
2001–2011



Source: Bureau of Labor Statistics, Author's Analysis

key *manufacturing* segment of the life sciences cluster —remained nearly constant over this period, increasing by just 0.2 percent.

What is notable, however, is that the employment growth rate actually *increased* in the second period (2006–2011) for both the pharmaceutical industry and

TABLE 4
Employment Change by Life Sciences Cluster Segment

	2001	2006	2011	% Δ 2001–2006	% Δ 2006–2011	% Δ 2001–2011
Drugs & Pharma	7,794	7,944	8,537	1.9%	7.5%	9.5%
Medical Devices & Equipment	22,835	21,645	22,882	–5.2%	5.7%	0.2%
Research, Testing, & Medical Labs	34,849	47,072	52,819	35.1%	12.2%	51.6%
Bioscience-Related Distribution	9,607	10,877	11,377	13.2%	4.6%	18.4%
Total	75,085	87,538	95,615	16.6%	9.2%	27.3%

Source: Bureau of Labor Statistics, Author's Analysis

medical device manufacturing, despite recession conditions nationally and regionally. Indeed, all four sectors in **Table 4** exhibited increased employment during this difficult economic period.

Life Sciences Employment Trends: Massachusetts vs. the United States

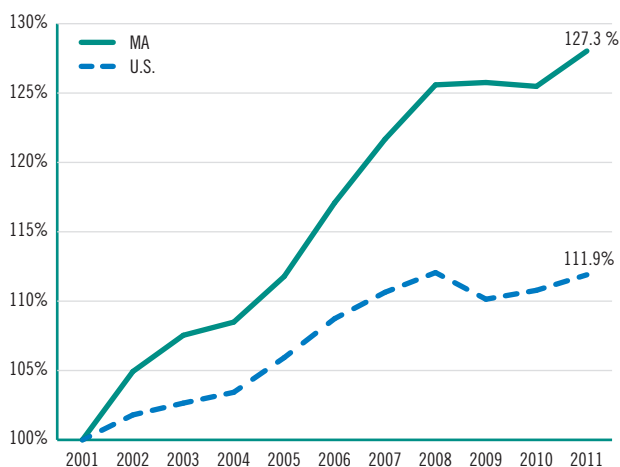
The capacity of the Commonwealth's life sciences to create jobs at a faster pace during the past decade than all other major Massachusetts industries is one indicator of the successful development of this sector. Even more important is how the state's life sciences have performed relative to the country as a whole and other states vying for supremacy in this rapidly evolving cluster of industries. The data we have gathered on

employment trends reveal that the Commonwealth has indeed overtaken the rest of the nation in terms of employment growth in the life sciences, fulfilling the initial goal of the MLSC.

Figure 7 reveals the trend in life sciences employment in Massachusetts compared to that of the nation as a whole between 2001 and 2011. During this period, Massachusetts life sciences employment growth outperformed the nation by a factor of better than 2-to-1—growing by 27.3 percent vs. 11.9 percent for the nation.

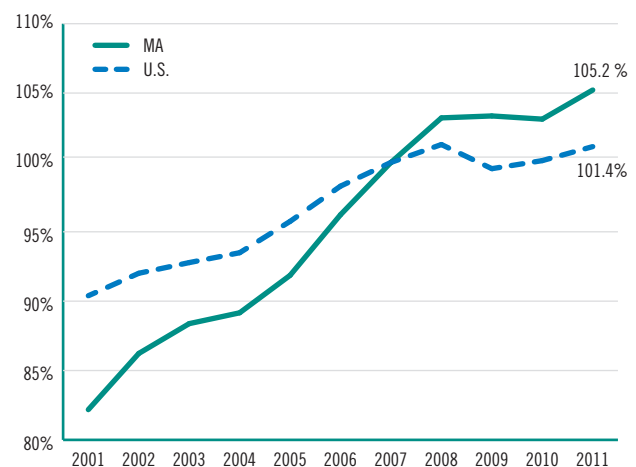
Figure 8, which indexes employment growth to 2007, reveals how the Commonwealth's life sciences cluster grew at a faster clip than the nation's, surpassing the nation and now remaining firmly ahead of it in terms of employment growth.

FIGURE 7
Employment in Life Sciences Indexed to 2001,
Massachusetts vs. the U.S.



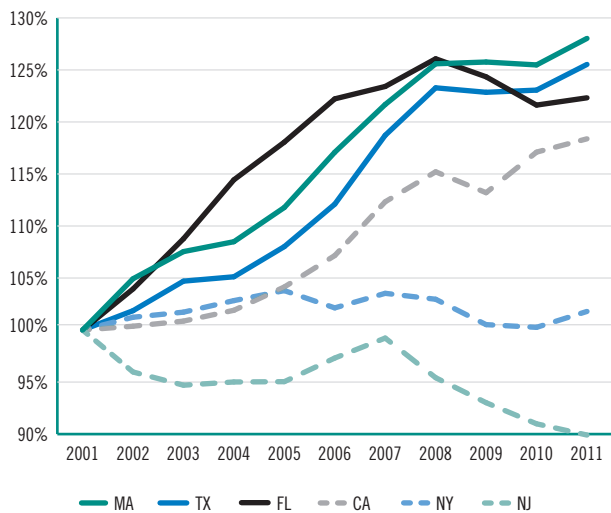
Source: Author's Analysis from BLS data

FIGURE 8
Employment in Life Sciences Indexed to 2007,
Massachusetts vs. the U.S.



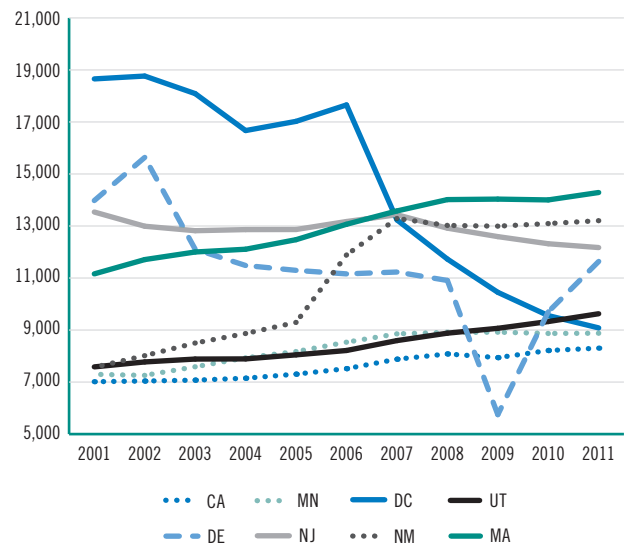
Source: Author's Analysis from BLS data

FIGURE 9
Employment in Life Sciences Indexed to 2001,
Massachusetts vs. Big Competitor States



Source: Author's Analysis from BLS data

FIGURE 10
Life Sciences Jobs per 1 Million 2010 Population
Top 8 States in 2011, by Year



Source: Author's Analysis from BLS data

The Commonwealth's main competitors in the life sciences include California, New Jersey, New York, Florida, and Texas. But as **Figure 9** demonstrates, after 2008 the Commonwealth overtook all of these states in terms of its 2001–2011 employment growth rate. Florida's nascent life sciences sector had been growing faster, but has fallen behind the Bay State during the past four years. Texas has been trying to catch up, but still trails Massachusetts. Over the decade, California's life sciences employment grew by just 18.4 percent compared with the Commonwealth's 27.3 percent. The growth rate in New York has been anemic, adding only 2 percent to its life sciences workforce while New Jersey, once the pharmaceutical capital of the nation, has seen its life sciences cluster decline sharply since 2007.

Even with Massachusetts's #1 position in the life sciences employment growth rate, it is not surprising that other states still have a larger absolute number of life sciences jobs. Of the top six states, Massachusetts ranked 5th in 2011, as **Table 5** reveals. California leads the pack with nearly 310,000 life sciences jobs.

Yet even as a much smaller state in total population, Massachusetts now leads all other states in the number of jobs in the vital biotechnology R&D sector within

the life sciences super cluster. In 2011, the Commonwealth boasted more than 28,000 jobs, exceeding second place California (22,600) and third place Pennsylvania (11,200).⁵⁴ Since 2007, this particular sector grew faster in the Commonwealth than in any other state, adding more than 3,500 jobs.

When we control for population size, Massachusetts is the clear winner for the entire life sciences cluster of industries. In **Figure 10**, we have controlled for the size of population of each state by measuring the number of life sciences jobs per 1 million residents. In 2001, the District of Columbia actually had the highest per capita number of life sciences jobs, presumably because of the physical presence of the National Institutes of Health. Delaware ranked second followed by New Jersey. California actually lagged Minnesota, Utah, and New Mexico on this measure. Massachusetts ranked #4.

But by 2011, given its rapid growth rate, the Massachusetts cluster had risen to #1 in terms of per capita life sciences employment. With nearly 14,300 life sciences jobs per 1 million people, Massachusetts had eclipsed New Jersey (12,171) and continued to far outstrip California (8,300).

TABLE 5
States with Largest Life Sciences Employment (2011)

California	309,344
New York	109,750
New Jersey	107,007
Texas	96,969
Massachusetts	95,615
Florida	83,836

Source: Author's Analysis from BLS data

Clearly, the life sciences cluster has enjoyed stellar growth in the Commonwealth over the past decade, and it appears that after the MLSC was created, the pace of growth outdistanced all of Massachusetts's rivals.

Clearly, the life sciences are flourishing in Massachusetts and the timing of the sector's employment growth suggests at least a correlation between the creation of the MLSC and the ability of the state's life sciences super cluster to overtake the rest of the nation.

But what evidence do we have of causation rather than simply correlation? What role has the MLSC played in the stellar growth of this set of industries? Here we find the interviews we conducted with key informants provided additional information on the role MLSC has played in this 21st-Century story of industrial success.

CHAPTER SEVEN

The Key Role of the MLSC: What We Learned from the Interview Data

To obtain a firsthand view of what part the MLSC may have played in the emergence of the Commonwealth's life sciences ecosystem, we conducted a series of "key informant interviews" with executives in the industry, with leaders of related trade associations, and with a number of scientists who have an intimate knowledge of the range of activities of the Center. In order to obtain an honest and unbiased assessment of the \$1 billion initiative itself and the functioning of the Center, we assured each of our informants strict confidentiality. Interviews were carried out with executives in both large and small companies in the industry, with those mostly devoted to research and development, and with those whose companies are now involved with the manufacture of scientific and medical products.

While we probed on many fronts, we asked each informant to consider a fundamental "counterfactual": *Would the life sciences in Massachusetts be much different from what they are today if the MLSC had never been created and the state had not committed long-term funding to assist the array of universities, research institutes, and companies that make up the life sciences super cluster?* What we learned provided us with a vital and deeper understanding of the critical role the MLSC has played.

Here are our key findings.

The Development of the Life Sciences "Ecosystem"

The leaders of large firms told us that given the scale of their operations, the MLSC plays at best a *minor direct role* in their own development, but an *immense indirect role* that helped to attract them to Massachusetts. The term that surfaced in virtually all of our interviews is "ecosystem," and that the MLSC has been central to the creation of the life sciences ecosystem that has made the Commonwealth more attractive than competing regions.

According to our interviews, the MLSC has indeed been instrumental in bringing together a tight-knit

community of life sciences institutions including universities, research hospitals, small start-up bioscience firms, medical device manufacturers, and Big Pharma. These stakeholders all interact on a regular basis to assist each other in the promotion of their activities. The ecosystem includes the nurturing of small firms through the MLSC's accelerator-loan and tax-incentive programs, assistance to the life sciences research labs in the state's public higher education system, the provision of funds for student interns in relevant fields, and countless opportunities for executives, scientists, and industry employees to meet and explore opportunities for expanding the life sciences super cluster in the Commonwealth. The Center has been critical, according to our key informants, in helping to build a "platform" for the entire sector and cultivate a "collaborative gene" among all of its separate parts.

As one recent example of this role, the MLSC helped create the Massachusetts Neuroscience Consortium, announced at the 2012 BIO International Convention in Boston. With charter sponsors including Abbott Labs, Biogen Idec, EMD Serono, Janssen Research & Development LLC, Merck, Pfizer, and Sunovion Pharmaceuticals, Inc., the consortium provides an arrangement whereby companies that normally compete with each other collaborate on funding preclinical neuroscience research under way at academic and research institutions throughout the state. With leadership provided by the MLSC, each of the founding sponsors has pledged \$250,000 toward this effort, and the Center will administer the funds.⁵⁵ The research results will be shared with all participants and all companies and academic researchers will have access to any tools developed as a result of these investigations. Without the Center playing this convening role, it is unlikely that such a consortium would have come into existence.

The Center has also been responsible for helping to nurture international cooperation among life sciences firms and academic institutions. The Center provided a \$300,000 grant to the Northern Ireland Massachusetts Connection (NIMAC) for a new multinational research

study on non-invasive procedures to detect pre-malignant lesions. Finland and Catalonia have joined NIMAC as well. MLSC is also helping to develop alliances between Massachusetts companies and Israeli firms through the Massachusetts-Israel Innovation Partnership (MIIP). The Center has contributed \$300,000 to this effort so far, funding two Massachusetts firms working in partnership with Israeli firms. A second round of funding for this program is pending.

All of these efforts are part of building an ever larger life sciences ecosystem based in the Commonwealth.

The Unique Growth Pattern of Regional Life Sciences Clusters

The most important lesson we derived from our interviews, however, was the unique growth pattern of the life sciences cluster. The regional concentration of life-sciences companies happens in a very different manner than in other industries. In the case of traditional industrial sectors such as auto, aircraft engine, financial services and the like, a region becomes dominant in a particular cluster once a large anchor enterprise or a small number of them establish operations in that locale. Once the anchor enterprise is established, an array of smaller firms is attracted to that region to serve as part of the supply chain for the large anchor enterprise(s).

Once Detroit became home to Henry Ford's car company and General Motors and Chrysler built huge auto assembly facilities in Michigan, hundreds of small parts plants, design studios, and small engineering facilities opened their doors nearby in order to easily serve the industry's "Big Three." The same is true of the aircraft engine industry in New England dominated by Pratt & Whitney in East Hartford, Connecticut, and General Electric's Aircraft Engine facility in Lynn-Everett, Massachusetts. These massive facilities attracted hundreds of aircraft engine parts suppliers to New England, making the region one of the core jet-engine manufacturing centers in the United States. *Essentially, the small firms in the industry are dependent on the large ones.*

For the life sciences, the reverse is true. For companies that crucially depend on the development of breakthrough innovations and sophisticated medical devices, *the large firms prosper by reason of being proximate to a*

panoply of small start-up firms. The reason for this is that despite their substantial research budgets, even the largest of the life sciences companies do not have the resources to generate more than a handful of breakthrough innovations in the biosciences, genomics, and other sophisticated fields. These large firms grow and prosper by carefully monitoring the scientific discoveries under way in university research laboratories and in the translational research carried out by small start-up firms. Those few start-ups that end up with potential blockbuster drugs or devices become prime targets for acquisition by the larger firms. Only a fraction of the long-term revenue generated by Big Pharma and the largest biotech and medical device companies has its origin in their own research labs. The majority comes from the absorption of successful smaller firms.

The secret to success in the acquisition process is being where the small firms are located. This permits the large firms to closely monitor the progress of smaller firms and buy the most promising ones before other Big Pharma or other competitors can make a bid. To use a metaphor from nature, the large, globally important life sciences firms want to feed in the waters where the minnows are swimming.

Pfizer, for one, has moved operations into Cambridge from other locations for this purpose.⁵⁶ In 2010, it announced that Cambridge would become one of Pfizer's worldwide research and development hubs, and it relocated approximately half of the current employees from its BioTherapeutics R&D organization to Kendall Square. A year later, Pfizer announced plans to move two existing research units, Cardiovascular Medicine (CVMed) and Neuroscience from Groton, Connecticut, to Cambridge, leasing 180,000 square feet of lab and office space from MIT to house these two research units.

In June 2011, Pfizer opened the Boston Centers for Therapeutic Innovation (CTI), an entrepreneurial network of partnerships with leading academic medical centers. According to the company, "these partnerships reduce the time and cost of drug discovery and development by accessing leading translational researchers."⁵⁷ Boston is also the global headquarters for the CTI network, which has established partnerships in New York City and San Francisco. The richness of the Massachusetts life sciences ecosystem prompted Pfizer to expand still further in the Commonwealth, with the company's newest building in Cambridge scheduled to be completed in 2013.

Over the past three years, Massachusetts is the only state where Pfizer has added jobs, not California, Connecticut, New Jersey, or New York. As an executive of this company told us in one interview, “Innovation between the big, the small, and the in-between is what makes the industry succeed.” Another Pfizer executive noted that while his company has not taken a dollar from the MLSC, the Center has helped the firm by creating a “mentality” about the life sciences that has permeated the state right down to the local level, making it possible to speed local permitting and rezoning where necessary.

Executives at Sanofi-Aventis SA, which acquired Genzyme in 2011 in a \$20 billion deal, have relied on the MLSC to “act as a bridge” between the company and such research institutions as the Cummings School of Veterinary Medicine at Tufts University and the University of Massachusetts Medical Complex in Worcester. Like Pfizer, Sanofi is expanding in Cambridge in order to have a “front row seat” for acquisitions.⁵⁸

And here is the key to understanding the central role of the MLSC. *While the large firms can easily exist without the MLSC, the small life sciences firms need the Center to provide them with accelerator loans, research and development funds, and interns who can help them translate their ideas into what could be commercially viable products. While the private venture capital market may provide some funds for this purpose, venture capital often requires a quicker return than can be obtained from this industry, which often has long lag times between initial research, proof of concept, and a final FDA-approved product.*

In 2012, according to data gathered by PricewaterhouseCoopers, venture capital investments in biotech and health-care startups fell to their lowest level since 1995.⁵⁹ Investment in biotech firms in the Boston area dropped to \$869 million in 2012, a 24 percent reduction from 2011 levels. Regulatory uncertainty facing the health-care industry is making this “a more challenging time for life sciences companies to raise money,” according to Terry McGuire, general partner of Polaris Venture Partners, a Waltham-based VC firm with about half its portfolio invested in health-care companies.⁶⁰ Another reason biotech investments may be dwindling is that new software companies are on the rise and the return on investments in these firms tends to be much more “capital-efficient,” paying off relatively rapidly.

The lack of easy access to VC funds has worried small life sciences firms about the “valley of death”—the gap in funding needed to move basic research into commercial products. In this environment, the MLSC has become an important investment partner for smaller life sciences firms, providing them with funds for translational research and development. These smaller firms may grow out of local research universities and medical complexes, but they can then turn to the MLSC for investment assistance. This tends to help keep them in the Commonwealth instead of losing them to investment funds in other regions.

In a number of cases, we found that smaller companies were being lured to relocate to other states, but according to their executives, the MLSC moved quickly to narrow the interregional cost differential and keep these firms in the Commonwealth. They did this through tax incentives and investment credits. And because these “minnows” stay here, Big Pharma has come from all over the world to swim in this pond. By helping to attract small life sciences companies to Massachusetts as well as incubating new ones begun in the state, the MLSC has created a well-stocked fishing ground for Big Pharma. In 2012 alone, a large array of small- and medium-sized domestic and international firms chose to establish operations in Massachusetts, including Era7 Bioinformatics, Algeta U.S., QServe, Scivax USA, ReproCELL, Inc., Human Metabolome Technologies, Inc., Alacrita, Arrayjet, ARGO Medical Technologies, BioAx-one, BioSurplus, Promedior, and KeraFAST.

By the end of 2012, nine of the ten major drug companies in the world had set up shop in Massachusetts.⁶¹ To house these firms, 3.4 million square feet of biotech-related office and laboratory space is now under construction across Massachusetts with massive buildings now being completed for Pfizer and Novartis. This adds to the 2.4 million square feet of commercial lab space erected between 2007 and 2011.⁶² The other Big Pharma firms with major investments in Massachusetts are Johnson & Johnson, GlaxoSmithKline, Sanofi (which absorbed Genzyme), AstraZeneca, Abbott Laboratories, Merck, and Bristol-Myers Squibb. A decade ago, none of these global firms had a significant presence or any presence at all in the state, according to Mass Bio, the state’s life sciences trade group.⁶³ Only Roche, the Swiss company and third largest biopharmaceutical firm in the world, has yet to establish a presence in the Commonwealth.

With this growth dynamic at work, Massachusetts appears well positioned to continue to attract new investment in the life sciences cluster.

The MLSC “Modus Operandi”

In the course of this study, many of those interviewed commented on the protocols that the MLSC follows in carrying out its activities. According to these sources, the Center’s success in funding firms is grounded in its reliance on a Scientific Advisory Board (SAB) to guide the Center’s Board of Directors in determining which firms show the greatest promise of economic and scientific success. The Center has established a competitive process for securing assistance and the SAB has made certain that the process is transparent. Over and over again, we heard in our interviews words like “rigorous” and “diligent” when describing the processes MLSC uses in selecting awardees.

It should be noted that other states that have created similar life sciences initiatives have had a less-than-stellar record of maintaining a process free of political considerations. In early 2013, the Texas Legislature essentially defunded the state’s Cancer Prevention and Research Institute (CPRIT), which had been established by referendum in 2007. This followed the resignation of the agency’s chief scientific officer, along with many of the institute’s high-profile grant reviewers, in protest over how the independent peer review system had been disrespected.⁶⁴ According to the chair of the MLSC’s Scientific Advisory Board, here in the Commonwealth the Center has been scrupulous in following the recommendations of the Center’s Board of Directors and the SAB.

This has apparently contributed to the Center’s exceptional record of assisting firms that ultimately succeed and grow. Accountability measures implemented by the Center have also contributed to the success of the Center’s tax program. As **Table 6** reveals, the Center had

TABLE 6
Firms Receiving Tax Incentive Funding (Program Years 2009-2011)—Active Awards

		Hiring Goal	Hiring Actual	% of Goal	Hiring Potential
2009	Shire	150	153	102%	153
2009	Cubist	58	60	103%	60
2009	Biogen	50	235	470%	235
2009	Merrimack	50	53	106%	53
2009	Lightlab	29	32	110%	32
2009	Constellation	26	21	81%	26
2009	Sepracor	25	108	432%	108
2009	InfraReDX	21	25	119%	25
2009	OmniGuide	18	10	56%	18
2009	Organogenesis	15	26	73%	26
2009	Dyax	15	23	153%	23
2009	Still River	10	18	180%	18
2009	Nova	10	25	250%	25
2009	Infinity	18	14	78%	18
2009	STD Med	10	54	540%	54
2010	Shire	150	141	94%	150
2010	Sanofil	100	101	101%	101
2010	Vertex	90	136	151%	136
2010	NX Stage	50	27	54%	50
2010	Merrimack	50	37	74%	50

TABLE 6
Firms Receiving Tax Incentive Funding (Program Years 2009-2011)—Active Awards (*continued*)

		Hiring Goal	Hiring Actual	% of Goal	Hiring Potential
2010	Ironwood	37	56	151%	56
2010	Instrumentation Laboratory	30	30	100%	30
2010	Valeritas	18	10	56%	18
2010	Organogenesis	17	44	259%	44
2010	Bluebird	10	13	130%	13
2010	Bind	10	8	80%	10
2010	NormOxys	10	-5	-50%	10
2010	LeMaitre	19	43	226%	43
2010	Foundation Medicine	40	25	63%	40
2010	Lightlab	14	45	321%	45
2010	Nova	10	10	100%	10
2011	Shire	100			100
2011	Vertex	100			100
2011	AVEO Pharma	94			94
2011	Biogen Idec	75			75
2011	Ironwood	75			75
2011	DePuy Orthopaedics	50			50
2011	Momenta Pharma	50			50
2011	PerkinElmer	50			50
2011	Organogenesis	35			35
2011	Aegerion Pharma	27			27
2011	Lightlab	26			26
2011	Cell Signaling Tech	20			20
2011	Quanterix Corp	19			19
2011	NinePoint Medical	15			15
2011	Pharmalucence	12			12
2011	Metamark Genetics	11			11
2011	New England Biolabs	10			10
2011	Nova	10			10
2011	T2Biosystems	10			10
2011	Boston Heart Diagnostics	31			31
2011	Ra Pharma	10			10
2011	Blueprint Medicines	15			15
2011	PAREXEL International	32			32
2011	Moderna Therapeutics	13			13
2011	Courtagen Life Sciences	13			13
2011	Knome	12			12
2009-2011 Awardees		1,160	1,578	136%*	2,639**

Source: Massachusetts Life Sciences Center

* Proportion of hiring goal for 2009-2010 active awardees only; no data available on 2011 awardees at this time

** Minimum total jobs created if, on average, all firms meet or exceed hiring

31 outstanding tax incentive packages from the 2009 and 2010 programs as of June 30, 2012.

In a number of cases, hiring targets were exceeded by a factor of four or greater. In only one case did a firm receiving an award actually reduce its staff. As of June 30, 2012, the currently active 31 awards from the 2009/2010 program have produced 1,578 new jobs, exceeding the aggregate hiring goal of 1,160 by 36 percent. Adding in the 2011 program awards for which we do not yet have data on hiring, the potential number of new hires could exceed 2,600 if all firms, on average, meet or exceed hiring goals.

As noted above, the accelerator loan program is also meeting with success, with six of the 20 firms that received such loans already repaying them in full.

Table 7 provides additional data on the outstanding awards to firms from the 2009 program, the first year

of the program. The outstanding amount of the tax incentive awards as of June 30, 2012 amounts to \$15.25 million. Fifteen firms received tax incentive awards in that year totaling \$15.25 million. They ranged in size from \$6.3 million to Shire Human Genetic Therapies to \$121,000 to STD Med, Inc. In 2009, these firms had a base headcount of 5,427. The target headcount associated with these awards was 5,932—an increase of 505 hires. By the end of 2011, 12 of these firms had met or exceeded their hiring targets.

What adds to the efficiency of these awards is a “claw-back” feature requiring firms that fail to meet their approved hiring goals to return to the Center the funds they were provided. A number of firms have done just that when they were unable to meet their specified minimum job-creation targets.

TABLE 7
Annual Report: 2009 Tax Incentive Program Results—for annual reporting period ending December 31, 2011

		Per Agreement				Actual	2011	Actual	
		\$ Award Provided	Base Hdct	Adds	Targeted	12/31/2011 Hdct	Actual Growth (from base)	% of Adds (from base)	Achieved or exceeded target
COMPANY									
Active awards									
1	Shire Human Genetic Therapies, Inc.	\$6,277,057	986	150	1136	1280	294	196%	Yes
2	Cubist Pharmaceuticals, Inc.	\$1,740,000	355	58	413	415	60	103%	Yes
3	Biogen Idec MA, Inc.	\$1,500,000	1899	50	1949	2134	235	470%	Yes
4	Merrimack Pharmaceuticals, Inc.	\$1,500,000	124	50	174	214	90	180%	Yes
5	LightLab Imaging, Inc.	\$188,951	64	29	93	141	77	266%	Yes
6	Constellation Pharmaceuticals, Inc.	\$513,252	41	26	67	62	21	81%	No
7	Sepracor Inc. / Sunovion	\$750,000	601	25	626	709	108	432%	Yes
8	Infraredx, Inc.	\$630,000	60	21	81	85	25	119%	Yes
9	OmniGuide, Inc.	\$ 540,000	62	18	80	72	10	56%	No
10	Infinity Pharmaceuticals, Inc.	\$ 540,000	172	18	190	186	14	78%	No
11	Organogenesis Inc.	\$ 245,240	241	15	256	311	70	467%	Yes
12	Dyax Corp.	\$ 100,000	94	15	109	117	23	153%	Yes
13	Mevion (formerly Still River Systems), Inc.	\$ 300,000	73	10	83	91	18	180%	Yes
14	Nova Biomedical Corporation	\$ 300,000	498	10	508	533	35	350%	Yes
15	STD Med, Inc.	\$ 121,000	157	10	167	211	54	540%	Yes
TOTALS		\$ 15,245,500	5427	505	5932	6,561	1,134		

Source: Massachusetts Life Sciences Center

Based on wage and salary data from the companies receiving tax-incentive awards between 2009 and 2011, we carried out an economic analysis of the cost and benefit of this MLSC program. The results are found in **Table 8**. Our analysis suggests that as of June 30, 2012, the Center had \$56.3 million in outstanding tax incentives. Altogether, the firms receiving these incentives added more than 2,500 jobs by 2012. The vast majority (1,843) of these were in pharmaceutical firms with the remainder generated by medical device companies (481) and scientific research enterprises (213). The average annual salary of these jobs exceeded \$105,000. As such, these new jobs generated a total of over \$266 million in wages and salaries each year.

Based on estimates from the Massachusetts Department of Revenue, we estimate that, on average, the added workers employed by these firms paid more than \$4,900 in income taxes to the Commonwealth and \$2,400 in sales taxes.⁶⁵ Assuming that each of these jobs lasts on average just five years, the added state revenue generated by these workers over that period is close to \$37,000 per worker or a total of \$93 million in tax revenue.

Compared with the total cost of the incentive program, each dollar in awards will generate \$1.66 to the state in added tax revenue. This represents an extraordinary rate of return on this public investment.

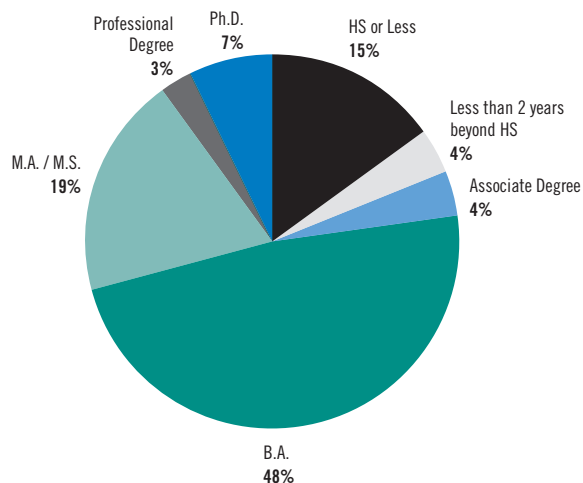
TABLE 8
Economic Return on the MLSC Tax Incentive Program

	Program Year 2009	Program Year 2010	Program Year 2011	3 Years of Incentives
Total Value of MLSC Tax Incentives (\$)	\$15,245,500	\$20,672,638	\$20,340,884	\$56,259,022
Net New Jobs Created	901	721	915	2,537
Tax Incentive per Job (\$)				\$22,175
Annual Tax Incentive per 5-year job (\$)				\$4,435
Average Salary per Job (\$)				\$105,037
Total Salaries Generated per Year (\$)				\$266,479,399
State Income Tax Revenue per Job per year (\$)				\$4,937
Total State Income Tax per year (\$)				\$12,524,532
Average Sales Tax per Job (\$)				\$2,404
Total State Sale Tax per year (\$)				\$6,099,447
Total Income+Sales Taxes per year (\$)				\$18,623,979
Average Income+Sales Tax/Job per year				\$7,341
Total Income+Sales Taxes per 5-year Job				\$36,705
Total Income+Sales Taxes over 5 years				\$93,120,585
Net State Revenue Gain (5 years) (\$)				\$36,860,872
Ratio of Tax Revenue/Incentive over 5 years				1.66

	Pharma	Medical Devices	Scientific Research	Total
Jobs	1,843	481	213	2,537
Average Salary (\$)	\$115,222	\$66,913	\$103,009	\$105,037
Total Salary (\$)	\$212,353,256	\$32,185,280	\$21,940,863	\$266,479,399
Share of Salary	0.7969	0.1208	0.0823	1.0000
State Income Tax By Sector (\$)	\$9,980,603	\$1,512,708	\$1,031,221	\$12,524,532
Sales Tax by Sector (\$)	\$4,860,554	\$736,689	\$502,204	\$6,099,447

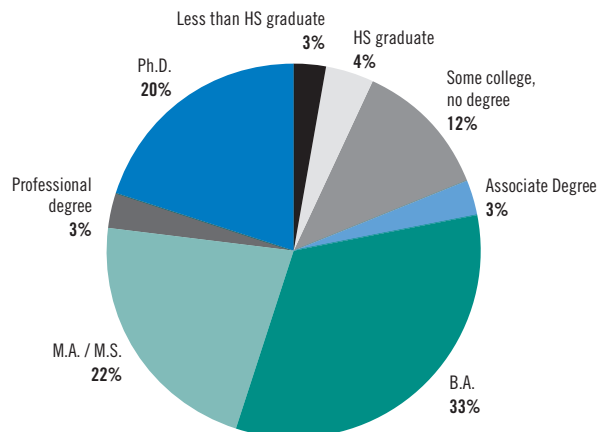
Source: Dukakis Center for Urban and Regional Policy

FIGURE 11
Education Distribution of New Hires
by 2010 MLSC Tax Incentive Awardees



Source: Dukakis Center for Urban and Regional Policy

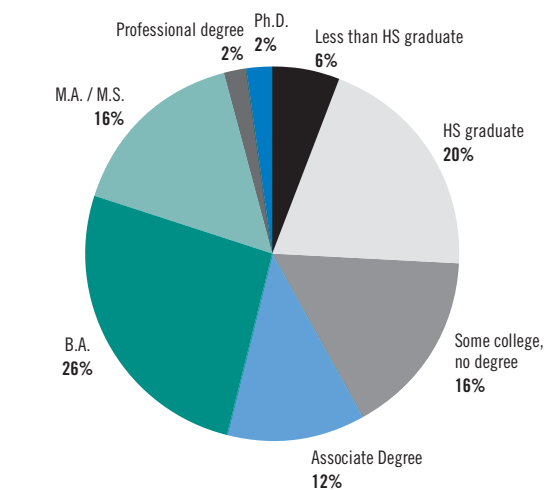
FIGURE 12
Education Distribution—Pharma



Less than B.A.: 22%

Source: Dukakis Center for Urban and Regional Policy

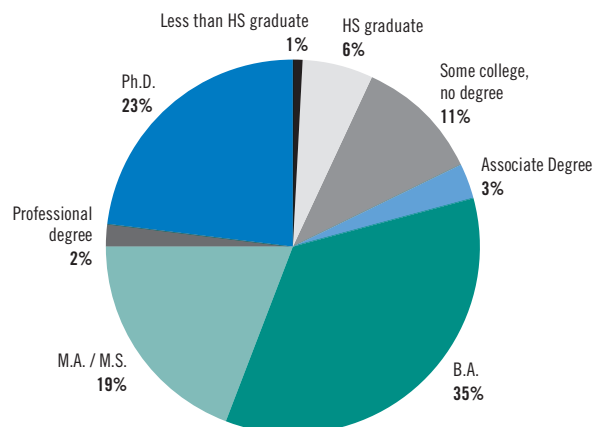
FIGURE 13
Education Distribution—Medical Devices



Less than B.A.: 54%

Source: Dukakis Center for Urban and Regional Policy

FIGURE 14
Education Distribution—Diagnostics, Tools,
and Related Products and Services



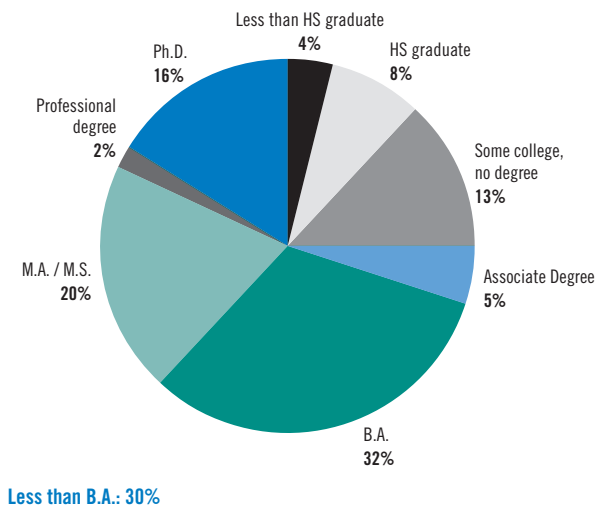
Less than B.A.: 21%

Source: Dukakis Center for Urban and Regional Policy

Of course, it is possible that these firms would have generated some or perhaps even many of these jobs without the MLSC award. But given the importance of the life-sciences ecosystem created in the Commonwealth, at least partly as a result of Center activity, it is reasonable to suggest that many of these jobs and their associ-

ated tax revenue would not have been created without the help of the Center. Moreover, our estimates do not consider any “multiplier” effects. The added spending of these new hires in the Commonwealth helped generate additional jobs as these workers spent money in the state, creating jobs in a wide range of industries.

FIGURE 15
**Education Distribution—Life Sciences Cluster
 Pharma/Medical Devices/Diagnostics, Tools,
 and Related Products and Services**



Source: Dukakis Center for Urban and Regional Policy

A concern that one might have about the employment generated by the life sciences super cluster is that the jobs created all go to the most educated workers in the state, leaving behind those who have not had the benefit of a college degree or post-graduate education. But based on the hiring records of a number of firms in the industry, it turns out that like other industries, life sciences firms need to hire workers who have a range of skills. In addition to Ph.D. scientists and other highly

educated workers, these firms need laboratory technicians and clerical staff, and they employ a range of other workers in occupations that require a good deal less education. **Figure 11**, based on these hiring data, reveals that less than a third (29%) of those working in the life sciences have a Master's degree, professional degree, or Ph.D. Nearly half (48%) have the B.A. or B.S. as their highest level of education, while nearly a quarter (23%) of the workforce has no more than an associate's degree, often from a community college.

Using national data from the 2010 *American Community Survey* (ACS) available from the U.S. Census Bureau, we were able to estimate the education distribution for the individual sectors within the life sciences super cluster. As **Figures 12–15** demonstrate, the proportion of workers in each of the cluster segments needing less than a B.A. (or B.S.) ranges from 21 percent in diagnostics, tools, and related products and services and 22 percent in pharmaceutical firms to more than half in medical devices. According to these national estimates, the total workforce in the super cluster requiring less than a 4-year college degree is 30 percent, a bit higher than the 23 percent in Massachusetts. Essentially, with such a highly educated workforce in the Commonwealth, firms here are able to insist on somewhat higher educational credentials for their employees.

What adds to the value of the life sciences labor market in the Commonwealth are the high wages paid in this sector. As **Table 9** reveals, based on an analysis of Census data, the average annual wage in the state's

TABLE 9
**Estimated Annual Earnings for Life Sciences Workers
 (2006–2010)**

	Pharma	Medical Devices	Scientific R&D	Total
Less than High School graduate		\$35,142	\$51,685	\$36,702
HS graduate	\$42,966	\$33,250	\$71,418	\$44,225
Some college, no degree	\$62,745	\$46,684	\$61,816	\$55,386
Associate's degree	\$96,171	\$61,400	\$53,712	\$61,285
Bachelor's	\$95,147	\$98,853	\$85,080	\$92,033
Master's	\$102,851	\$114,019	\$102,045	\$105,143
Professional school degree	\$150,264	\$118,399	\$182,999	\$161,195
Doctorate	\$171,596	\$249,332	\$112,626	\$134,195
Total	\$102,961	\$78,498	\$96,379	\$91,805

Source: Dukakis Center Analysis of American Community Survey (Census) data

life sciences varies from \$78,500 in medical devices to nearly \$103,000 in the pharmaceutical industry.⁶⁶ Those with a Ph.D. earn, on average, nearly \$250,000 in the medical-device sector and well over \$100,000 in other sectors within the cluster. But even those who have not completed high school average nearly \$37,000 a year, the equivalent of more than \$18.00 an hour. High school graduates average more than \$44,000 and those with an associate's degree, more than \$61,000.

Compared with other industries, the life sciences provide some of the highest paying jobs in the Commonwealth. With an average annual salary of nearly \$92,000, this sector rewards its workforce with higher pay than those who work in manufacturing as a whole, construction, real estate, education, government, health care, and transportation. The average salary in the life sciences industries in the Commonwealth exceeds the all-industry Massachusetts average by 68 percent.⁶⁷

The Long-Term Impact of the Commonwealth's Life Sciences Initiative

Based on all of the data we collected about the MLSC and its activities, the analysis we conducted on the expansion of the life sciences industries in the Commonwealth, and the information we gleaned from the interviews, our overall conclusion is that because of its unique comprehensive approach to an entire industry super cluster and its reliance on scientific peer-reviewed procedures for awarding grants, the Commonwealth has reaped a substantial return on its life sciences initiative investment. Moreover, given the number of firms that have been attracted to the state, in large measure because of the ecosystem the Center has helped nurture, the benefits from the state's investment in this initiative are likely to pay off bountifully in the years to come.

Many of our informants for this report noted that by 2018, when the \$1 billion Life Sciences Initiative sunsets, the state will still need an agency that encourages innovation among smaller life sciences firms. Innovation, they note, must be a continuous process for the region to remain prosperous. This will be particularly important as China, India, Singapore, and other foreign countries compete for a share of this expanding super cluster by offering massive incentives to life sciences start-ups.

The big question is whether Massachusetts can continue to lead the nation in the evolution of this critical industry or whether other regions of the country will be able to capture this industry and the jobs that go with it. Massachusetts was once the premier textile center of the nation until the south captured much of the industry in the early part of the 20th century. The Commonwealth led in the development of the commercial computer industry in the 1970s and 1980s with the growth of Digital Equipment Corporation (DEC), Data General, Prime Computer, and Wang, but lost out to Silicon Valley in California and companies like Dell in Texas. Today, other states including New Jersey, California, New Mexico, Utah, and Minnesota are all vying to expand their life sciences clusters. The state's concentration of globally prominent "eds and meds" has clearly been critical to the evolution of the life sciences in the Commonwealth.

One area where the MLSC might wish to pay more attention in the years to come is the medical-device industry. As noted earlier in this report, employment in this component of the life sciences cluster has been stagnant. According to our interviews, other states including Indiana, Michigan and Minnesota are targeting this sector with state funding. Unlike Big Pharma, which can be more patient in the marketplace and worry less about cost pressures, medical-device firms need to move quickly in the market to commercialize their products and they need to be vigilant about reducing costs. To the extent that the MLSC can assist these firms, Massachusetts could remain a center for this sector and employment growth could ensue.

But overall, based on the state's continued commitment to the life sciences, we fully expect to see further growth in the size of private-sector investments in the state's life sciences industries and further increases in employment opportunity.

Assessment of the MLSC Staff

The interviews we carried out also suggested that the Center itself is being run quite effectively and efficiently and in a highly professional manner. Virtually all of our informants praised the management team and especially appreciated the leadership's reliance on peer review and its refusal to permit political considerations to trump scientific merit. As one expert informant noted, the MLSC has "lots of moving parts" and all of them are working well and the Center remains responsive to

industry needs, meeting deadlines, and staying focused on its mission. As another informant put it, with the reliance on the Scientific Advisory Board (SAB) to select awardees, “there is not an ounce of boondoggle in this agency.” In its report on creating fiscally sound state tax incentives, the Pew Center on the States singled out the Massachusetts Life Sciences Tax Incentive Program for its focus on annual cost controls and its reliance on scientific merit in making awards.⁶⁸

Still another informant noted that the MLSC is successful because its leadership is committed to working “at the speed of business” and therefore has become a valued partner in the expansion of the industry.

Conclusions

All of our research suggests that the state will benefit from fully funding the remaining five years of the initiative in order to maintain the lead the life sciences have established in the Commonwealth. This is particularly important as other states ramp up their investments in hopes of creating their own life-sciences ecosystems to entice the small and large firms Massachusetts has successfully attracted. California, Maryland, New Jersey, New York, Minnesota, and Florida are not resting on their laurels, but continue to spend state funds on their own life-sciences industries.

Over time, it should be possible for the Center to reach out to the private sector to help fund more of its initiatives, as it has done with the Massachusetts Neuroscience Consortium. With the plethora of larger, profitable firms coming to the state to expand their operations, one could imagine the Center funding more of its internships with private funds and having private firms contribute to other programs (STEM education, for example), allowing the Center to focus even more of its funding on accelerator loans and tax incentives for firms undertaking translational research.

We should also note that the success of the MLSC has lessons for other quasi-public entities in the Commonwealth. We can mention five of them here:

1. Long-term success in the use of tax incentives and business loans is most likely to occur when funds are focused on a cluster of firms and a set of technologies in a given industry, helping to create an industrial ecosystem which can attract new companies to the state.
2. The use of expert panels to determine the awarding of loans assures that these funds will be well utilized. “Claw-back” provisions protect the taxpayers by requiring firms to repay funds advanced by the Commonwealth if they fail to meet hiring goals.
3. The focus on encouraging firms in their early-stage innovation activity is central to promoting economic growth and prosperity.
4. Helping fund workforce development efforts for critical industries as part of the mandate of the quasi-public helps assure a pipeline of skilled workers for the industry and this itself helps attract new firms to the region.
5. Taking a “portfolio” approach to the entire range of activities in the life sciences—from investments in small innovative firms to helping train the future workforce to underwriting infrastructure—helps sustain the “ecosystem,” undergirding a virtuous cycle of discovery, innovation, investment, and employment opportunity.

In the end, we applaud the Governor and the Legislature for their foresight in creating the Massachusetts Life Sciences Center and the \$1 billion Life Sciences Initiative. The structure put in place is fulfilling the goals set out in the original legislation and the Center’s leadership has continually assured that the structure works effectively and efficiently.

Endnotes

Chapter One

1. The Massachusetts Life Sciences Center, “About the Center,” www.masslifesciences.com/mission.html.
2. Massachusetts Life Sciences Center, *Fiscal Year (FY) 2012 Annual Report*, “Outpacing the Competition,” Cover Letter, September 28, 2012.
3. According to an analysis prepared by the Massachusetts Budget and Policy Center, the Commonwealth faces at least a \$1.2 billion deficit in FY2014. This is based on current tax rates and expected spending. See Massachusetts Budget and Policy Center, “A Preview of the FY2014 Budget,” January 10, 2013.
4. Following on the early work of Stanley Surrey who served as Assistant Secretary of the U.S. Treasury for Tax Policy, the Congressional Budget and Impoundment Act of 1974 (CBA) defines *tax expenditures* as “those revenue losses attributable to provisions of the Federal tax laws which allow a special credit, a preferential rate of tax, or a deferral of tax liability.” See Stanley Surrey, *Pathways to Tax Reform: The Concept of Tax Expenditures* (Cambridge, MA.: Harvard University Press, 1974); U.S. Congress, Congressional Budget Act of 1974.
5. Joe Stephens and Carol D. Leonnig, “Solyndra: Politics Infused Obama Energy Program,” *Washington Post*, December 25, 2011.
6. Carol D. Leonnig, “Battery Firm backed by Federal Stimulus Money files for Bankruptcy,” *Washington Post*, October 16, 2012.
7. Jason Schwartz, “End Game,” *Boston Magazine*, August 2012.
8. The specific life sciences industry sectors used in this report are based on the non-agricultural 6-digit NAICS (North American Industry Classification System) as reported in the *Battelle/Bio State Bioscience Industry Development 2012 Report* produced jointly by the Battelle Institute, the Biotechnology Industry Organization (BIO), and MPM Public Affairs Consulting, Inc. (June 2012).
9. This set of NAICS industries omits perhaps 50 percent of the growth in life sciences jobs in Massachusetts because it omits life sciences in research in hospitals and universities. These jobs are not counted in the Battelle report because the NAICS industrial coding system cannot distinguish between research jobs in hospitals and other jobs in hospitals such as physicians and nurses, and life sciences research jobs in universities and other jobs such as English and social science professors.
10. It is important to note that because we could not break out faculty, staff, and students involved in the life sciences departments and research institutes from all others employed at universities and hospitals, this report does not include an analysis of the educational attainment, earnings, and occupations for those working in these institutions. Clearly, if we could have done this, our estimates of the number of those employed in the life sciences in Massachusetts would be much greater.
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Chapter Two

13. The largest of these include the exclusion from taxable income of employer contributions for medical insurance premiums and medical care; the net exclusion of contributions to 401(k) pension plans, Individual Retirement Accounts (IRAs), and Keogh plans; the deductibility of home mortgage interest on owner-occupied homes, the deductibility of charitable contributions, and the preferential tax rates on long-term capital gains.
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15. Ibid., Table 1, pp. 3–5.
16. See Louise Story, Tiff Fehr and Derek Watkins "As Companies Seek Tax Deals, Governments Pay High Price," *New York Times*, December 1, 2012, p. 1; "Lines Blur as Texas Gives Industries a Bonanza," *New York Times*, December 2, p. 2; "Michigan Town Woos Hollywood, but End Up with a Bit Part," *New York Times*, December 3, p. 1.
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21. Pollin and Baker, op. cit., p. 3
22. Barry Bluestone and Bennett Harrison, *Growing Prosperity: The Battle for Growth with Equity in the 21st Century* (New York: Houghton Mifflin Company and The Century Foundation, 2000), p. 207.
23. Bluestone and Harrison, op. cit., p. 207.
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26. See Jeremy Greenwood, "The Third Industrial Revolution," Paper prepared for the American Enterprise Institute, October 25, 1996.
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28. See a series of papers by Erik Brynjolfsson and Lorin M. Hitt including "Computers and Productivity Growth: Firm-Level Experience," MIT Sloan School of Management, January 1997; "Information Technology as a Factor of Production: The Role of Differences among Firms," *Economics of Innovation and New Technology*, Vol. 3, No. 4 (1995); and "Paradox Lost: Firm-Level Evidence on the Returns to Information Systems Spending," *Management Science*, Vol. 42, No. 4 (April 1996).
29. Battelle Institute, "2012 Global R&D Funding Forecast," *R&D Magazine*, December, 2011.
30. Battelle Institute, op.cit, p 6.
31. Bluestone and Harrison, op.cit., p. 216.
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45. MassBio "Biopharma Industry Snapshot, 2012," p. 23 based on MassBio membership reports and the *Boston Business Journal Book of Lists*, 2012.
46. See Greg Turner, "Boston is a Big Force in Pharma, *Boston Herald*, December 14, 2012.
47. Jones, Long LaSalle, "Life Sciences Cluster Report: Global 2011," p. 16. Boston ranked #1 on each component of the composite score with the exception of venture capital funding where it ranked #2.

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50. Massachusetts Life Sciences Center, *Fiscal Year (FY) 2012 Annual Report*, p. 4.
51. According to an MLSC memo to the Secretary of Administration and Finance, "The MLSC Tax Incentive Program has enforcement mechanisms, including strict monitoring and reporting requirements for recipient companies. Within 30 days of the end of each calendar year following the award, awardees are required to provide an annual report to the Center that permits the Center to determine whether the awardee's job targets have been met. The statute provides for 'clawback' provisions for companies that are found not to be fulfilling their job creation commitments to the state. Companies that fail to achieve at least 70% of their job targets at the end of any annual reporting period are subject to an investigation to determine the cause of this 'material variance.'" In cases where it is found that the company cannot meet its requirements, the Center

notifies the Massachusetts Department of Revenue so that the department can initiate claw-back procedures to recover the tax value any award provided. If a company has met at least 70% of its goal, the Center may permit the company a second year to fully meet this requirement before notifying the DOR. See memo to Jay Gonzales, Secretary, Executive Office for Administration and Finance from Susan Windham-Bannister, President and CEO of the Massachusetts Life Sciences Center, August 27, 2012.

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As a case in point, on January 29th, 2013 Sanofi announced the launch of LeGoo, a biopolymer gel that allows surgeons to temporarily stop blood flow during surgery without the use of clamps, elastic loops or other conventional occlusion devices that may risk trauma to blood vessels. LeGoo was developed by Pluromed, a young company that was one of the first to receive a loan through the Center’s Accelerator Loan Program in 2009. The Accelerator Loan provided support for Pluromed at a critical stage in the development of LeGoo. Pluromed repaid its loan with interest to the Center following its acquisition by Sanofi.

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60. Michael B. Farrell, “Startup Funding Declines Across US,” op. cit., p. B9.

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62. MassBio “Biopharma Industry Snapshot,” 2012, p. 9.

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64. Monya Baker, “Texas Cancer Institute gets no Funds for new Grants in Proposed Budget,” *Nature.com*, January 16, 2013.

65. According to estimates prepared by the Mass DOR from recent annualized tax revenue data, state income tax revenues in the Commonwealth average 4.7% of wage and salary income and sales tax revenues average 48.7% of income tax revenues.

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68. “Avoiding Blank Checks: Creating Fiscally Sound State Tax Incentives, Pew Center on the States, December 2012, Table 1, p. 5 and p. 14.

