Innovation Capacity:  
A Framework for Identifying Priorities

April 3, 2018  
Presentation to the New Jersey Taskforce

BIOMEDICAL GROWTH STRATEGIES LLC
The Language of Innovation: Terminology

- **Innovation**: the set of activities required to translate an idea or invention into a product or service that creates value for which customers will pay
  - Good ideas translated out of the research space and into the hands of caregivers and the bodies of patients
  - The pace and volume of job creation, capital investment and economic development accelerates as we move from research (ideation and invention) to application and commercialization (innovation)
The Language of Innovation: Terminology

- **Entrepreneurship**: the process of starting a business that offers (an innovative) product, process or service
  - The willingness to take risks (and fail) to bring new ideas into application.
  - Culture, human capital, investment, connections, support systems and places to grow new business
The Language of Innovation: Terminology

- **Innovation ecosystem**: a highly coalesced group of organizations, programs, activities and relationships working together to enable innovation
  - All of the necessary ingredients working together to support the production and diffusion of new knowledge, products and services
Why Set Strategic Priorities for Investments?

- Identifies the *optimal “bundle”* of investments that will *enable the goals* of the Initiative *and deliver* economic value.

- Determines the *required level of investment in each component* of this “bundle” and the overall budget.

![Diagram showing the relationship between breadth/depth of investment and targets for investment, illustrating the efficiency curve with Investment Bundles A, B, and C.](attachment:image)
Innovation Capacity

What is Innovation Capacity?
“The ability to produce and commercialize a flow of innovative technology, products and services over the long term.”
Furman, Porter and Stern (2002)

Create → Develop → Grow → Sustain

Strategic priorities are targeted to close gaps and build strengths across the innovation lifecycle

Why Invest in Building Innovation Capacity?
- Promotes the goals of innovation initiatives
- Strengthens the “platform” that supports innovation
- All stakeholders benefit

“Geographies with high innovative capacity usually develop faster economically, attract highly skilled populations, and experience rising incomes and trade.”
(Harvard Business School 2011)
Leveraging NIH Research Investments FY 2016

Ratio of Private (VC) Investments to Public (NIH) Funding, Federal FY 2016

- Massachusetts: $1.24
- California: $1.13
- New Jersey: $0.50
- Total U.S.: $0.41
- Maryland: $0.21
- Texas: $0.18
- Connecticut: $0.17
- Pennsylvania: $0.16
- Washington: $0.15
- New York: $0.12

Sources: PwC MoneyTree™, National Institutes of Health (NIH)

PwC uses the ratio of VC investment to research dollars as a proxy for commercialization in the state where the research is conducted.
What is the Economic Impact?

Example:

In 2014, New York State received over $2B in NIH research funding (#3), but only $100M in VC dollars – $0.05 of venture money per NIH dollar.

The Opportunity Cost:

KPMG estimates that if commercial activity in (Downstate) New York was on par with its NIH funding, the region could see an additional 18,000–25,000 jobs and $2.2–3.1 billion of additional economic growth!

(Commercial Life Sciences Can Be New York’s Next Big Industry, 2016)
Investing to Build Innovation Capacity: A Framework for Identifying Strategic Priorities and Investment Targets

Target the **Five Key Enablers** of Innovation Capacity

- Translational Scientific Research
- Workforce Development and Job Growth
- Ecosystem
- Entrepreneurial Culture and Capital
- Enabling Infrastructure
What is the Rationale for Each Component of the Framework?

- **Translational Research and Academic Investments**
  - Enables Discovery – the starting point for innovation
  - Attracts industry partners and capital for infrastructure
  - Trains the next generation of life sciences workers (entrepreneurs, scientists, care providers)

- **Entrepreneurship – Culture, Capital, Ability to Thrive**
  - Next generation of companies that commercialize academic discoveries
  - Mature companies are heavily reliant on “external innovation”
    - *A rich pipeline of new companies is a magnet for mature companies*
  - Attracts investment capital
  - Attracts talent
  - Creates a “buzz”
What is the Rationale for Each Component of the Framework? (cont’d)

- **Supply, distribution and inclusiveness of workforce**
  - Workforce is a draw for mature companies and entrepreneurs
  - Ensures that there is alignment between company needs and workers’ skills – *not just research skills!*
  - Enables (mature) companies to locate “wherever” it makes the best business sense for them (state-wide)
  - Promotes ability of New Jersey workers to compete for life sciences jobs
  - Can create pathways into the life sciences for mid-skilled workers
What is the Rationale for Each Component of the Framework? (cont’d)

- **Infrastructure**
  - Cutting edge facilities for research institutions supports discovery and may provide unique resources that can be found only in New Jersey
  - Basic infrastructure helps New Jersey compete to attract companies
  - Can promote expanded economic regional development
  - Business incubators provide places for young companies to grow
  - Convening spaces support collaboration and ecosystem
  - Web-enabled tools promote collaboration and ecosystem
What is the Rationale for Each Component of the Framework? (cont’d)

- **Ecosystem**
  - Collaboration, new models of partnership and “connecting the dots” accelerates the pace of innovation \((1+1=11)\)
  - Increases the leverage on investment dollars
  - Coalesces the cluster into a *community* – a sense of community is attractive to companies, investors and researchers
  - Enables easy entry to the community for newcomers -- access to people, organizations, skills, people
  - Attracts mature companies who want “expedited” access; Encourages young companies to remain and grow jobs
  - Includes professional service companies and other supporting players
  - Active partnerships with state agencies enables the development and implementation of successful economic development strategies
Coalesce the “Cluster” into an “Ecosystem”

A “cluster” is a collection of assets — universities, medical centers, companies, investors, service providers, etc.

In an innovation “ecosystem” all members of the cluster work well individually and together!
Creating an Ecosystem

Target the **Five “A’s”** of Ecosystem Creation and Effectiveness

- **Goal**
- **Information**
- **Business Strategy**
- **On.h Line Network**
- **Magnet Attraction**

- **(Shared) Aspiration and Vision**
- **Advocacy and Publicity**
- **Advisory and Mentoring Resources Participate**
- **Attraction – There are incentives to be part of the ecosystem**
- **Alignment of Stakeholders on Core Competencies and Value Proposition**
Accelerating Life Sciences Innovation: a Public-Private Partnership

The Massachusetts Life Sciences Initiative

Presented to the New Jersey Task Force
April 3, 2018
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States with Low Innovation Capacity Underleverage Research Investments

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- Advisory and Mentoring Resources Participate
- Advocacy and Publicity
- Alignment of Stakeholders on Core Competencies and Value Proposition
- Attraction – There are incentives to be part of the ecosystem
The Massachusetts Life Sciences Initiative: Investing to Create a High-Performance Innovation Ecosystem
What is the Massachusetts Life Sciences Initiative?

• A 10-year, $1 billion initiative (2008-18)

• Envisioned and initiated by Governor Deval Patrick
• Commitment by Governor Charles Baker to recapitalize

• Administered by the Massachusetts Life Sciences Center (MLSC), a quasi-public authority funded by the state but governed by a Board of Directors

The MLSC funds innovation and also is an innovator:

✓ New roles for the public sector as “strategic investor”
✓ Portfolio of novel programs and financial tools
✓ Unique models of collaboration and partnership with the private sector
A “Hub” for the Massachusetts Life Sciences Community

Stakeholders

- Trade Associations
- Other Massachusetts State and Quasi-Public Agencies
- MA Companies
- U.S. Companies
- International Companies
- Foreign Governments
- International Delegations

The MLSC needed to be a “one stop shop” for funding, tools, programs, access and sector expertise

MLSC Activities

- Programs and Incentives
- Referrals and Coordination
- Convening and Facilitation
- Outbound Marketing
- Inbound Inquiry Management
- Targeted Outreach
- Tradeshows Participation
- Partnership
- Business Development

BIOMEDICAL GROWTH STRATEGIES LLC
The Massachusetts Life Sciences Initiative: A Strategic Plan of Action

Broad Goals:

- Invest in **good science and good business**
- Strengthen Massachusetts’ global leadership in life sciences
- Accelerate commercialization
- Create jobs and drive economic development across the state

The Initiative “Sits” at the Intersection of Public Policy and Business Strategy
The Massachusetts Life Sciences Initiative: Is Broadly Defined

What Sectors?
- Biotechnology
- Pharmaceuticals
- Medical Devices
- Diagnostics
- Bioinformatics

What Skills?
Science, Technology, Engineering, Math (STEM) AND.....
- Administration
- Animal Husbandry/Care
- Advertising and Communications
- Computing/IT
- Finance
- Legal and Regulatory
- Logistics Management
- Project Management
- Sales and Marketing
- Skilled Manufacturing
Where Did Massachusetts Find a Billion Dollars?

- Annual Share of Massachusetts’ Bond Capacity
  - Infrastructure projects

- $500 Million Capital Fund
- $250 Million Investment Fund
- $250 Million Tax Incentives
  - 10 Years
  - $1 Billion Investment

- Annual Authorization
  - Awarded on a Competitive Basis for Job Creation

Annual Appropriation in the Massachusetts State Budget
- “Discretionary” fund (Used for grants & loans; includes the MLSC’s operating funds)
The MLSC is Governed by a Multi-Disciplinary Board Representing the Public and Private Sectors

- Secretary of Housing and Economic Development
- Secretary of Administration and Finance
- President of the University of Massachusetts System
- A researcher involved in the commercialization of biotechnology, pharmaceuticals or medical diagnostic products*
- A physician licensed to practice medicine in the Commonwealth and the President or senior administrator of an academic medical center*
- A person with financial expertise in the life sciences*
- A CEO of a Massachusetts-based life sciences company*

*Board members with staggered terms
Experts Guide Investment Decisions and Help Coalesce the Ecosystem

FOUNDING CHAIR: Harvey F. Lodish, Ph. D., Whitehead Institute and Massachusetts Institute of Technology (MIT)

Academia

James J. Collins, Ph.D., Massachusetts Institute of Technology
John M. Collins, Ph.D., Center for Integration of Medicine & Innovative Technology (CIMIT)
Robert D'Amato, M.D., Ph.D., Center for Macular Degeneration Research, Harvard Medical School and Boston Children's Hospital
Glenn R. Gaudette, Ph.D., Worcester Polytechnic Institute (WPI)
Judith Lieberman, Ph.D., Immune Disease Institute, Boston Children's Hospital and Harvard Medical School
Lita L. Nelsen, Massachusetts Institute of Technology
Barbara Osborne, Ph.D., UMass Amherst
Guillermo Tearney, M.D., Ph.D., Harvard Medical School, Harvard-MIT Division of Health Sciences and Technology (HST) and Massachusetts General Hospital
David Walt, Ph.D., Tufts University School of Medicine
Frederick J. Schoen, M.D., Ph.D. Professor Harvard Medical School

CURRENT CHAIR (FOUNDER OF ILLUMINA)

Industry

James Barry, Ph.D., Inspire MD, Inc.
Dalia Cohen, Ph.D., ALN Associates
José-Carlos Gutiérrez-Ramos, Ph.D., Pfizer
Dale Larson, Draper Laboratory
Alan Smith, Ph.D., CBE, FRS, Genzyme (Retired)
Alison Lawton, Ovascience

Venture Capital

Kevin Bitterman, Ph.D., Polaris Venture Partners
T. (Teo) Dagi, M.D., M.B.A., Queens University Belfast & Broadview Ventures
Andrew Jay, DMD, Siemens Venture Capital
Henry Kay Boston Harbor Angels
Carmichael Roberts, Ph.D., M.B.A., North Bridge Venture Partners
Lauren Silverman, Ph.D., Novartis Option Fund
Frederick Jones, M.D. Broadview Ventures

Entrepreneurs

Alison Taunton-Rigby, Ph.D., RiboNovix, Inc.
Hillel Bachrach, Viztech & UltraSPECT

* SAB members rotate
The Massachusetts Life Sciences Initiative: Impact
MLSC Investments Helped Lead Massachusetts Out of the Economic Recession and Build the Economy

Employment Growth in MLSC-Targeted Sectors (2006-2014)

Biopharma Economic Impact in Massachusetts (2016)

- 66,414 employees
- $138,768 average annual wage
- $9,216,168,893 total MA-based wages

Sources: B. Bluestone and A. Clayton-Matthews, *Life Sciences Innovation as a Catalyst for Economic Development: The Role of the Massachusetts Life Sciences Center* (March 2013)
MA Now Ranks #1 in U.S. Life Sciences Employment On a Per Capita Basis

Total Life Sciences Employment, per One Million Population by U.S. State (2016)

- Massachusetts: 17,363
  - 1.3X higher than in New Jersey
- New Jersey: 13,592
  - 1.8X higher than in California
- California: 9,524
  - 1.8X higher than in Pennsylvania
- Pennsylvania: 9,477
  - 2.3X higher than in New York
- New York: 7,392
  - 3.0X higher than in Florida

Sources: MassBio Industry Snapshot (2017); B. Bluestone and A. Clayton-Matthews, Life Sciences Innovation as a Catalyst for Economic Development: The Role of the Massachusetts Life Sciences Center (March 2013)
Massachusetts Academic Institutions are Now Actively Engaged in Creating Start-up Companies

Startups at Universities
Fiscal Year 2013

Source: Association of University Technology Managers
VC and IPO Activity in Massachusetts is High

**Seed and Early Stage**

Venture Capital Investment in BioHealth

In Millions of Dollars, 2010-2014

- Pittsburgh
- Raleigh-Durham
- New York
- Philadelphia
- Baltimore/ CMD
- San Diego
- San Francisco
- BOSTON

**Initial Public Offerings by BioHealth Companies**

2012-2013

- Pittsburgh
- Philadelphia
- Baltimore/ CMD
- New York
- Raleigh-Durham
- San Diego
- San Francisco
- BOSTON

Source: Pricewaterhouse Coopers MoneyTree, EAGB Analysis

Source: World Federation of Exchanges, EAGB

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Massachusetts is Commercializing Its Research...And Has Pulled Ahead of California

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Sources: PwCMoneyTree™; National Institutes of Health (NIH)
MLSC Tax Incentives Have Created Jobs for a Range of Skills and Educational Levels

Distribution of New Hires by Level of Education Among Companies Receiving MLSC Tax Incentives

- Bachelor's Degree, 48%
- Master's Degree, 19%
- High School or Less, 15%
- Less than 2 years beyond High School, 4%
- Professional Degree (e.g. - MBA), 3%
- Associate Degree, 4%

Only 26% of the net new jobs created have been filled by workers with a Masters degree or above!

Sources: B. Bluestone and A. Clayton-Matthews, Life Sciences Innovation as a Catalyst for Economic Development: The Role of the Massachusetts Life Sciences Center
Global Leaders are Moving Their U.S. Headquarters to MA

**Merck**
Merck KGaA moving US base to Billerica, Millipore deal also expected to bring new jobs to state (3/4/10)

**Baxter**
Healthcare Giant Baxter International is Moving to Cambridge (8/27/14)

**Shire**
Shire to Move US HQ and 500 Jobs to Greater Boston (11/19/14)
Shire to Buy NPS Pharmaceuticals for $5.2 Billion and Considering Moving Many of NPS’s 400 Employees to its Lexington Campus (1/1/15)

**GE Healthcare**
GE Healthcare will establish a new US headquarters for its life sciences division in Massachusetts, in a move that could bring hundreds of jobs to the state (8/24/14)

**Baxalta**
Baxter biopharm spinout Baxalta is Cambridge-bound (9/30/14)

**GE Digital**
GE Digital will move 100 employees to temporary Boston HQ (3/11/17)

**Boston Business Journal**
Amgen enters heavyweight fray for Kendall Square’s few remaining blocks of space (8/19/14)

**The Boston Globe**

**BIOMEDICAL GROWTH STRATEGIES LLC**
MA Has Become a Target for Investment and Growth by Industry Leaders

- **18 of the top 20 biopharma companies** now have a significant presence in Massachusetts

- Among the largest life sciences employers in MA, **two-thirds employ 500-1,000 workers; one-third employ 1,000+ workers**

- **Of these major employers one-third had little or no presence in MA before 2007!**

The benefits extend FAR beyond job creation:

- Anchor the life sciences ecosystem
- Provide seasoned experts to mentor young companies
- Are sources of spin-outs and investments (venture arms)
- Reduce the # of early stage companies that are acquired and taken out of Massachusetts
- Leverage on public investments
- Train talent that may migrate to start-up companies

Sources: MassBio Membership Reports & Surveys; Boston Business Journal Book of Lists, 2015
# Largest Biopharma Employers in Massachusetts (2017)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company</th>
<th># Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sanofi Genzyme</td>
<td>5,000</td>
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<tr>
<td>2</td>
<td>Shire</td>
<td>3,040</td>
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<tr>
<td>3</td>
<td>Biogen</td>
<td>2,443</td>
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<td>4</td>
<td>Novartis</td>
<td>2,333</td>
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<td>5</td>
<td>Pfizer</td>
<td>2,200</td>
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<tr>
<td>6</td>
<td>Takeda</td>
<td>2,000</td>
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<tr>
<td>7</td>
<td>Vertex</td>
<td>1,600</td>
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<tr>
<td>8</td>
<td>Quest Diagnostics</td>
<td>1,550</td>
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<tr>
<td>9</td>
<td>Charles River Laboratories</td>
<td>1,446</td>
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<td>10</td>
<td>MilliporeSigma</td>
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<td>11</td>
<td>Parexel International</td>
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<td>AbbVie</td>
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<td>Alkermes</td>
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<td>Sunovion Pharmaceuticals</td>
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<td>Alnylam</td>
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<td>Foundation Medicine</td>
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<td>18</td>
<td>Merck</td>
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<td>20</td>
<td>Amgen</td>
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<td>GE Healthcare Life Sciences</td>
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<td>Bristol-Myers Squibb</td>
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<tr>
<td>25</td>
<td>Ironwood</td>
<td>375</td>
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Sources: MassBio Membership Reports & Surveys; Boston Business Journal Book of Lists, 2017
Boston Has Transitioned from an Academic Hub to a "Start-up Hub"

New Report Labels Boston a Better Hub for Startups Than San Francisco

The Initiative Has Received National Recognition

- Received in September 2013, the **State Science and Technology Institute’s Award** for Excellence in Technology Based Economic Development for “Improving Competitiveness of Existing Industries”

- Based on a national, judged competition to identify initiatives that represent best practices in innovation-driven, economic development
Guidelines for MLSC Investment

- Strategic and well-chosen investments by the state should be highly leveraged to serve as a magnet for private investment.

- Investment based on a competitive process promotes the relative best use of public dollars entrusted to the Center.

- Inclusionary decision making engages the private sector in the life sciences initiative, creates shared ownership and accesses the breadth of expertise needed to optimize the impact of the Center’s investments (“wisdom of crowds”).

- A “portfolio” strategy is the most effective approach for accomplishing the Center’s mission and vision.

- The best use of MLSC funds is to “seed, accelerate, match” (vs. providing operating funds).

- Funding and incentivizing new models of partnership and collaboration are critical to a successful life sciences ecosystem.

- Funding priorities should be based on a “bottoms up” (market driven) vs. “top down” approach.
The Roadmap: A Strategic Investment Portfolio

Investments Specially Targeted Gaps That Were Weakening Massachusetts’ Innovation Capacity

**Translational Research Culture**
- Faculty/EIR Grants
- Grants to Early Career Scientists for Translational Research
- Co-operative Research Grants

**Entrepreneurship**
- Grants for Business Plan Competitions
- Accelerator Loan Program
- Milestone Achievement Program (MAP)
- Small Business Matching Grant (SBMG)
- Mentoring Program
- Incubating, Accelerating and “Maker” Spaces
- Expedited Access by Investors and Industry to New Technologies

**Workforce Development and Job Growth**
- Internships
- Grants to Community-Based STEM Programs
- Equipment and Supply Grants to Middle, Voc Tech and Public High Schools
- Grants for Programs that Promote Workforce Inclusion and Diversity
- Tax Incentives for Growth and Capital Investments

**Ecosystem**
- Collaborative R&D Partnerships
- Grants for Shared R&D Spaces
- Convening Spaces
- Biomanufacturing Roundtable
- Neuroscience Partnerships
- Partnership Assistance Portal

**Infrastructure**
- Updates and Renovations
- Cutting Edge Spaces for Research, Training, Biomanufacturing and Computing (“WOW” Projects)
Strengthen the Translational Research Pipeline

**Objective:** Promote interest by academics in translational research, industry partnerships and entrepreneurship (culture change)

**MLSC investments through end FY 16:**
$15.8 million -- matched dollar for dollar by the private sector

- 21 early career investigators (**$5.1 million**)
- Faculty and Entrepreneurs-in-Residence at universities and academic medical centers (**$3.7 million**)
- 12 translational research collaborations between industry and academic partners (**$7 million**)
- Funding for the Massachusetts Association of Technology Transfer Offices (MATTO)* Best Practices (**$100k**)

MATTO’s mission: “to promote efficient and effective transfer of knowledge and technology developed at academic institutions in the Commonwealth of Massachusetts to companies that will develop and bring novel products to market for the public good.”

BIOMEDICAL GROWTH STRATEGIES LLC
Help Life Sciences Companies Grow

Objective: Provide funds and incentives to accelerate the formation, recruitment and growth of life sciences companies in Massachusetts

- Tax Incentives:
  - Incentives in Exchange for Job Creation and Capital Investments
  - Support the Business Case for Growing in MA

- Funding for Early Stage Companies:
  - Grants and Loans
  - Share in Risky Investments
  - Support Mentoring and Coaching

- Business Plan Competitions:
  - Sponsorships
  - Promote Culture of Entrepreneurship
Workforce Development Programs

**Objective:** Train future life sciences workers – across skill levels, regions of the state and socio-demographics

- Skill development in *Early to Middle School grades (K-8)*
- State-of-the-art training facilities at public and vocational-technical high schools
- Infrastructure upgrades in *community colleges and four-year colleges and universities*
- *Career pathways* into the life sciences – “real world experience”
Career Pathways: Internship Challenge Program

- Nearly $16 million invested since 2009
- 3,000 internships funded
- One-quarter of participating interns who were eligible to work were offered full or part-time employment
The MLSC Capital Grant Program

Objective: Expand capital and infrastructure resources across MA, build regional strengths to host industry, support life sciences research, development and commercialization, create collaboration spaces

Life Sciences Laboratories at the University of Massachusetts, Amherst campus: $95 million to fit out and equip a substantial portion of the university’s facilities

Town of Framingham State-of-the-Art Pumping Station: $13M grant to upgrade the town's wastewater collection system. The new wastewater system enabled Genzyme Corporation's to build a $330M manufacturing plant for Fabrazyme® followed by an $80M million downstream processing facility adjacent to the manufacturing site.

Albert Sherman Center at University of Massachusetts Medical School: $90M for interdisciplinary research and education facility that fosters inter-disciplinary collaboration and promotes innovation
Upgrade and Renovate Outdated Space

New Life Sciences Institute (LSI) at Roxbury Community College: $3 million to upgrade outdated facilities for approximately 1,100 students enrolled in its science programs and to build additional science labs, renovate existing lab space. RCC’s student body is predominately made up of students of color and immigrant communities, uniquely positioning the College to fill the need for a diverse, well-trained and local life sciences workforce.

Renovation of the Loeb Lab at the Marine Biological Institute: $10 million grant from the Center that leveraged a $15 million grant from the Howard Hughes Medical Institute (HHMI), transformed Loeb into a state-of-the-art facility that serves as a national resource for science training and discovery.
Cutting-Edge Shared Training Spaces

**WPI Biomanufacturing Education and Training Center (BETC):** $6.6M grant for an innovative partnership between academia and industry that creates customized workforce development solutions focused on biomanufacturing. *Industry matches to date are $50M*

The BETC is the first of its kind in New England: at the 10,000-square-foot pilot-scale Biomanufacturing facility for innovative training. The BETC also offers contract services such as small-scale non-GMP manufacturing, and consulting.
Cutting-Edge Shared Research Spaces

Center for Personalized Cancer Therapies: $10M in seed funding to the CPCT, a joint initiative of UMass Boston and the Dana-Farber Cancer Institute that helps investigators and clinicians analyze samples, identify genetic variants contributing to disease risk, and reveal complex mechanisms involved in human disease.

The Laboratory for Systems Pharmacology at Harvard Medical School: $5M to transform drug discovery by convening biologists, chemists, pharmacologists, physicists, computer scientists and clinicians to explore together how drugs work in complex systems.
Cutting-Edge Shared Research Spaces (cont’d)

**Boston University’s Center for Regenerative Medicine (CReM):** $2M to help build a new lung regeneration facility. The new facility is housed on the Boston University Medical Campus and brings together academic and industry scientists from across the state to apply stem cell biology advances to developing new treatments for cystic fibrosis and other lung diseases.

**The Joslin Translational Research Center for the Cure of Diabetes:** $5M for the creation of new labs and new platforms that will lead to the development of translational studies for curing Type 1 and Type 2 diabetes.
Biobank for Microbiome Research: $4.8M grant to Brigham and Women’s Hospital, the Forsyth Institute, Boston Children’s Hospital (BCH) and the Harvard Digestive Disease Center (HDDC) to form the collective “Massachusetts Host-Microbiome Center.” Funding will advance clinical trials targeting the microbiota while furthering the development of diagnostic tools.

The Advanced Cell Therapy Unit: $4.6M: MLSC grant funding will support the Dana-Farber Cancer Institute’s Advanced Cell Therapy Unit, which will establish partnerships with commercial partners to refine cell therapy manufacturing processes, validate manufacturing procedures, and provide manufactured cellular products for patients enrolled in FDA-approved clinical trials.
Cutting-Edge *Shared* Research Spaces (cont’d)

**Gloucester Marine Genomics Institute, Gloucester - $2.7M**

The Gloucester Marine Genomics Institute will establish a world-class marine genomics research institute on Gloucester Harbor, integrating the dynamic components of scientific discovery, workforce development and investment, and diversifying Gloucester’s maritime economy.

![Gloucester Marine Genomics Institute](image)

**Institute for Protein Innovation**

The **Institute for Protein Innovation: $5M**.

The IPI will build and operate an open-source antibody discovery platform focused on protein therapeutics, with the long-term goal of developing antibodies targeting the entire human extracellular proteome.

![Institute for Protein Innovation](image)
$4.5M for the creation of a supercomputer system for research in the life sciences. The MGHPCC is a critical piece of infrastructure that promotes cooperative research, education and outreach activities. Computers in the MGHPCC run millions of virtual experiments per month, supporting thousands for researchers in Massachusetts and around the world.

90,000 square foot, 15 megawatt facility located on an 8.6 acre former industrial site in Western Massachusetts.
Since 2007, over eleven million square feet of commercial lab space have been added to the Massachusetts’ inventory – an increase of nearly 70%.

28.2M square feet

16.7M square feet

MLSC investments have funded Over $2M sq. ft. of this new research space

2007 2017

Source: Colliers Meredith & Grew, Life Science Review, 2007-2015 and 2016-17
Courtesy of MassBio Industry Snapshot 2017
Business Incubating Spaces

M2D2: the Massachusetts Medical Device Development Center

M2D2 offers inventors and executives of medical device companies easy, affordable, and coordinated access to world-class researchers and resources at the University of Massachusetts Lowell Campus and the University of Massachusetts Medical School and Medical Center.

$10M seed and expansion funding from the MLSC
Business Incubating Spaces

TechSpring: The Baystate Health Technology Innovation Center

TechSpring is the only healthcare innovation center to empower technology companies with the three conditions needed to advance transformative digital healthcare solutions:

- An authentic healthcare environment to test and prove solutions
- Access to healthcare technology systems and informatics
- A forum for healthcare and technology experts to communicate and collaborate

$5M seed funding from the MLSC
Business Accelerating Spaces

LabCentral: a first-of-its-kind shared laboratory space

LabCentral is a launch pad for high-potential biopharma start-ups

“Our mission is to help create the next generation of powerhouse biotech companies by providing entrepreneurs and innovative life-sciences startups with the space and resources they need to test out, challenge, and nurture early ideas.”

$10M seed and expansion funding from the MLSC

BIOMEDICAL GROWTH STRATEGIES LLC
Massachusetts Accelerator for Cell and Vector Biomanufacturing (VMC) in Fall River

First-in-Massachusetts cGMP (Current Good Manufacturing Practice) facility to respond to a new era in the use of viral vectors to prevent and treat human diseases

The VMC is a 3,900 sq. ft. commercial/clinical scale facility that includes multi-platform upstream cell culture, downstream purification and dedicated fill capabilities. The facility was built and is operated by MassBiologics and the University of Massachusetts Medical School.

$20M from the MLSC

The VMC enhances the ability of the Massachusetts life sciences community to translate breakthrough science into viable commercial products. The VMC’s unique set of competencies and facilities do not exist in any current commercial facility capable of manufacturing virus based products.

BIOMEDICAL GROWTH STRATEGIES LLC
**Convening Spaces**

**District Hall:** a dedicated civic space where the innovation community can gather and exchange ideas.

*District Hall has open workspace, classrooms, assembly space, flexible use ‘pods’, and writable surfaces everywhere.*

*The MLSC was a capstone funder.*
Promoting the Public’s Interest

Boston Museum of Science Hall of Human Life: $5 million capstone grant to create a permanent exhibition designed to revolutionize how people view and engage with their own biology.

Boston Children’s Museum: $500k grant to create a “maker space” and study how young children develop skills for STEM as well as engage parents in working on STEM projects with their children.
Consortia and Collaborations: Neuroscience Consortium

Objective: Accelerate breakthrough treatments in CNS by creating a pioneering new model of collaboration that leverages Massachusetts’ rich neuroscience environment

- Accelerates pre-clinical research available to the pharmaceutical industry
- Introduces academic researchers to targeted research
- Facilitates new models of industry-academic partnership
- Provides sponsors with expedited access to Massachusetts’ neuroscience cluster – the highest density of neuroscience research in the world

Neuroscience Consortium Charter members:

- Abbvie
- Biogen-Idec
- EMD Serono
- Janssen Research (Johnson and Johnson)
- Merck
- Pfizer
- Sunovion (DainipponSumitomo)

Projects are funded by Consortium members; the MLSC provides staff support and grant administration
Consortia and Collaborations: 
MLSC and NIIMBL Partnership

**Objective:** Accelerate innovation in biomanufacturing

- Partnership with NIIMBL (National Institute for Innovation in Manufacturing Biopharmaceuticals) -- the nation’s first biomanufacturing innovation institute (launched 2016)

- MLSC is an anchor to NIIMBL’s northeastern node

- Regional consortium includes:
  - Small, medium and large biopharmaceutical industry partners
  - MIT, Quincy College, UMass Lowell, UMass Medical School, and the Worcester Polytechnic Institute (WPI).

*Center has committed up to $20 million for five years*
Creating the Ecosystem Was a Team Effort

Many constituencies took ownership for the vision and contributed to its realization and helped drive culture change.

- “Bioready Communities” rating (MassBio)
- Venture forms and educational sessions for entrepreneurs (Law and Accounting firms)
- “Life Sciences Corridor” (Mayors of 5 cities and towns along the eastern seaboard)
- Tax incentives to life sciences start-ups and mature companies (Local governments)
- Pro bono first class luxury space for the MassChallenge’s business plan competition (The Fallon Company)
- Creation of the Boston “Innovation District” — a “new model designed to foster collaboration, especially among start-ups and research-based companies (Mayor, City of Boston)

“Team Massachusetts” creates a unified marketing message and brand

BIOMEDICAL GROWTH STRATEGIES LLC
Revving Up the Massachusetts Life Sciences Ecosystem

Translational Research
$49M

Early Stage Companies & Entrepreneurship
$44M

Advanced and Bio-Manufacturing
$76M

Voc Tech & High School Equipment
$20M

Tax Incentives
$139M

Internships
$17M

Capital Projects
$395M

K-12 STEM Programs
$6.2M

Leverage
$2B+

Collaboration
$5.1M

*best estimates based on available data

Invested through FY '17*
Why It Works

- Innovation can be an outcome of focused, strategic investments*
- Strategic investments by government will be leveraged by private investment, especially capital expenditures
- A rich pipeline of early stage companies attracts large companies that anchor the ecosystem
- Academic institutions and faculty benefit from actively participating in translational research, entrepreneurship and industry partnerships
- Career opportunities are created for workers with a variety of skills and educational levels
- "Wisdom of experts" identifies the relative best investments and creates shared ownership
- Innovation-driven economic development is a viable goal for policymakers
- Collaboration, partnerships, collaboration, partnerships......

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