Overview and Summary of Recent Initiatives

During and since the last gubernatorial election cycle, several organizations and think tanks in Massachusetts have developed economic "roadmaps" highlighting the role of the biosciences. One such report was **MassBiotech 2010** published by the **Massachusetts Biotechnology Council (MBC).** Another more recent study was the **Technology Road Map and Strategic Alliances** study commissioned by **MassInsight Corporation,** a CEO leadership group. The roadmap identified life sciences as among four key opportunity areas for development of partnerships between industry and academia.

One response was MBC's creation of an **Industry Development Program** that works in close partnership with state agencies as the first point of contact for biopharmaceutical companies to assist them on issues of site selection, permitting, and financing. The **Massachusetts Technology Collaborative (MTC)** also received $35 million under the 2003 Economic Stimulus Act to establish the **Johns Adams Innovation Institute.** This Institute gives the state for the first time ever the ability to make grants for research-based initiatives, including a $20 million Research Center Matching Fund to create or expand centers that can attract federal or industrial support in three prespecified fields including biotechnology. MTC has also received support from the Boston Foundation to extend the 2003 Harvard/Massachusetts Institute of Technology (MIT) Life Science summit by working with MBC and other stakeholders on a **Life Sciences Plan.**

Since the last BIO report, MTC began issuing program announcements for these grants and has made more than $16 million in awards and commitments. In addition, the University of Massachusetts rolled out its **Massachusetts Technology Transfer Center,** which provides targeted resources to technology commercialization offices at all the major institutions, both public and private.

Building Bioscience R&D Capacity

Recent state investments in facilities

Facilities developed recently with state funding include the 42,000-square-foot headquarters in Springfield for the **Pioneer Valley Life Sciences Institute,** a translational-research collaboration of Bay State Health System and UMass Amherst. Still under development is a 200,000 square foot **Integrated Life Sciences Building** at the University of Massachusetts (UMass) Amherst. UMass Medical School recently completed the 360,000-square-foot **Aaron Lazare Medical Research Building** on its Worcester campus as well as major expansion of its **Massachusetts Biologic Laboratory** in Jamaica Plain.

In the Boston/Cambridge area, the private institutions continued to build new facilities, including a **National Biocontainment Laboratory** at Boston University (BU); a 410,000-square-foot **McGovern Brain Institute** building at MIT; a 525,000-square-foot, $260 million research building for Harvard Medical School; and a 230,000-square-foot, privately developed headquarters for the **Broad Institute,** a collaborative of MIT, Harvard, the Whitehead Institute, and several research hospitals.

Research programs

The Research Center Matching Fund of the Adams Innovation Institute provides support up to $500,000 to programs that build research capacity. Recent investments include a **Center of Excellence in Apoptosis Research** at the Pioneer Valley Institute noted above and investigation of biomedical applications at a joint nanotechnology initiative among several institutions. Smaller Development Grants have been made to the **MIT Center for Biomedical Innovation,** an industry/university partnership; and the **Massachusetts Biomanufacturing Center,** a joint initiative of UMass Lowell, Worcester Polytechnic Institute, Tufts University, and UMass Dartmouth.

The regional pool at the Adams Innovation Institute can fund smaller projects in the range of $25,000 to $500,000. UMass has also applied its $1 million internal **Science and Technology Initiatives Fund** to seeding research projects throughout the system. Through the first 2 years of the program, roughly half the awards have been made to projects in the biosciences, including biomanufacturing.

Moving Technology into the Marketplace

Commercializing university technology

Massachusetts has multiple public and private sources to support precommercialization research. Major programs include the following:

- The Massachusetts Technology Transfer Center, funded at UMass for $1.9 million in the Economic Stimulus bill, makes **Technology Assessment** awards up to $5,000 and **Technology Investigation** awards up to $25,000 to all research institutions, both public and private.
- Internal to UMass, the office for **Commercial Ventures and Intellectual Property** has a $100,000 fund from which it makes precommercialization development grants up to $20,000.
- At MIT, the **Deshpande Center** has targeted $15 million of its $20 million endowment to support development of promising research into commercial enterprises. The center makes **Ignition Awards** up to $50,000 to research teams and somewhat larger **Innovation Awards** to help determine whether to start a company or execute a license with an existing firm.
- At Boston University, the Office for Technology Development, now embedded in a larger **Institute for Technology Entrepreneurship,** maintains resources for similar technology-development awards and to initially capitalize start-up entities.

Supporting bioscience entrepreneurs and emerging companies

Statewide, the Massachusetts Technology Transfer Center provides commercialization assistance to early-stage companies with technology licensed from any research institution and holds an annual one-day workshop for life science researchers interested in starting a spin-off company. It also sponsors an annual venture forum showcase.

Regional bioscience cluster organizations and other entities are involved in commercialization assistance to bioscience entrepreneurs in three major regions of the state:

- In western Massachusetts, the Economic Development Council of Western Massachusetts and industrial liaison staff at UMass Amherst collaborate on a Regional Technology Corporation, which includes a **Bio Economic Technology Alliance.**
- In central Massachusetts, the **Massachusetts Biomedical Initiatives** organization provides commercialization support in addition to incubation (see below) and has established a bioinformatics resource for joint academic/industrial use.
- In Boston, BU's **Health Care Entrepreneurship Program** provides similar support for commercialization.

Making Capital Available

Pre-seed and seed capital

Boston is one of the few communities to have a healthcare-focused angel fund, **Angel Healthcare Investors** ($11 million). Recently, several local hospital systems revealed plans to create angel capital networks to assist them in financing spin-out ventures at the earliest stages.

Seed-stage investments (typically up to $500,000, with co-investment from outside parties) in several fields including the life sciences are also available from the **Massachusetts Technology Development Corporation,** another quasi-public agency. MTDC was recapitalized by $5 million in new appropriations and liquidity events since the last BIO report.

With support from the John Adams Innovation Institute, the **Boston Redevelopment Authority's** Life Sciences Initiative provides seed grants and low-interest loans.

Providing Space for Bioscience Companies

Incubators

Bioscience incubators include the following:

- **Discovery and Innovation Center,** a 12,000-square-foot incubator within BU's BioSquare research park (see below).
- Two **Innovation Centers** operated by Massachusetts Biomedical Initiatives in Worcester, both situated downtown and outside the boundaries of the Massachusetts Biotechnology Research Park.

Facilities financing

MassDevelopment, the state's development finance agency, has created a $25 million Emerging Technology Fund that can make loans up to $2.5 million for biotechnology facilities financing, including in biomanufacturing, and with some flexibility to help leverage federal grants. At the regional level, $500,000 loans for biomanufacturing are available from the **Greater Fall River Development Corp.**

Bioscience research parks

Massachusetts has two essentially mature bioscience research parks:

- **University Research Park,** a 1.3-million-square-foot park of nine buildings in a 27-acre zone in Cambridge, developed by Forest City Enterprise pursuant to master agreement with MIT. It is also near additional bioscience properties owned by MIT itself (Technology Square, where Novartis opened a laboratory) and private developers (Alexandria, Lyme, and others).

- **Massachusetts Biotechnology Research Park,** a 1-million-square-foot park on 105 acres adjacent to UMass Medical Center in Worcester, anchored by Abbott Laboratories and now owned by Alexandria.

Additionally, the following projects are under development:

BU's **BioSquare,** targeted for 2 million square feet on 14 acres at the BU Medical Center Campus in the South End, recently reached 1.1 million square feet with the opening of its third wet-lab building, privately developed by Spaulding & Slye Colliers.

- The Longwood Medical and Academic Area in Boston for the first time includes commercial space, including a Merck laboratory on property rented from Emmanuel College, and the **Black Fan Center,** a privately developed, multitenant wet-lab building.

- **Gateway Park** is a 15-acre park devoted to bioengineering being developed on land adjacent to Worcester Polytechnic Institute.

- **Tufts Biotechnology Corporation** is planning a 106-acre life science park adjacent to the university's School of Veterinary Medicine in Grafton, also in central Massachusetts.

Addressing Talent Needs

Recruiting management talent

MBC manages an internship program to link students to opportunities in the bioscience sectors.

Specialized postsecondary programs

The **Biotech Learning Center** of MassBioEd, the affiliated education foundation of MBC, offers adult-education courses in clinical research and biotech project management.

K-12 outreach

Through its **BioTeach** program, MassBioEd also provides laboratory equipment and professional development resources to enable every public high school in the state to teach biotechnology by the year 2010.

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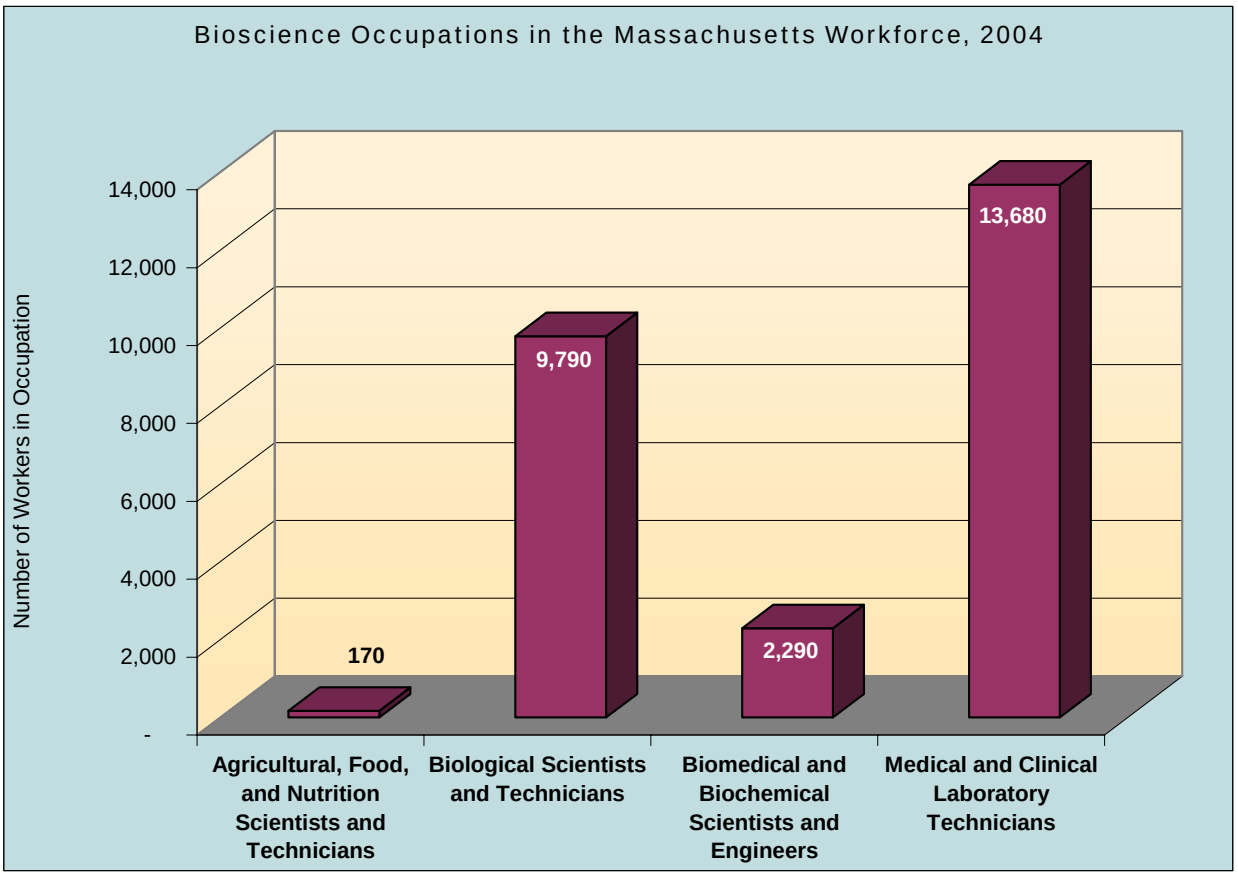
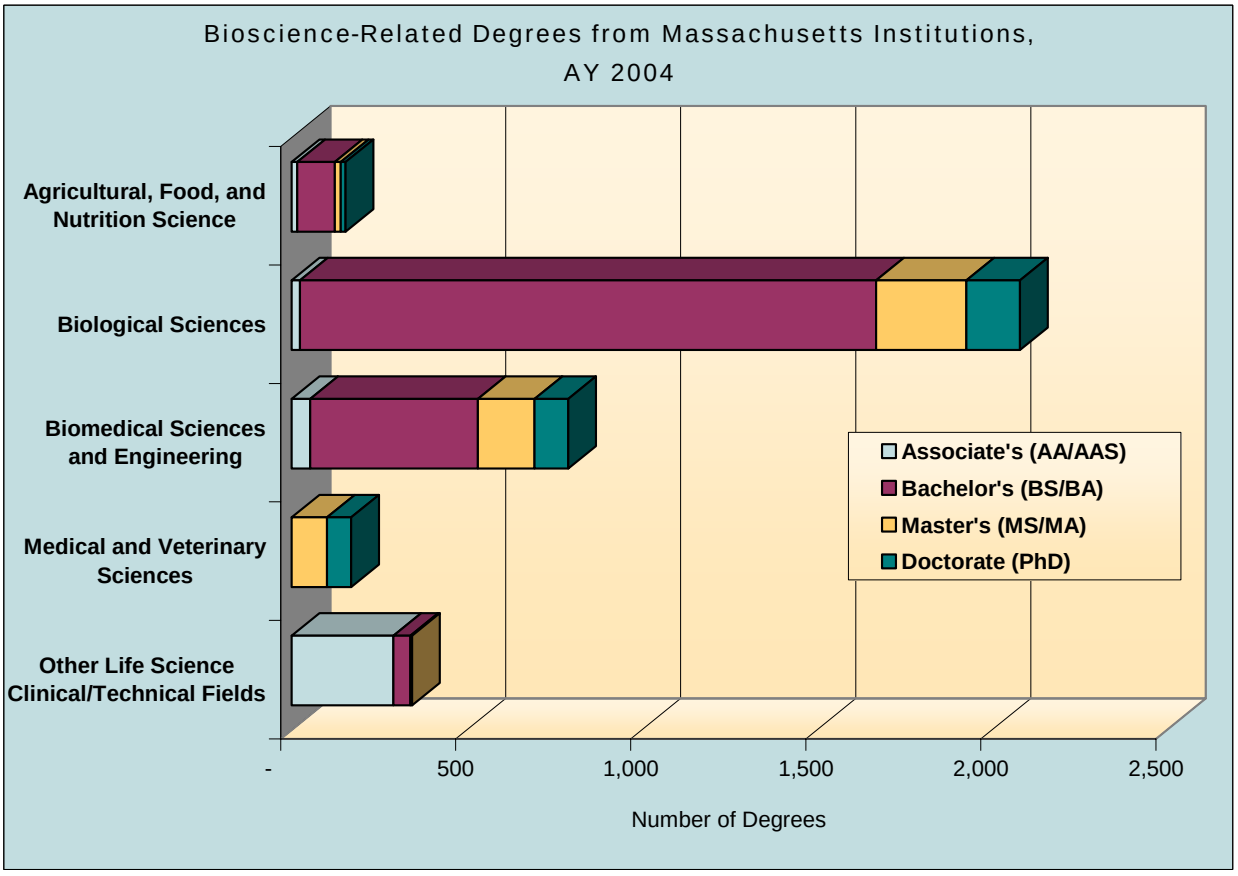
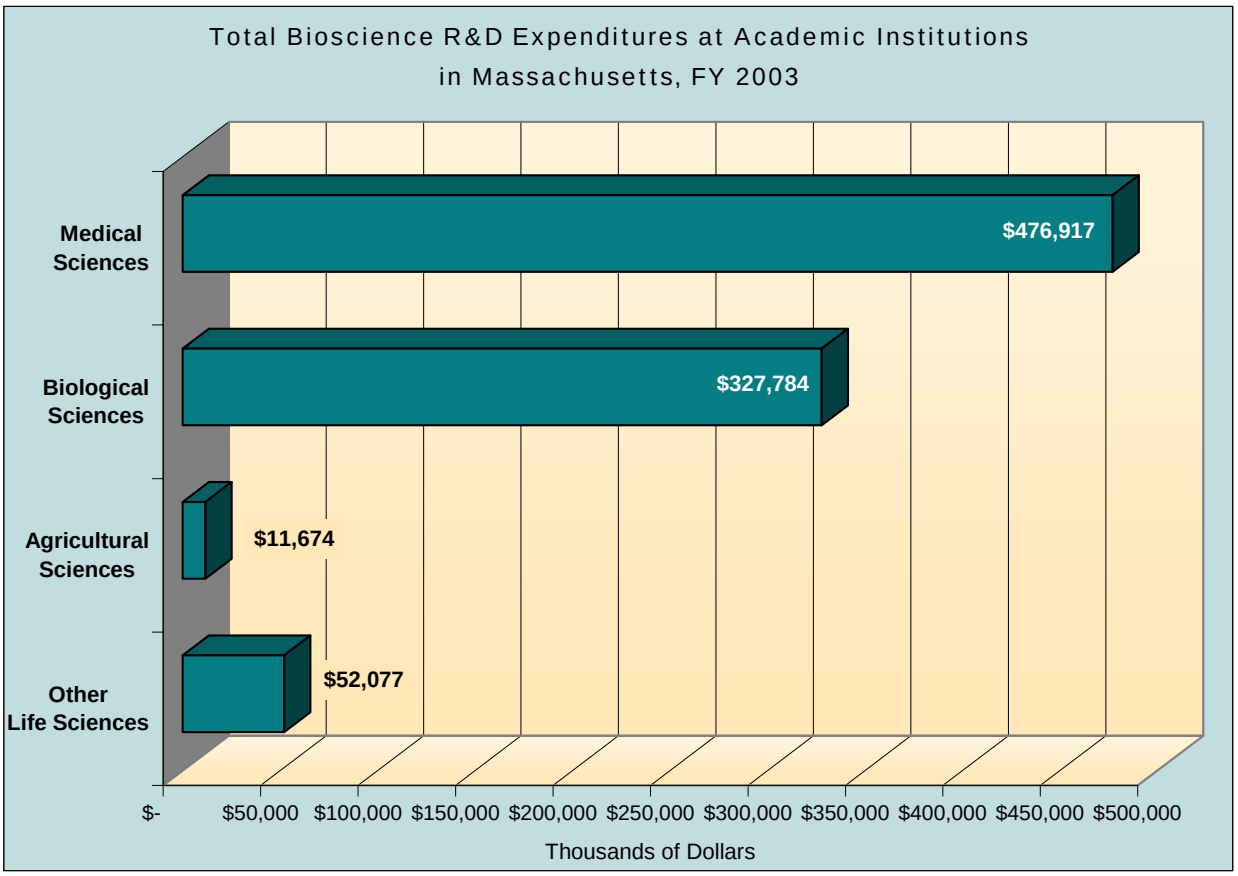
Industry Subsector	Massachusetts	United States
Agricultural Feedstock & Chemicals		
Establishments 2004	22	2,111
2001-2004 Establishment % Change	-17.1%	0.4%
Employment 2004	485	104,893
2001-2004 Employment % Change	-4.4%	-6.9%
Share of U.S. Employment	0.5%	100.0%
Location Quotient	0.18	n.a.
Average Annual Wage 2004	$60,990	$63,383
Direct-Effect Employment Multiplier	4.67	10.91
Total Employment Impact	2,266	1,212,094
Drugs & Pharmaceuticals		
Establishments 2004	87	2,589
2001-2004 Establishment % Change	1.2%	-0.6%
Employment 2004	6,979	313,207
2001-2004 Employment % Change	-10.5%	2.7%
Share of U.S. Employment	2.2%	100.0%
Location Quotient	0.89	n.a.
Average Annual Wage 2004	$100,994	$79,303
Direct-Effect Employment Multiplier	6.46	9.51
Total Employment Impact	45,081	2,731,321
Medical Devices & Equipment		
Establishments 2004	459	15,190
2001-2004 Establishment % Change	-2.5%	0.2%
Employment 2004	21,755	411,460
2001-2004 Employment % Change	-19.0%	-3.6%
Share of U.S. Employment	5.3%	100.0%
Location Quotient	2.11	n.a.
Average Annual Wage 2004	$75,207	$56,449
Direct-Effect Employment Multiplier	3.39	4.56
Total Employment Impact	73,812	1,817,705
Research, Testing, & Medical Laboratories		
Establishments 2004	801	20,565
2001-2004 Establishment % Change	20.7%	19.4%
Employment 2004	23,315	413,550
2001-2004 Employment % Change	14.1%	8.2%
Share of U.S. Employment	5.6%	100.0%
Location Quotient	2.25	n.a.
Average Annual Wage 2004	$84,706	$65,414
Direct-Effect Employment Multiplier	2.37	3.15
Total Employment Impact	55,164	1,272,936
TOTAL PRIVATE SECTOR		
Establishments 2004	204,348	8,156,137
2001-2004 Establishment % Change	9.8%	4.8%
Employment 2004	2,739,198	109,249,195
2001-2004 Employment % Change	-4.3%	-0.7%
Share of U.S. Employment	2.5%	100.0%
Location Quotient	n.a.	n.a.
Average Annual Wage 2004	$49,218	$39,003

Source: Battelle calculations -- based on Bureau of Labor Statistics QCEW data from the Minnesota Implan Group, RIMS II Employment Multipliers from the Bureau of Economic Analysis, and the Census Bureau's Economic Census.
Note: n.a. = metric is not applicable.


Bioscience Occupations in the Massachusetts Workforce, 2004
Number of Workers in Occupation
14,000
12,000
10,000
8,000
6,000
4,000
2,000
-
170
9,790
2,290
13,680
Agricultural, Food, and Nutrition Scientists and Technicians
Biological Scientists and Technicians
Biomedical and Biochemical Scientists and Engineers
Medical and Clinical Laboratory Technicians


Bioscience-Related Degrees from Massachusetts Institutions, AY 2004
Agricultural, Food, and Nutrition Science
Biological Sciences
Biomedical Sciences and Engineering
Medical and Veterinary Sciences
Other Life Science Clinical/Technical Fields
Associate's (AA/AAS)
Bachelor's (BS/BA)
Master's (MS/MA)
Doctorate (PhD)
-
500
1,000
1,500
2,000
2,500
Number of Degrees



	Massachusetts	United States	Rank
University R&D Expenditures, FY 2003			
Total ($ thousands)	$1,821,817	$40,104,621	6
Life Science R&D ($ thousands)	$909,628	$24,062,088	8
Percent of Total R&D	49.9%	60.0%	
Life Sciences Per Capita	$141.39	$82.74	
Change in Life Sciences FY 1999–2003	43.3%	52.7%	
NIH Support to Institutions, FY 2004			
Total ($ thousands)	$2,265,512	$22,556,459	2
Per Capita Expenditures	$352.15	$77.56	
Change in Expenditures FY 2000–2004	47.7%	53.2%	
Higher Education Degrees in Bioscience Fields, AY 2004	3,538	111,329	10
Bioscience Occupations in the Workforce, 2004	25,930	616,140	6