Identifying Employer Needs, Talent Gaps, & Strategies to Grow a Stronger Bio Science Workforce in Rhode Island

BIOSCIENCE

SKILLS 2013 STUDY

Rhode Island Bioscience Industry
About Tech Collective
Tech Collective is Rhode Island’s Bioscience and Information Technology Industry Association. Uniting industry, government, and academic stakeholders, our mission is to inspire, engage, educate, and employ a high-skill, high-wage Knowledge Economy in Rhode Island. Get connected at www.tech-collective.org.

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Growing an Industry

Rhode Island’s bioscience industry is a story that brings together historic strengths in manufacturing and design with advances at the forefront of biotechnology and understanding of human health. As an industry, bioscience is growing faster than the Rhode Island economy.

Rhode Island’s bioscience industry contributes to the life sciences on a national and global stage. The industry is diverse and innovative, employing 4,602 bioscience professionals and having a total employment impact of an additional 11,847 workers. The specialized industry is categorized by highly skilled professionals, above-average wages, and great social impact. While the biosciences are a small sector comparatively to the state and the New England region, it is one of Rhode Island’s highest growth potential industries.

With a mix of companies ranging from “idea stage” ventures spinning out of hospital and university research to production facilities operated by mature global companies, the greatest opportunities for bioscience job growth in Rhode Island lie ahead of us.

Study Approach

The Rhode Island Bioscience Skills Gap Study has been undertaken by Tech Collective and funded by the Governor’s Workforce Board Rhode Island. Following the release of Tech Collective’s 2009 “RI: At the Heart of Bioscience” skills gap report, this study provides an updated look at workforce issues influencing the industry.

Rhode Island’s bioscience employers face a skills gap. This report aims to identify talent skills gaps within the industry’s existing and potential workforce; examine how workers enter and advance within the industry; provide recommended actions to address these needs; and to raise awareness and guide investments in Rhode Island’s bioscience workforce.

In researching and compiling the report, we have incorporated local and national industry data and labor market information (LMI) as well as conducted focus groups and one-on-one interviews with Rhode Island bioscience employers. Guided by this input, a web-based survey was also distributed to collect quantitative data from employers.
In alignment with leading industry research, this report looks at the bioscience workforce from two occupational categories: 1.) occupations which are primarily science, technology, engineering, and mathematics (STEM) focused (for example: biologists, chemists, engineers, technicians, quality control specialists, and clinical researchers); and 2.) occupations which are not STEM, but are critical to the industry (for example: lawyers, facilities, marketing, and sales professionals). The employer-driven data in this report focuses on workforce needs that are primarily in the STEM occupations. Industry data and labor market information include all occupations within the industry unless otherwise noted. The focus of this report is on building Rhode Island’s bioscience workforce and sustainable pipeline. However, it is important to recognize that the industry needs to be supported across many levels, including workforce, research assets, access to capital, and infrastructure. Because an industry is successful when all of its needs are met adequately, we briefly address industry needs in the Competitive Factors section of this report.

**Defining the Biosciences**

The biosciences are not a neatly definable industry. Many activities and occupations range across traditional industrial and occupational roles, which must be identified and analyzed to comprise an industry snapshot and related data. Additionally, the industry is constantly evolving to incorporate new scientific research, discoveries, and best practices. As defined by the global organization, BIO, “the biosciences are best understood as a grouping of diverse industries with a common link—the application of biological scientific knowledge.” BIO additionally identifies five primary sectors of the bioscience industry:

- **Agricultural Feedstock and Chemicals**: involving industries, for example, that utilize advances in biochemistry and biotechnology for producing products involved in crop protection, advanced seed, agricultural processing, bio-fuels, biodegradable materials from plant-based feedstock, sustainable industrial oils, lubricants and enzymes, and bio-based catalysts for industrial processes.
- **Drugs and Pharmaceuticals**: involving industries that produce vaccines, biopharmaceuticals, and tissue and cell culture media.
- **Medical Devices and Equipment**: involving industries...
that produce a variety of biomedical products such as surgical instruments, orthopedic implants, bioimaging equipment, dental instruments, and patient care products (such as walkers, wheelchairs, and beds).

- **Research, Testing, and Medical Laboratories:** involving emerging companies working to develop and commercialize new drug discovery/delivery systems and gene and cell therapies as well as more service-oriented firms involved in pre-clinical drug development, clinical trials, and research/laboratory support services. While primarily focused on human health, these companies also include those that are focused on research and testing for agriculture and veterinary uses.

- **Bioscience-Related Distribution:** involving specialized approaches such as cold storage and highly regulated product monitoring, and new technologies for distribution such as automated pharmaceutical distribution systems. These include three detailed distribution industries: one associated with medical equipment and device distribution; another with drug distribution; and a third with agricultural-related chemicals and seed distribution.

(Source: Battelle/BIO State Bioscience Industry Development Report, 2012.)

**Rhode Island’s Bioscience Industry**

Rhode Island’s bioscience industry is largely comprised of the Drug and Pharmaceutical, Medical Device and Equipment, and the Research and Development (R&D) sectors. The highest concentration of jobs in the industry come from the Drug and Pharmaceutical sector, with companies producing chemistry-based pharmaceutical drugs, cell-based biological drugs, and generic drugs.

Rhode Island’s Medical Device sector is a long-standing strength for the region. Several companies have evolved from textiles, plastics, and metal fabrication into the bioscience market, producing treatments ranging from cell and chemical-based implants to biotextiles.

On the R&D front, Rhode Island has a substantial pipeline of small, younger companies developing therapeutics, diagnostics, or medical devices. Many are spin-offs from Rhode Island’s high concentration of hospitals and universities. At this stage, R&D companies require venture capital funding or partnerships with larger companies or organizations in order to realize the development, testing, and validation needed to bring a product to market.

The bioscience industry additionally includes the capabilities of testing laboratories and specialty suppliers that directly support product development and production. Competencies in imaging, analytical equipment, and devices overlap with specializations in Rhode Island’s defense industry. Some companies serve both the medical and defense markets, particularly in wound healing and biological defense. Agricultural bioscience and biofuel companies serve non-medical markets such as food, energy, clean water, and environmental health.

Rhode Island’s bioscience professionals are pushing the boundaries of knowledge application. Rhode Island has been successful in attracting global bioscience companies, allowing the state to both expand its workforce and build stronger regional collaboration. This is largely due to mergers and acquisitions of companies and specialized facilities initially established by Rhode Island-based scientists, engineers, and entrepreneurs. Such companies, though headquartered outside of Rhode Island, have become significant employers in the state. The ability of the state and its workforce to respond to the needs of this industry and the opportunities it presents has been and continues to be critical to enabling companies of all sizes to expand in Rhode Island.

<table>
<thead>
<tr>
<th>Growth of Bioscience Industry Occupations</th>
<th>US 5 yr Projected Growth</th>
<th>RI 5 yr Projected Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical engineers</td>
<td>31%</td>
<td>37%</td>
</tr>
<tr>
<td>Medical scientists</td>
<td>18%</td>
<td>16%</td>
</tr>
<tr>
<td>Software developers</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>Medical equipment repairers</td>
<td>16%</td>
<td>14%</td>
</tr>
<tr>
<td>Industrial production managers</td>
<td>n/a</td>
<td>7%</td>
</tr>
<tr>
<td>Biological technicians</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>Chemical technicians</td>
<td>3%</td>
<td>6%</td>
</tr>
<tr>
<td>Electrical engineering technicians</td>
<td>4%</td>
<td>6%</td>
</tr>
<tr>
<td>Chemists</td>
<td>1%</td>
<td>6%</td>
</tr>
<tr>
<td>Industrial engineers</td>
<td>2%</td>
<td>5%</td>
</tr>
<tr>
<td>Business operations specialists</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>Computer hardware engineers</td>
<td>6%</td>
<td>4%</td>
</tr>
<tr>
<td>Statisticians (including biostatisticians)</td>
<td>7%</td>
<td>2%</td>
</tr>
<tr>
<td>Mechanical engineers</td>
<td>4%</td>
<td>0%</td>
</tr>
<tr>
<td>Electronics engineers</td>
<td>2%</td>
<td>0%</td>
</tr>
</tbody>
</table>

## Rhode Island Bioscience Workforce Highlights

### Timeline

**Bioscience Industry Development**

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>Tech Collective BioGroup formed</td>
</tr>
<tr>
<td>2005</td>
<td>Rhode Island NSF EPSCoR launched</td>
</tr>
<tr>
<td>2006</td>
<td>Rhode Island Science and Technology Advisory Council (STAC) formed</td>
</tr>
<tr>
<td>2007</td>
<td>Rhode Island connects with BIO</td>
</tr>
<tr>
<td>2008</td>
<td>Tech Collective BioTuesdays launched</td>
</tr>
<tr>
<td>2009</td>
<td>At the Heart of Bioscience: Rhode Island Skills Gap Report released by Tech Collective; funded by the Governor’s Workforce Board Rhode Island (GWBRI)</td>
</tr>
<tr>
<td>2010</td>
<td>New England Biotechnology Association (NEBA) formed</td>
</tr>
<tr>
<td>2011</td>
<td>Innovate Rhode Island Small Business Fund established</td>
</tr>
<tr>
<td>2012</td>
<td>Rhode Island Bioscience Leaders formed</td>
</tr>
<tr>
<td>2013</td>
<td>Tech Collective Rhode Island Bioscience Awards launched</td>
</tr>
<tr>
<td>2013</td>
<td>MedMates formed</td>
</tr>
</tbody>
</table>

**Workforce Training Grants**

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004 – 2008</td>
<td>USDOL H-1B Biotechnology Manufacturing Grant administered by Workforce Partnership of Greater Rhode Island (WPGRI) and Tech Collective; trained workers at local bioscience companies, provided tuition assistance for students in post-secondary biotech programs (URI Biotechnology Manufacturing Certificate Program, CCRI Biotechnology Certificate Program, Brown University), and provided teacher training/supplies for RIDE Biotechnology Academies. Served 900 people in total.</td>
</tr>
<tr>
<td>2009 – 2011</td>
<td>Industry Skills Development Initiative (ISDI) funded by GWBRI; trained 94 incumbent workers at bioscience companies and connected 975 students to youth activities including industry speakers, company tours, job shadows, STEM in the Middle, and GRRL Tech.</td>
</tr>
<tr>
<td>2008 – Current</td>
<td>Industry Partnership (IP) Grants GWBRI recognizes Tech Collective as its Rhode Island Bioscience Industry Partner. From 2011-2013, trained 52 incumbent workers at bioscience companies; conducted industry development activities including forums and marketing/ awareness; and connected 1,702 students to youth activities including industry speakers, company tours, job shadows, STEM in the Middle, and GRRL Tech.</td>
</tr>
<tr>
<td>2013</td>
<td>Tech Collective Graduate Fellowship Program provides 10-12 week fellowships to recent college/university graduates at Rhode Island bioscience companies. Funded by GWBRI. In 2013, six Fellows completed the program, all became employed in the industry.</td>
</tr>
</tbody>
</table>

**1997**

Slater Technology Fund established

**Descriptions of bioscience-serving organizations can be found on pages 26-27**
K-16 Education

2013
**Bioscience Job Shadow Day**
First-ever bioscience job shadow day in Rhode Island; in partnership with Junior Achievement of Rhode Island and Tech Collective. In 2013, 30 students participated.

**SkillsUSA Rhode Island Bioscience Competition**
National organization’s first-ever student bioscience competition and first in Rhode Island; in partnership with URI Providence Biotechnology Center, Alexion Pharmaceuticals, RI NSF EPSCoR, and Tech Collective. In 2013, 30 students from seven Rhode Island high schools and career and tech centers participated.

2010
**Bioscience Educators Roundtable** formed forums hosted for high school and career and technical center bioscience educators to share best practices, resources, and approaches to introduce into the classroom; in partnership with RI NSF EPSCoR and Tech Collective.

2007
**Rhode Island Amgen Biotech Experience**
(formerly known as the Amgen-Bruce Wallace Biotechnology Lab Program) has introduced 8,000 secondary school students to contemporary science techniques through robust, hands-on, inquiry-based biology curriculum. In 2013, Amgen granted URI $174,000 for continued implementation.

**RIDE Biotechnology Academies**
Rhode Island Department of Education (RIDE) Career and Technical Education (CTE) established biotechnology programs at seven Rhode Island high schools and career and technical centers; in partnership with URI, CCRI, Brown University, WPGR, East Bay Collaborative, and Tech Collective. Included the development of a curriculum for grades 10-12 that cross-walked GSEs and combined academic knowledge, technical skills, and employability skills from bioscience and agricultural biotechnology skill standards; also included performance outcomes and assessment.

2004
**CCRI Biotechnology Certificate Program**
prepares students for entry into the biomanufacturing industry in a little under a year. Students receive hands-on instruction designed for individuals at all levels of workplace experience and education. Certificate can be used for entry into the industry and/or as a bridge to more advanced positions.

2003
**URI Biotechnology Manufacturing Program**
prepares students for employment in biomanufacturing in a 1+3 program integrated with a full-time industry internship and a Bachelor’s degree in Clinical Laboratory Science.

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**Rhode Island Outlook**

In a decade (2002-2012) in which private sector employment in Rhode Island sagged by 4%, the biosciences grew employment by 24%. Pharmaceutical manufacturing has more than doubled in ten years. Bioscience research firms have grown by 3%, and Rhode Island’s long-established medical device industry has maintained employment.

Rhode Island bioscience leaders we spoke with expressed an unanimously optimistic outlook for their companies and for the industry in the state. Ninety percent anticipate that their company will expand over the next 3-5 years. Half of company leaders expect the industry in Rhode Island to expand over that time frame, and the other half expect it move forward at approximately current employment levels. No one is anticipating decline.

The Bureau of Labor Statistics projects faster employment growth in Rhode Island than the nation for biomedical engineers, chemical technicians, electrical engineering technicians, chemists, industrial engineers, and business operations specialists (see “Growth of Bioscience Industry Occupations” chart on page 3). A rapid increase in demand for biomedical engineers is expected over the next five years both nationally (31% projected growth) and in Rhode Island (37% projected growth).

While this report will demonstrate that Rhode Island still has work to accomplish to support and grow its bioscience industry, the state has laid foundational groundwork over the past 10+ years. Workforce training funding, bioscience education pipelines, and industry development initiatives have contributed to bioscience workforce growth in Rhode Island. The “Rhode Island Bioscience Workforce Highlights” chart to the left showcases statewide investments and initiatives.

The bioscience industry and market as a whole, including in Rhode Island, is global. While there is a slice of the industry that distributes products or provides services to a regional market, the majority of Rhode Island bioscience companies designing and manufacturing new healthcare products, devices, diagnostics, or therapies are not oriented to a local market.

In such a business and talent market, Rhode Island competes for bioscience companies on agility, cost, and homegrown assets. Other indicators also point to the importance of bioscience in Rhode Island’s future. A PricewaterhouseCoopers Money Tree Survey found that more than half of the venture capital flowing to Rhode Island companies in the last five years was attracted by biotech and medical device companies (see “Venture Capital Flow to Rhode Island Companies” chart on page 2).

Similarly, much of the outlook for bioscience depends on market forces outside of Rhode Island. There are many layers of uncertainty, including how a product will perform in trials, regulatory approval, and competition in the market.
Diversity and Identification

Just as its industry is, Rhode Island’s bioscience workforce is diverse. Bioscience professionals in the industry combine their scientific knowledge with a range of additional skills such as business, manufacturing, regulatory affairs, quality assurance, and communications.

Throughout this report, we identify STEM occupations held within the industry as well as roles which are not primarily STEM-focused, but are essential to the operations of a bioscience company. They include transportation, logistics, maintenance, production, and business operations professionals.

While overall knowledge of the industry is critical across the biosciences as a whole, each sector requires varying skill sets from its workers. For example, an R&D lab might focus heavily on biological skill sets whereas a medical device company would need strength in engineering talent and a pharmaceutical manufacturer would employ production and facilities/maintenance workers.

The various stages of company growth across all industry sectors additionally impacts the skill sets required. Startup companies in the idea stage are often spinoffs from college and university or hospital research. Founders range from young entrepreneurs pursuing a medical device design to senior-level professionals who want to bring a treatment to market. Companies at this stage require a workforce of only a few highly skilled and dedicated individuals. As companies grow in size and stages, so do their workforce needs (see “Workforce Stages” chart below).

Hiring

Employers look to find and retain employees who offer scientific as well as business/operations skill sets. In a highly regulated and complex industry, interdisciplinary knowledge and expertise can be a factor in whether a company achieves success and growth or it does not.

Every respondent to Tech Collective’s Employer Survey indicated that the “Lack of skilled workers/candidates to hire” is the biggest workforce challenge at their company. Competition with other companies to hire qualified workers and retaining skilled workers were also concerns for 40% of companies.

Across the industry at the entry-level, biologist and biological technician roles were cited by employers as “easy” to fill. Biomedical engineers, chemical engineers, and computer scientists were noted as “marginal” positions to fill (in which the time it took to fill an open position was longer than ideal).

At the mid-level, employers identified chemical engineer and mechanical engineer positions as “difficult” to fill. Regulatory affairs specialists were challenging positions to fill at both the entry (“marginal” to fill) and mid (“difficult” to fill) levels.

Employers also noted they are continuously recruiting for one or more positions including:
- Formulation specialists
### Examples of Jobs by Minimum Education Level for Entry

<table>
<thead>
<tr>
<th>High School + OJT</th>
<th>Associate's Degree</th>
<th>Bachelor's Degree</th>
<th>Graduate Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drugs &amp; Pharmaceuticals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance &amp; repair workers</td>
<td>Computer user support</td>
<td>Industrial engineers</td>
<td>Medical scientists</td>
</tr>
<tr>
<td>Glass washers</td>
<td>Electronics engineering technicians</td>
<td>Medical lab technologists</td>
<td>Biostatisticians</td>
</tr>
<tr>
<td>Cleaning services</td>
<td>Operations managers</td>
<td>Chemists</td>
<td></td>
</tr>
<tr>
<td>Administrative services</td>
<td>Industrial engineering technicians</td>
<td>Materials scientists</td>
<td></td>
</tr>
<tr>
<td>Shippers/receivers</td>
<td>Medical equipment repairers</td>
<td>Industrial production managers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality control analysts</td>
<td>Industrial safety &amp; health engineers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medical equipment repairers</td>
<td>Quality control systems managers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality assurance testers</td>
<td>Biostatisticians</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Biological technicians</td>
<td>Biostatisticians</td>
<td></td>
</tr>
<tr>
<td><strong>Medical Devices</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock clerks</td>
<td>Customer service reps</td>
<td>Industrial engineers</td>
<td>Medical scientists</td>
</tr>
<tr>
<td>Maintenance &amp; repair workers</td>
<td>Computer support specialists</td>
<td>Medical engineers</td>
<td>Physicians, surgeons</td>
</tr>
<tr>
<td>Machinists</td>
<td>Electronics engineering technicians</td>
<td>Electrical engineers</td>
<td>Lawyers</td>
</tr>
<tr>
<td>Molding machine operators</td>
<td>Operations managers</td>
<td>Quality control systems managers</td>
<td>Clinical data managers</td>
</tr>
<tr>
<td>Assemblers</td>
<td>Industrial engineering technicians</td>
<td>Industrial production manager</td>
<td>Biostatisticians</td>
</tr>
<tr>
<td>Inspectors, testers</td>
<td>Medical equipment repairers</td>
<td>Biomedical engineers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality control analysts</td>
<td>Human factors engineers</td>
<td></td>
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<tr>
<td></td>
<td>Medical equipment repairers</td>
<td>Quality assurance engineers</td>
<td></td>
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<tr>
<td></td>
<td>IT project managers</td>
<td>Chemists</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chemical technicians</td>
<td>Microbiologists</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mechanical engineering technicians</td>
<td>Registered nurses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental &amp; health safety technicians</td>
<td>Clinical research coordinators</td>
<td></td>
</tr>
<tr>
<td><strong>Bioscience Distribution</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspectors, testers</td>
<td>Administrative support</td>
<td>Market research analysts</td>
<td>Medical scientists</td>
</tr>
<tr>
<td>Shippers/receivers</td>
<td></td>
<td>Marketing managers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engineers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Registered nurses</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technical sales reps</td>
<td></td>
</tr>
</tbody>
</table>

Source: Community Economic Futures. Complied using BLS OES state data and national industry-occupational matrix, O*NET job zones, employer interviews, and job postings from Rhode Island bioscience employers
• Chemists
• Research and development scientists and engineers
• Process safety, control, and quality assurance engineers
• Manufacturing, mechanical, and industrial engineers
• Regulatory affairs specialists
• Research study coordinators

**Technical and Professional Skills**

Looking at the industry as a whole, all facets of a bioscience company are factors to its success. Likewise, all employees need to understand the intricacies of working in a highly regulated environment. From biologists and laboratory technicians to marketers and lawyers, employees who understand and apply basic bioscience knowledge to their job are valued by employers.

Across bioscience sectors, when asked to reflect upon positions they have recently hired for, employers shared perceived gaps both in technical and professional skills.

**Technical Skills**

Skills gaps were cited in regulatory compliance, quality assurance/control, research, Good Manufacturing Practice (GMP), Good Clinical Practice (GCP), and Good Laboratory Practice (GLP). Gaps exist at both the entry and mid levels, but were more prevalent at the entry-level. GMP was noted as a “minimal” skill gap at the mid-level by half of survey respondents. At both the entry and mid levels, technical writing/documentation was the most critical skill gap.

**Professional Skills**

Skills gaps at the entry and mid levels were cited in critical thinking/problem solving, ability to work independently, communication (written and verbal), teamwork, leadership, cultural awareness, project management, time management, and openness to career transitions and acquiring cross-functional skills. At the entry-level, employers cited a critical need for leadership and project management and a minimal skills gap in teamwork.

Although talent needs vary across industry sectors and company size, skill needs which permeated throughout the majority of industry sectors are compiled below:

**Technical Writing:** Technical writing and documentation is a foundational requirement of the industry. Equally important to the lab work done by bioscience companies is their ability to complete industry-accepted documentation.

**Critical Thinking:** Employers need workers who are critical thinkers and problem solvers. This includes performing procedures as well as understanding the “why” and “how” of them in relation to their overall context and goals.

**Regulatory Awareness:** Employers expressed their challenge in this area on two fronts: 1.) everyone in the company needs to understand the intricacies of working in a regulated environment; and 2.) finding regulatory professionals is challenging because this skill set often comes from experience and training on the job.

**Quality and Best Practices:** The highest quality and precision standards are expected throughout all bioscience industry operations. GMP, GCP, and GLP are looked to as industry-accepted best practices for reduced variability, carefully controlled parameters, and repeatable results.

**Project Management and Communication:** Employees need to be able to coordinate between project teams and clearly communicate with external clients as well as internally. Employers value employees who are able to communicate high-level scientific and technical knowledge across the business objectives.

**Leadership:** Employers are looking for leaders in all positions and levels throughout their companies.

**Compensation and Recruiting in a Regional Context**

Pay scales in the bioscience industry almost all exceed the average private sector wage in Rhode Island. The “Pay Ranges for Occupations Important to the Bioscience Industry” table on the right illustrates entry, median, and experienced level wages for key industry occupations. (Note: this occupational data encompasses employment in all industries, not just the bioscience industry.)

Chemical technicians, chemists, industrial engineers, and medical scientists experienced the strongest wage growth in the last five years across all levels. In addition, experienced industrial designers saw high wage growth.

Regionally, Rhode Island both draws strengths and challenges from its close proximity to established bioscience hubs in Connecticut and the Boston-Cambridge Metro. Rhode Island benefits from its ability to draw on these regional resources, including access to talent. Several large Rhode Island bioscience employers report that more than half their employees commute daily from Massachusetts or Connecticut.

On the contrary, employers also note losing Rhode Island talent going to work elsewhere in the region. Challenges also arise in that employers feel they must match Boston-area salaries to attract and retain some employees, particularly when hiring for senior-level positions.
## Pay Ranges for Occupations Important to the Bioscience Industry*

*Median, 25th and 75th Percentile Pay, Rhode Island, 2012*

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Entry-Level Pay</th>
<th>Median Pay</th>
<th>Experienced Pay</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engineers &amp; Designers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronics Engineers, Except Computer</td>
<td>95,120</td>
<td>112,510</td>
<td>116,290</td>
</tr>
<tr>
<td>Computer Hardware Engineers</td>
<td>75,330</td>
<td>100,730</td>
<td>115,810</td>
</tr>
<tr>
<td>Electrical Engineers</td>
<td>81,120</td>
<td>99,370</td>
<td>114,910</td>
</tr>
<tr>
<td>Other Engineers, includes Biochemical engineers</td>
<td>74,550</td>
<td>97,180</td>
<td>123,440</td>
</tr>
<tr>
<td>Industrial Production Managers</td>
<td>81,740</td>
<td>93,840</td>
<td>118,590</td>
</tr>
<tr>
<td>Software Developers, Applications</td>
<td>75,380</td>
<td>93,150</td>
<td>113,840</td>
</tr>
<tr>
<td>Biomedical Engineers</td>
<td>75,220</td>
<td>90,970</td>
<td>110,790</td>
</tr>
<tr>
<td>Mechanical Engineers</td>
<td>72,140</td>
<td>90,840</td>
<td>112,280</td>
</tr>
<tr>
<td>Industrial Engineers</td>
<td>66,510</td>
<td>81,010</td>
<td>93,890</td>
</tr>
<tr>
<td>Commercial and Industrial Designers</td>
<td>42,750</td>
<td>52,510</td>
<td>72,040</td>
</tr>
<tr>
<td><strong>Scientists</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological Scientists, All Other</td>
<td>65,010</td>
<td>80,850</td>
<td>90,850</td>
</tr>
<tr>
<td>Chemists</td>
<td>58,850</td>
<td>74,560</td>
<td>104,090</td>
</tr>
<tr>
<td>Medical Scientists (excluding physicians)</td>
<td>52,090</td>
<td>72,230</td>
<td>98,850</td>
</tr>
<tr>
<td>Statisticians (Including Biostatisticians)</td>
<td>62,150</td>
<td>72,050</td>
<td>84,300</td>
</tr>
<tr>
<td><strong>Technicians &amp; Production Occupations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronics Engineering Technicians</td>
<td>44,270</td>
<td>61,070</td>
<td>75,020</td>
</tr>
<tr>
<td>Mechanical Engineering Technicians</td>
<td>43,870</td>
<td>52,450</td>
<td>60,400</td>
</tr>
<tr>
<td>Life Scientists, All Other</td>
<td>37,720</td>
<td>47,130</td>
<td>65,900</td>
</tr>
<tr>
<td>Medical Equipment Repairers</td>
<td>32,250</td>
<td>44,100</td>
<td>61,140</td>
</tr>
<tr>
<td>Chemical Technicians</td>
<td>35,220</td>
<td>42,600</td>
<td>51,900</td>
</tr>
<tr>
<td>Chemical Equipment Operators and Tenders</td>
<td>31,060</td>
<td>36,780</td>
<td>44,310</td>
</tr>
<tr>
<td>Biological Technicians</td>
<td>30,080</td>
<td>36,140</td>
<td>46,790</td>
</tr>
<tr>
<td>Medical Appliance Technicians</td>
<td>30,200</td>
<td>34,380</td>
<td>38,340</td>
</tr>
<tr>
<td>Inspectors, Testers, Sorters, Samplers, and Weighers</td>
<td>24,630</td>
<td>32,050</td>
<td>40,020</td>
</tr>
<tr>
<td><strong>Business Administration</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Database Administrators</td>
<td>61,210</td>
<td>82,200</td>
<td>99,130</td>
</tr>
<tr>
<td>Logisticians</td>
<td>57,050</td>
<td>70,460</td>
<td>87,650</td>
</tr>
<tr>
<td>Financial Analysts</td>
<td>56,610</td>
<td>70,010</td>
<td>87,040</td>
</tr>
<tr>
<td>Business Operations Specialists, All Other</td>
<td>53,630</td>
<td>67,270</td>
<td>83,210</td>
</tr>
<tr>
<td>Training and Development Specialists</td>
<td>51,440</td>
<td>64,230</td>
<td>75,910</td>
</tr>
<tr>
<td>Purchasing Agents</td>
<td>50,500</td>
<td>61,450</td>
<td>76,750</td>
</tr>
<tr>
<td><strong>RHODE ISLAND, ALL OCCUPATIONS</strong></td>
<td>24,120</td>
<td>37,360</td>
<td>61,040</td>
</tr>
</tbody>
</table>


* Occupational data is from all industries in Rhode Island, separate breakouts are not available for occupation by industry at the state level.
Skills Gaps in the Entry and Mid-Level Workforce, Ranked by Bioscience Employers, Rhode Island

Reflecting upon the entry and mid-level positions you have recently hired, what skills gaps have you perceived in the applicant pool?

<table>
<thead>
<tr>
<th>Skill</th>
<th>Entry-Level Jobs (1-3 years experience)</th>
<th>Mid-Level Jobs (not less than 3 years experience)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Management</td>
<td>70%</td>
<td>20%</td>
</tr>
<tr>
<td>Leadership</td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>Time Management</td>
<td>44%</td>
<td>30%</td>
</tr>
<tr>
<td>Critical thinking / problem solving</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>Ability to work independently / self-starter</td>
<td>30%</td>
<td>20%</td>
</tr>
<tr>
<td>Communication skills (verbal and written)</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Openness to career transitions and acquiring cross-functional skills</td>
<td>20%</td>
<td>0%</td>
</tr>
<tr>
<td>Cultural awareness</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td>Teamwork</td>
<td>10%</td>
<td>10%</td>
</tr>
</tbody>
</table>

What industry-specific technical skills gaps have you perceived in the applicant pool?

<table>
<thead>
<tr>
<th>Skill</th>
<th>Entry-Level Jobs</th>
<th>Mid-Level Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCP (Good Clinical Practice)</td>
<td>75%</td>
<td>75%</td>
</tr>
<tr>
<td>GLP (Good Laboratory Practice)</td>
<td>43%</td>
<td>50%</td>
</tr>
<tr>
<td>GMP (Good Manufacturing Practice)</td>
<td>25%</td>
<td>17%</td>
</tr>
<tr>
<td>Quality assurance / control</td>
<td>38%</td>
<td>25%</td>
</tr>
<tr>
<td>Regulatory compliance</td>
<td>29%</td>
<td>25%</td>
</tr>
<tr>
<td>Research Skills</td>
<td>29%</td>
<td>29%</td>
</tr>
<tr>
<td>Technical writing / documentation</td>
<td>50%</td>
<td>38%</td>
</tr>
</tbody>
</table>

**Education is Highly Valued**

Entry into the bioscience workforce most often requires an Associate’s or Bachelor’s degree. Employers are also receptive to graduates of established industry certificate programs, such as the University of Rhode Island’s Biotechnology Manufacturing Program or the Community College of Rhode Island’s Biotechnology Certificate Program.

Advancement within the industry demands recognized certifications and graduate or professional degrees. Students can rarely enter the industry out of high school due to training/skills and sometimes legal requirements. Professionals from other occupations can rarely take a short-term training program and transfer into the industry. Due to the specialized nature of the industry, skill sets are not always easily transferrable even between bioscience industry sectors. The “Education Attainment by Occupation, Rhode Island” chart on page 12 demonstrates the high educational attainment of bioscience industry professionals as a whole.

In some respects, the need to focus on highly trained, specialized skill sets has created a slower moving workforce pipeline when compared to other industries. Employers are challenged to find the talent they need to bring their products and companies to the next level. Compounding this challenge is that Rhode Island does not have a large enough need or demand to create customized training or degree programs. While a bioinformatician or a biomedical equipment technician (BMET) might be critical to the operations of a company, creating a program to serve the need for a half-dozen specialists a year is not feasible in cost or resources. Employers understand this and work to utilize the resources they do have in existing education programs, experiential learning, and professional development and training.

**Bioscience Education/Entry**

Employers reported students graduating from Rhode Island colleges and universities are equipped to enter the workforce with strong bench skills and foundational knowledge in the biosciences. Students entering the bioscience workforce are doing so with degrees including biology, chemistry, engineering, industrial design, computer science, and mathematics and statistics. Employers noted strength in students entering the workforce in biological research assistant roles, citing strong local programs in these areas. Business management, healthcare management, entrepreneurship, engineering, and statistics.

**Job Opportunities**

- Research Associates
- Biological and Chemical Technicians
- Biomanufacturing Production Technicians
- Biological Scientists

- Electronic Engineers and Technicians
- Process Control Engineers and Technicians
- Industrial Engineers
- Biomedical Engineers
- Chemical Engineers
- Medical Device Technicians

- Industrial Designers

- Statisticians

- Computer Hardware Engineers
- Software Developers
and regulatory affairs are also study areas. (See “Higher Education Aligned with Bioscience Careers” on page 17 and “Certificates and Degrees Granted, Rhode Island, 2012” on page 18.)

At the entry level, workers must have proficiency with the common tools of the trade, such as running gels, basic assays, and pipetting. For research associates and biological technicians, employers are frequently looking for knowledge of biochemistry, cell biology, molecular biologics, formulation, analytical science, or analytical validation.

For mechanical and industrial engineers and technicians, medical equipment and technology are often married together. Companies need workers with no fear of taking apart machines, working with CAD, using small level calipers, and completing documentation. Other relevant skill areas are electrical, pumps, piping, blowers, and instrumentation.

For all workers, an aptitude for problem-solving and critical thinking is highly valued by employers. The learning curve appears for entry-level professionals when they must think and act independently, when lab conditions are not optimized as they might be in a post-secondary course lab, and when their study knowledge must be turned into practical applications and solutions. Employers value employees who have a deep understanding of the processes and techniques which allow them to interpret results, figure out when things are not working, and troubleshoot the problem. The first 3-6 months on the job can be largely dedicated to building that comfort level and knowledge-base for graduates entering the workforce.

Internships and Experiential Learning

One of the most important vehicles to bridge bioscience education with real-world experience is through internships and experiential learning. Bioscience employers have been responsive to requests to provide these learning opportunities for students across the education pipeline. The majority of interns come from local colleges and universities. Even still, finding sufficient internship placements remains a challenge.

The size of Rhode Island’s bioscience industry limits its capacity to host experiential learning opportunities. Larger companies have more capacity, but some do not have internship programs or interns are recruited nationally, not only from the Rhode Island or local region. For smaller companies, hosting interns can be a strain on operations. Funding to host or pay interns can be challenging; as can having the human capital necessary to successfully manage interns. As an industry overall, Rhode Island’s smaller bioscience companies host proportionately more interns. Many employers were passionate about the importance of mentoring and growing the incoming workforce.

In 2013, the Rhode Island General Assembly created the Innovate Rhode Island Small Business Fund. One component of the initiative is to grow the state’s talent pipeline through its Internship Grant program. Rhode Island bioscience and engineering companies may apply for funding to offset the costs of paid internships for Rhode Island students. For FY 2014, $500,000 has been allocated to the Internship Grant program.

Professional Development: Training Methods and Priorities

Bioscience professionals need to advance their bioscience knowledge and also develop their ability to navigate the regulatory, legal, product-to-market, and business operations environments. Access to technical, scientific, and business training opportunities are critical to success.

Employers across the bioscience industry universally invest in employee training. Two of the most utilized professional development channels are in-house training.
and outside training by colleges/universities and private training providers.

Because the industry is highly driven by intellectual property and specialized techniques and procedures, hosting and delivering training with in-house resources is vital to company operations. Larger employers are systematic about workforce training and advancement, while smaller companies lack the economies of scale. Employers voiced their need for increased support and funding of in-house or customized training related to the company’s needs, programs and processes.

Outside training delivered by colleges/universities and private training providers allow employees to ensure and advance current skill sets through industry-valued professional certifications and degrees. Examples of industry certifications are identified in the “Certifications of Value to Bioscience Employers” chart below.

Industry-related conferences and professional meetings are valued by employers as opportunities to learn about and share general industry advancements and best practices as well as network and collaborate with industry peers. Particularly for smaller companies, being able to connect with new resources and opportunities is important to growing company reach and investment.

In identifying training priorities, bioscience companies indicate that they train in techniques, procedures, safety, and technology use. All employers cited training employees on user-training specific to company equipment. Other top categories were workplace safety, hazmat, environmental regulations/compliance; user-training specific to company’s software tools; and cGLP, cGMP, and/or cGCP. (See “Training Priorities” chart on page 14.)

When asked to identify top training priorities in the next 1-2 years, needs included development of technical skills as well as professional skills. Examples provided were:

**Technical Skills**
- Statistical analysis and process control
- Biomedical equipment technicians (BMETs)
- High-performance liquid chromatography (HPLC)
- Anatomy
- Regulatory compliance
- Investigational New Drug (IND) FDA regulations
- Licensing negotiation
- Field sales
- Operations and logistics
- Database management

**Professional Skills**
- Leadership
- Management effectiveness
- Problem solving

Training which employers do not offer, but believe would have value include executive/business operations training, communications, project management, and statistics training. Employers also suggested a “Bioscience 101” training for non-bioscience professionals in the company would be of benefit.

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**Certifications of Value to Bioscience Employers**

*Ranked by frequency of mention by employers*

- OSHA training certification
- Quality engineering certification (ASQ)
- Certified pharmaceutical GMP professional (ASQ)
- Certified biomedical equipment technician (BMET)
- Certified clinical engineer (CCE)
- Electronic technology certification
- Regulatory affairs certification (RAC)
- Project management professional
- Professional engineer
- ASCP Board Certification of medical laboratory professionals

---

**How Does Your Company Offer Employee Training?**

<table>
<thead>
<tr>
<th>Training Offered</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>We do not currently offer employee training</td>
<td>0%</td>
</tr>
<tr>
<td>We offer individuals tuition reimbursement for approved courses</td>
<td>50%</td>
</tr>
<tr>
<td>We pay for training sessions with outside trainers</td>
<td>80%</td>
</tr>
<tr>
<td>We pay for industry-related conferences or professional meetings</td>
<td>90%</td>
</tr>
<tr>
<td>We offer courses/workshops with in-house trainers</td>
<td>90%</td>
</tr>
</tbody>
</table>

In addressing the regulatory affairs skills gap, several employers expressed a desire for Rhode Island’s post-secondary institutions to develop accessible MS degree programs in regulatory affairs for drugs, pharmaceuticals, and medical devices with a part-time and online option to enable full-time employees to attend. Programs are offered in the Greater Boston region at Northeastern University and the Massachusetts College of Pharmacy and Health Sciences. Roger Williams University is creating a 4+1 Bachelor’s and Master’s degree program which includes regulatory affairs studies and is anticipated to start in the fall of 2014. There is also enthusiasm for Brown University’s Executive Master of Healthcare Leadership program.

**Moving from the Entry to Mid Level**
Rhode Island’s investments in educating an entry-level workforce have been well received and enabled the overall growth of bioscience employment in Rhode Island. At the moment, Rhode Island employers have a consistent demand for entry-level bioscience workers. Although there is an overlap of technical and professional skills needs, employers expressed a barrier in advancing successful entry level workers to the mid-level.

The gap between roles does not always reflect a lack of technical ability, but more often, the ability to operate across company functions and support the business as a whole. Resourcefulness, critical thinking, leadership, and entrepreneurial thinking were also cited as necessary abilities at the mid-level. In larger companies, there can be opportunity for employees to advance within a company through gradually increased roles of responsibility. In smaller companies, employees, particularly at the mid and senior levels, wear many diverse hats and need to be able to perform effectively in them.

**Training Priorities**
"What types of training do you currently offer?"

- Currently offer or have offered in the last 12 months
- Not offering, but this would be valuable to offer

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STEM Engagement

STEM education is the foundation for success in a 21st century world and its workforce. Early interest and engagement have been identified as key factors in students’ decisions to pursue higher education and career opportunities in the STEM fields. More and more, these fundamentals are being incorporated into K-12 education and youth programs, most importantly at the middle and high school levels. For girls, breaking down gender barriers and myths are also priorities which have led to increased female participation in the industry over past years.

Youth education opportunities available to Rhode Island students are identified in the “School Bioscience Programs” chart below. These programs connect school curriculum to industry learning and experience through industry tours, hands-on workshops, interaction with industry role models, and demonstration of learned skills.

High School / K-12 Bioscience Education

Biology has been part of the standard high school curriculum since the science course sequence was standardized in 1893 and is taught in every high school. The challenge in biology is to make students aware of the diversity of career tracks applying biological concepts in health, energy, and food markets. Biology curriculums do not necessarily include bioscience course work or provide foundational exposure to wet lab techniques, analytical skills, and documentation practices required of occupations within the industry.

Rhode Island has seven high schools and career and tech centers with Bioscience Academies or programs. Others provide students with an introduction to bioscience techniques and concepts through individual courses or integration into science curriculums.

School Bioscience Programs, Grades 6-12, Rhode Island, 2013

<table>
<thead>
<tr>
<th>High Schools with Bioscience Academies / Programs</th>
<th>Integrated or After-School Programs</th>
<th>Statewide Events / Workshops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burrillville High School: 10 students</td>
<td>Industry Tours (facilitated by Tech Collective): 8 tours, 171 students</td>
<td>Bioscience Job Shadow Day (Junior Achievement of Rhode Island and Tech Collective): 30 participants</td>
</tr>
<tr>
<td>Coventry Area Career and Tech Center: 48 students</td>
<td>Industry Speakers (facilitated by Tech Collective): 4 speaking engagements, 134 students</td>
<td>Chemistry Camp, Computer Camp, and Summer Engineering Academy (Universiy of Rhode Island)</td>
</tr>
<tr>
<td>Davies Career and Tech High School: 43 students</td>
<td>Rhode Island Amgen Biotech Experience (implemented with University of Rhode Island and Rhode Island secondary schools)</td>
<td>Community College of Rhode Island Kids’ College: 230 students age 8-14</td>
</tr>
<tr>
<td>Juanita Sanchez Complex: 30 students</td>
<td>SkillsUSA Rhode Island Bioscience Competition (with Tech Collective and the University of Rhode Island Providence Biotechnology Center): 30 students participated in 2013 inaugural event</td>
<td>GRRL Tech Interactive Technology Expo (Tech Collective): 500 students from 30 schools</td>
</tr>
<tr>
<td>Mt. Hope High School</td>
<td>SMILE Program (University of Rhode Island)</td>
<td>Introduce a Girl to Engineering Day (Ximedica): 35 girls</td>
</tr>
<tr>
<td>Ponaganset High School: STEM Academy, established 2013</td>
<td>Chemistry Camp, Computer Camp, and Summer Engineering Academy (Universiy of Rhode Island)</td>
<td>Marine Biology Workshops (RI NSF EPSCoR / URI Graduate School of Oceanography): 99 students</td>
</tr>
<tr>
<td>Warwick Veterans High School: 17 students</td>
<td></td>
<td>Starship Poseidon (Naval Undersea Warfare College): 24 high school students</td>
</tr>
<tr>
<td>Woonsocket Area Career and Tech Center: 39 students</td>
<td></td>
<td>STEM in the Middle (Tech Collective): 90 students from 3 schools</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AP Biology Exams: Ecology - 139 students Molecular - 201 students</th>
</tr>
</thead>
</table>
The Rhode Island Department of Education (RIDE) supports articulation agreements between high schools and area colleges. In meeting the requirements of Rhode Island state categorical funding for career and technical education, instructors are required to implement a program curriculum in which students will earn industry-recognized certifications or credentials. In 2013, RIDE allocated $3 million in categorical funding to high-cost and innovative career and technical education programs.

In April 2013, the Next Generation Science Standards (NGSS) were released. Led by RIDE, Rhode Island was one of 26 states to lead the development of the standards with science community, education, and industry stakeholders. On May 23, 2013, Rhode Island became the first state to adopt the NGSS. Created with fidelity to the Framework for K-12 Science Education, the NGSS are “designed to actively engage students in scientific and engineering practices by applying crosscutting concepts to deepen their understanding of the core ideas in science” (www.ride.ri.gov). Areas of study include life science, earth and space, physical science, and engineering and technology.

Support available to K-12 science educators include the Rhode Island Science Teachers Association, Tech Collective’s Bioscience Educators Roundtable, the Rhode Island STEM Center at Rhode Island College, Rhode Island NSF EPSCoR, and programs at Rhode Island colleges and universities. These initiatives provide professional development, industry connection, and access to curriculum, technology, and lab equipment.

As bioscience education continues to grow in reach and participation, 2013 welcomed two firsts for exposing students to the bioscience industry. In February, the Rhode Island chapter of SkillsUSA hosted the national organization’s first-ever student bioscience laboratory skills competition in partnership with the URI Providence Biotechnology Center and Tech Collective. In December, Junior Achievement of Rhode Island and Tech Collective hosted the state’s first-ever Bioscience Job Shadow Day at industry-leading medical device company, Davol, Inc., a wholly-owned subsidiary of C.R. Bard, Inc.

**Post-Secondary Education**

Rhode Island’s education and workforce investments supporting the bioscience industry are paying off. Industry leaders recognize the efforts area colleges and universities have made to connect to the industry and be responsive with curriculum. There is an expectation that bioscience leaders have a responsibility to engage with post-secondary education, participate in an advisory capacity, and hire student interns. Reciprocally, companies have access to a pipeline of graduates with industry-relevant entry-level skills and knowledge.

Broadly, biology majors have high rates of employment and 9% higher earnings than the average college graduate. Outcomes for graduates in engineering, computer science, and physical science are even greater.

Rhode Island has seen growth in degrees and certificates granted related to bioscience in the last ten years. Degrees in biostatistics, biotechnology, chemistry, and in biological, medical, and chemical technicians have increased in recent years (see “Growth in Select Degrees Linked to Bioscience Careers, Rhode Island” chart below. Degrees available at the Associate’s level are in engineering technologies and laboratory technologies, as well as general STEM studies for transfer to a four year institution.

**Growth in Select Degrees and Certificates Linked to Bioscience Careers, Rhode Island**

<table>
<thead>
<tr>
<th>Year</th>
<th>General Biology</th>
<th>Chemistry</th>
<th>Biomedical &amp; Chemical Engineering</th>
<th>Biomedical, Chemical, Clinical/ Medical Laboratory Technology</th>
<th>Biotechnology</th>
<th>Biostatistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>22</td>
<td>14</td>
<td>55</td>
<td>80</td>
<td>117</td>
<td>+650</td>
</tr>
<tr>
<td>2003</td>
<td>24</td>
<td>16</td>
<td>57</td>
<td>78</td>
<td>113</td>
<td>+650</td>
</tr>
<tr>
<td>2004</td>
<td>28</td>
<td>19</td>
<td>61</td>
<td>82</td>
<td>117</td>
<td>+650</td>
</tr>
<tr>
<td>2005</td>
<td>30</td>
<td>22</td>
<td>65</td>
<td>90</td>
<td>120</td>
<td>+650</td>
</tr>
<tr>
<td>2006</td>
<td>32</td>
<td>24</td>
<td>68</td>
<td>92</td>
<td>123</td>
<td>+650</td>
</tr>
<tr>
<td>2007</td>
<td>34</td>
<td>26</td>
<td>71</td>
<td>95</td>
<td>125</td>
<td>+650</td>
</tr>
<tr>
<td>2008</td>
<td>36</td>
<td>28</td>
<td>74</td>
<td>98</td>
<td>127</td>
<td>+650</td>
</tr>
<tr>
<td>2009</td>
<td>38</td>
<td>30</td>
<td>77</td>
<td>100</td>
<td>129</td>
<td>+650</td>
</tr>
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<td>108</td>
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<td>+650</td>
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Higher Education Aligned with Bioscience Careers

University of Rhode Island (URI) Providence Biotechnology Center – The URI Providence Biotechnology Center is a collaboration of the College of Continuing Education (Graduate Professional Center) and the College of the Environment and Life Sciences (Department of Cell and Molecular Biology). It is the hub for biotechnology programs at the undergraduate and graduate levels, as well as the Institute for Immunology and Informatics, and K-12 and industry training.

URI Biotechnology Manufacturing Program prepares biomanufacturing professionals for the rapidly growing biopharmaceutical industry in the region. Structured in a 1+3 format. First year is a full-time day program with intensive training in biology, biochemistry, chemistry, microbiology, human physiology, biotechnology, biomanufacturing, and professional topics. This is followed by a full-time internship at a life sciences company. Upon completion, the student is eligible for employment and can complete the degree on a part-time basis (BS in Clinical Laboratory Science) Graduates are well prepared for employment in other life sciences specialties such as research and development, clinical affairs, process development, and quality assurance/control.

BS/ MS Biotechnology, Microbiology, Medical Laboratory Science
BS Clinical Laboratory Science (Biotechnology/ Biomanufacturing Option)
MS Cytotechnology Program

Community College of Rhode Island, Biotechnology Certificate Program – This program designed with input from local employers prepares students for entry into the biomanufacturing industry in a little under a year, with an emphasis on the knowledge and skills necessary to succeed in this emerging field. Students receive hands-on instruction designed for individuals at all levels of workplace experience and education. Students earning the certificate will be qualified for many entry level positions, and those with prior experience and/or education can use the certificate as a bridge to more advanced positions.

Brown University – BS/MS/PhD Human Biology, Neuroscience, Pathology, Epidemiology, Molecular Biology, Cell Biology, Biochemistry, Biophysics, Molecular Microbiology and Immunology, Molecular Pharmacology, Physiology, and Biotechnology, MD School of Medicine.

Roger Williams University – Biotechnology Certificate Program open to Biology, Marine Biology, Chemistry, and Environmental Sciences students. This program emphasizes developing critical thinking with biotechnology skills for a more competitive workforce.

Bryant University – BS in Biology with minor in biotechnology

Most Colleges and Universities – General Biological Sciences

Brown University - Sc.M. Biostatistics, undergraduate Public Health minor in Statistics (School of Public Health), Sci. M./PhD Computational Molecular Biology.

Brown and URI - BS Bioengineering, Biomedical Engineering

Brown University - BS Chemical and Biochemical Engineering, Program in Innovation and Entrepreneurship Engineering (PRIME).

New England Institute of Technology – AS/BS Electrical and Mechanical Engineering Technology

Rhode Island School of Design (RISD) - BA/Masters Industrial Design

Brown University - Executive Masters of Healthcare Leadership (16 month blended)

Bryant University - MBA specialized in healthcare management

URI - MBA options include Interdisciplinary 4 + 1 BS in Industrial and Systems Engineering-MBA and Doctor of Pharmacy -MBA, and part-time URI MBA@PFIZER.
or program of study. Relevant to the medical device sector, there have been declines in degrees related to electrical, computer, and hardware engineering.

As a share of degrees granted, Rhode Island has a relatively strong higher education pipeline in biological and chemical engineering and in biological, chemical, and medical technicians. Biologists with specialties and technical skills relevant to the local bioscience industry are in high demand. Student exposure to and study in a range of biology career options and required skill sets is important. Bioscience certificate and degree programs report recruiting students is highly dependent upon raising their awareness of industry careers and opportunities.

Rhode Island falls short of the region in the number of graduates of industrial engineering and other engineering areas relevant to medical devices. Employers spoke positively about the technical and communication skills of engineering graduates from Brown University and the University of Rhode Island, noting they would like to see an increase of students in these programs.

Bioinformatics was identified as an emerging need. In the last three years, 41 students graduated with bioinformatics or biostatistics degrees in Rhode Island. It is hard to find individuals who combine programming, statistics, or analysis with knowledge of biology concepts. Analytics with images is another application for informatics.

**Diversity**

As Rhode Island is experiencing growth of Black and Latino populations, diversity continues to play a role in the workforce. The bioscience higher education pipeline demonstrates high participation by women and growing participation by Asian, Black, and Latino students.

Asian students are earning 10% of the certificates and degrees aligned with the bioscience industry – double their proportional share. Temporary residents (foreign students) earned 11%. Industrial design and medicine are the two disciplines that stand out for highest minority and high female representation in the degree pipeline.

Overall, in biological and biomedical sciences, women earn the majority of degrees – 64% of Bachelor’s degrees in 2012. Women’s participation is lower in the technical fields aligned with medical devices, including engineering technology, industrial engineering, and computer science. Within engineering, women earn a greater share of degrees in biochemical and biomedical engineering than other specialties.

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### Certificates and Degrees Granted, Rhode Island, 2012

<table>
<thead>
<tr>
<th></th>
<th>Certificates</th>
<th>Associate Degrees</th>
<th>Bachelor’s Degrees</th>
<th>Graduate Degrees</th>
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<td>-</td>
<td>147</td>
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<td>Brown, URI, PC</td>
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</table>

National Center for Education Statistics. 2012. IPEDS Completions Survey. Data not available on management programs related to the bioscience industry.
Competitive Factors

An Innovation Ecosystem

While this study focuses on workforce skill needs, it is important to recognize that the foundations for future bioscience industry growth in Rhode Island include strong basic and clinical biomedical research, specialized facilities, and access to capital. BIO/Battelle emphasize that the strength of the bioscience industry is built from “the bottom up” and that bioscience industry development is a shared national, state, and local responsibility.

During our conversations with Rhode Island bioscience employers, many shared insights and concerns about competitive factors pertaining to the industry. A brief overview has been provided below. Workforce development investments are having an impact as part of total investments in the bioscience innovation ecosystem.

Capital

The bioscience innovation ecosystem requires especially large amounts of capital. Avenues to pursue capital include venture funding, partnerships with established companies, and loans and lines of credits from banks. However, following a national recession and economic uncertainty, access to capital for both startups as well as established bioscience companies is a challenge. Rhode Island’s reputation as a place to pursue a bioscience venture is important for raising capital; investors want to be confident their funds will be supported and turned into a successful business venture.

Research Assets

Rhode Island’s strategic investments have helped build shared core research facilities, fund research projects with commercial potential, catalyze research collaborations between institutions, and fund student research experiences. These coordinated investments have helped build the research assets at the core of the bioscience innovation ecosystem. Work continues to be done to expand these opportunities and also leverage them in the commercial sphere.

Relationships with Colleges and Universities

Both educating Rhode Island’s bioscience pipeline as well as serving as a starting point for many bioscience startup ventures, Rhode Island-based colleges and universities play a critical role in the local industry. While the relationships between bioscience companies and universities are essential, they are not without complications. Areas of interest to the bioscience venture community include:

Facility Use Agreements:
Access to space and equipment is an issue for startup companies. Some companies have facility use agreements with universities, particularly those with faculty founders.

Animal Research Facilities:
Access to flexible animal research facilities is a need especially for R&D stage companies. Rhode Island universities and research hospitals have animal research facilities that can be used by academic research teams affiliated with these institutions. However, once a research project transforms into a commercial venture, it is no longer affiliated with the university or hospital and scientists need to utilize the services of contract research organizations (CROs).

Inventorship:
Inventorship and intellectual property (IP) ownership are critical factors in a private company accessing funds to bring a product to market. The inventorship issue arises most commonly between hospitals and universities and the researchers they employ, even if it is on a visiting or adjunct faculty basis.

Clinical trials

Clinical trials are an essential milestone in bringing a product to market. Clinical trials nationally are clustered around hospitals, physicians, and clinical trial management staff that have experience. Rhode Island does not implement high numbers of clinical trials. Bioscience employers express the need for increased awareness of and participation in clinical trials for both the medical community and the general population.
Facilities and Infrastructure

Facilities and space issues arise for companies at two points: 1.) when they are first starting or spinning out of a hospital or university; and 2.) when they enter an expansion phase. Space in Rhode Island is more affordable than nearby Boston and Connecticut, but not necessarily easier to find. New construction can be too costly or difficult to find open land for, especially in Providence. Existing buildings are often transformed into bioscience facilities, but that too can be difficult because of the inherent nature of the industry and its needs. Infrastructure, access to water, clean rooms, and air/temperature control are just some of the requirements. Navigating multiple local and state regulations, approval processes and permitting, and health and safety rules (DEM, EPA, OSHA) for this industry can be extensive. Fire code compliance in retrofitted bioscience buildings can also be a challenge.

Tax Climate

Bioscience leaders feel that the Rhode Island tax structure is not as competitive as neighboring Massachusetts or Connecticut. At the early expansion stages, the commercial property tax (rate and what is taxed) is critical. The corporate profits tax becomes an issue at later stages. Tax climates are also not consistent throughout the state, with cities and towns differing in how they value equipment for property tax purposes.

Political Support on National Issues

In addition to local and state support of the industry, bioscience leaders also look see to Rhode Island’s congressional representatives advocating for the interests they share with others in their industry. National industry issues that bioscience employers expressed the most concern over were FDA approval times for moving drugs to market and the top-heavy fee structure for drug approval. The work of Rhode Island’s congressional representatives on Capitol Hill plays into the state’s bioscience business climate.
Recommendations

The Rhode Island bioscience workforce is growing. Employers have expressed praise in some workforce proficiencies and identified challenges in others. Employers are optimistic about the potential of the Rhode Island bioscience industry. In order to seize this talent opportunity and to continue to foster the industry, we must address the industry’s workforce challenges together.

The following recommendations aim to do so. Expanding upon existing programs and initiatives and incorporating new ones, the recommendations of this report aim to inspire and engage youth in the STEM fields, strengthen education pathways and professional development opportunities, and raise industry awareness and advocacy. Some activities are already underway; where appropriate, these have been identified as “Action” items. It is important to note that identified actions are not stand-alone solutions, rather one aspect of a multi-faceted approach.

To find success, these recommendations require the collaboration and investment of bioscience stakeholders statewide and in industry, academic, and government capacities. They should also be recognized in the context of addressing the needs of the bioscience innovation ecosystem as a whole.

Inspire and Engage Youth in STEM

Science is a core subject in all school systems, but we still need to ensure that we are interesting and engaging students in these fields and raising awareness of possible career paths. Rhode Island has added significant opportunities to its K-12 STEM education program (see “School Bioscience Programs, Grades 6-12, Rhode Island, 2013” chart on page 15.) It is to the benefit of the industry that we continue to develop, support, and expand these programs.

**Recommendation:** Grow K-12 STEM opportunities. This includes integrating bioscience learning into classroom curriculums and expanding programs and course offerings at Bioscience Academies, career and tech centers, and high schools.

**Recommendation:** Build on the success of student bioscience programs to continue to inspire students to higher levels of achievement and build their confidence in laboratory science skills and bioscience career opportunities. This includes providing students with industry-related experiences such as job shadows, classroom speakers, industry tours, and hands-on bioscience and STEM workshops.

Inspire and Engage Youth in STEM

Rhode Island students will develop realistic ideas about career paths through interaction with professionals from a wide variety of bioscience companies.

Bioscience education incorporated into classroom learning as well as outside programming will provide “line of sight” to bioscience careers for high school students.
Recommendation: Connect educators to bioscience industry professionals and opportunities. Learning new bioscience technologies, approaches, and uses in the industry can help educators strengthen existing programs and incorporate new bioscience-based learning objectives into curriculums.

Action: The Rhode Island Science Teachers Association is a statewide professional organization for Rhode Island science teachers, including the biosciences. The 154-member group communicates as needed to inquire about best practices and resources. Professional development opportunities for educators and learning opportunities for students are shared via weekly newsletter.

Action: Tech Collective hosts quarterly Bioscience Educators Roundtable sessions. Educators share information on curriculum and certifications, best practices, and learning opportunities. Bioscience industry or education experts are invited to share industry knowledge, techniques, and approaches that can be brought back to the classroom. Participating educators also helped to design the laboratory skills component of the 2013 SkillsUSA Rhode Island Bioscience Competition.

Higher Education and Experiential Learning

Education relevant to the biosciences will remain essential to the success and growth of the industry. Employers look to Rhode Island’s education resources and pipeline to train a workforce which meets their talent needs.

Rhode Island has high quality bioscience programs that are responsive to the local bioscience industry. There is a need to increase awareness both of these programs as well as the opportunities available to graduates with such credentials.

In gaining workforce experience, employers largely support and participate in hosting internships. Yet, it can be a strain on company resources, and they cannot always meet the student demand for experiential learning opportunities.

Recommendation: Raise student awareness of and enrollment in higher education bioscience-related programs and degrees. Colleges and universities report they need to actively recruit students to enroll in bioscience programs, citing a lack of industry and career awareness. Strengthen higher education support for students in STEM fields, including academic and career guidance. Explore opportunities for industry-education collaboration in recruiting.

Recommendation: Connect students to experiential learning opportunities (such as job shadows, internships, co-ops, and fellowships) while they are in school, so that when they graduate they already have some transferrable industry experience.

Recommendation: Provide experiential learning support for employers. This includes assisting employers in establishing and running internship programs, providing internship resources, recruiting qualified student
participants, and providing access to funding for employers to offer paid internships.

**Action:** Colleges and universities are increasingly incorporating experiential learning into their curricula. For example, the University of Rhode Island’s Biotechnology Manufacturing Certificate Program has a successful internship component which has become a feature of the program.

**Action:** Tech Collective’s Fellowship Program was launched in 2012 and connects recent Rhode Island college and university graduates with bioscience employers looking to fill entry-level positions. Fellows work at a company for 10 weeks and are paid a stipend. The program is funded by a Governor’s Workforce Board Rhode Island (GWBRI) Innovative Partnership Grant.

**Action:** In 2013, the Rhode Island General Assembly created the Innovate Rhode Island Small Business Fund. Administered by the Rhode Island Science and Technology Advisory Council (STAC), one component of the initiative is its Internship Grant program, which offers funding for bioscience and engineering employers to offset the costs of paid internship opportunities.

**Action:** The GWBRI Rhode Island Work Immersion Program was established in 2013 to assist in providing students and unemployed adults with paid work experiences. Partial reimbursement is available to employers across all Rhode Island industries.

**Action:** The Rhode Island Student Loan Authority (RISLA) has launched the bridge.jobs initiative as an internship web portal open to all students and employers in the state. Bridge.jobs also offers employers support and resources on how to structure internships and recruit students.

**Professional Development**

While all Rhode Island bioscience employers invest in employee training, public workforce investment plays a critical role in supporting wider workforce efforts. The most valuable bioscience professionals are continually advancing their knowledge and ability to navigate the regulatory, legal, product-to-market, and business operational environments. Funding for skills advancement and flexible training opportunities were identified as professional development needs.

**Recommendation:** Continue to fund workforce training opportunities for existing (incumbent) workers at the state and federal levels. Ensure access to training needs across the industry and workforce pipeline. This includes developing employees’ technical, business, and professional skill sets.

**Recommendation:** Support and expand upon training funding resources. Working with industry and the Rhode Island workforce system, identify new opportunities and funding for worker training. Ensure bioscience industry employers and employees are aware of training, funding, and workforce opportunities.

**Professional Development**

*In the short term, higher education and professional development investments support productivity growth for bioscience employees. Over the long term, such investments support the growth of bioscience employment in Rhode Island.*
Recommendation: Increase flexibility in funding for methods through which employees receive training. Employers expressed a need for in-house and outside training for their employees. Current training funds do not always allow for reimbursement of in-house training. In an industry driven by intellectual property and highly specialized skills, in-house training methods allow employers to provide customized training specifically on the company’s needs, programs, and processes.

Recommendation: Provide increased flexibility for employee education/training opportunities. Suggestions provided were the creation of online, blended, or part-time degree programs for bioscience professionals, especially in the areas of quality assurance and regulatory affairs.

Action: Rhode Island has made employee training resources available to state employers over the past several years. Depending upon the program, funds can be used for bioscience professional development training in technical, business, and professional skills. Some funds are available only to Rhode Island bioscience employers while others are offered to employers across all industries. They include:

- **Industry Partnership Incumbent Worker Training funds** – funded by GWBRI, administered by Industry Partners (Tech Collective is the Rhode Island Bioscience Industry Partner)
- **Monthly Incumbent Worker Training Express Grants** – funded by GWBRI
- **Annual Incumbent Worker Training Grants** – funded by GWBRI
- **On the Job Training** – funded by Rhode Island’s Workforce Investment Boards: Workforce Partnership of Greater Rhode Island (WPGRI) and Workforce Solutions of Providence/Cranston

Action: Tech Collective will continue to work with the industry and state and federal workforce systems to identify and pursue appropriate workforce funding opportunities. Tech Collective will continue to work with industry resources and stakeholders to ensure employers and employees are aware of the training, funding, and workforce opportunities available to them.

Action: Roger Williams University is developing an integrated 4+1 Bachelor’s Degree program in Biotechnology.

Action: Brown University has launched an Executive Master of Healthcare Leadership program.

**Awareness and Advocacy**

We heard throughout the creation of this report that there is not enough awareness of the biosciences as an industry or its impact locally in terms of workforce and economy and globally in terms of innovation. Growth for Rhode Island’s bioscience industry is dependent on its being identified as a high-impact industry sector. Improving competitiveness and strengthening the bioscience industry requires ongoing, cross-sector
collaboration. Awareness of and advocacy for the bioscience industry and its growth needs and opportunities are critical to its success.

**Recommendation:** Educate Rhode Island state legislators in a more focused forum and on a regular basis. This will help drive more informed decisions on policy, funding, and other issues impacting the industry.

**Recommendation:** Advocate for continued and expanded state funding to support the Rhode Island bioscience industry and its growth needs. This funding has gone to support important avenues of bioscience research and start-up ventures, including the Innovate Rhode Island Small Business Fund, the Rhode Island Research Alliance, and the Slater Technology Fund.

**Recommendation:** Leveraging bioscience-serving organizations including MedMates, the Rhode Island Bioscience Leaders, the Rhode Island Science and Technology Advisory Council, and Tech Collective, support the recommendations of the *Economic Intersections of Rhode Island* initiative led by the Rhode Island Foundation and Commerce RI. Suggested actions are:

- **Establish a Cross-Sector Biotech, Medical, and Public Health Oversight Team:** The team would support a vision and coordinate and sustain statewide “intersection” activities and dialogue.

- **Establish a Statewide Inventory of the Sector and Conduct a Competitive Analysis:** The analysis should realize strengths, define gaps, and identify competitive edge.

- **Create an Identity for the Sector:** A narrative and identity would help the sector integrate into Rhode Island’s statewide story to improve the profile of the sector and the state on a national and international scale. Other sectors should be engaged to coordinate this effort.

- **Enable and Incentivize a “Profile” System:** Engage regional peers to inventory, market, and connect expertise across the state (across discipline, sector, organizations).

*(Source: *Economic Intersections of Rhode Island: a private sector-generated action agenda, 2013.)*

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**Awareness and Advocacy**

*Rhode Island will complement bioscience workforce investments with other high-leverage investments, increasing industry competitiveness in research, higher education, capital access, and the development of specialized real estate.*

*The Rhode Island bioscience industry will have a unified and recognized identity; leaders and the public at large will be aware of the industry, its opportunities, growth needs, and what can be done to facilitate that growth.*
The Governor’s Workforce Board Rhode Island (GWBRI)

The Governor’s Workforce Board is the primary workforce development policy-making body for the state of Rhode Island. Since its inception in 2005, the 19-member board has invested more than $70 million to improve the existing skill base of the workforce and anticipate the future needs of growing and emerging business.

GWBRI workforce funding opportunities include Industry Partnership Incumbent Worker Training, monthly Incumbent Worker Training Express Grants, annual Incumbent Worker Training Grants, Innovative Partnership Grants, the Rhode Island Work Immersion Program, GWB Jobs Initiatives, and Job Training Tax Credits. www.rihric.com

Innovate Rhode Island Small Business Fund

In 2013, to foster job creation, facilitate small business development, and enhance the workforce pipeline, the Rhode Island General Assembly created the Innovate Rhode Island Small Business Fund (IRISBF). Through the Fund, eligible Rhode Island small businesses may apply for grants and loans to defray the cost of applying for SBIR/STTR awards, to match SBIR/STTR Phase I and Phase II awards, and to hire interns.

The goals of the program are to leverage state funds to encourage and support Rhode Island entrepreneurial participation in the federal SBIR/STTR programs; increase the amount of federal research dollars received by Rhode Island firms; sustain companies through the early stages of product development; encourage the establishment of high potential, high quality, high growth ventures in Rhode Island; and enhance the talent pipeline in the life sciences and engineering fields. The Innovate Rhode Island Small Business Fund is administered by RI STAC. http://stac.ri.gov/innovate-ri-fund

Rhode Island Bioscience Leaders

Rhode Island Bioscience Leaders brings together bioscience firms in the Providence metro with university researchers. The group enhances information exchange and collaboration around legislative initiatives, university internship placements, venture capital, and opportunities around wet lab space. The group hopes networking will benefit the community and further bioscience research capabilities in the region.

Rhode Island Commerce Corporation

The Rhode Island Commerce Corporation (Commerce RI) is the full-service, official economic development organization for the state of Rhode Island. A quasi-public agency, the corporation serves as a government and community resource to help streamline the business expansion in, and relocation to, Rhode Island. The agency assists companies with commercial real estate, business financing, workforce training, and other relevant issues. www.commerceri.com

Rhode Island IDeA Network of Biomedical Research Excellence

The Institutional Development Award (IDeA) Network of Biomedical Research Excellence (INBRE) is designed to provide funding for research capacity building in states that have not participated fully in the research programs of the NIH. The network has the objective to support and develop talented individuals, committed to research careers in Rhode Island, and to build the biomedical research capacity of Rhode Island institutions that have historically received little NIH funding. The research foci of the RI-INBRE program are: molecular toxicology, cell biology, and the behavioral sciences. www.uri.edu/inbre

MedMates

MedMates is Rhode Island’s first healthcare technology network group dedicated to galvanizing collaboration between health-tech companies, hospitals, universities, sources of capital, and governmental partners. Its mission is to support and accelerate health-tech opportunities in the Ocean State. Founded in 2013, MedMates members have deep experience in the fast-changing health-tech field, ranging from startups to mature companies and everything in between. Its goal for 2014 is to continue building an interconnected web of talent, a robust entrepreneurial launchpad, and help shape public policy into the future. www.medmates.org
Rhode Island NSF EPSCoR

Rhode Island NSF Experimental Program to Stimulate Competitive Research (EPSCoR) supports research at all its partner institutions, seeking to better understand and anticipate the impact of climate variability on marine life and ecosystems. From tourism to fishing fleets, the housing market, educational systems, and business opportunities, preservation of our coastal waters is necessary to sustain the Ocean State economy and our cherished way of life, while helping find ways to feed and fuel a growing world population with shrinking and endangered resources.

As part of its educational mission, Rhode Island NSF EPSCoR conducts outreach in middle and high schools to spark imaginations and cultivate interest in science, technology, engineering and math (STEM) careers. The organization brings these students to the University of Rhode Island’s Narragansett Bay campus to share the beauty and wonder of ocean life, and they visit the college and university campuses to explore the potential and promise that higher education provides.

http://web.uri.edu/rinsfepscor

Rhode Island Research Alliance (RIRA)

To create stronger connections across the state’s research organizations, STAC created RIRA to serve as a platform for promoting collaboration, maximizing state and federal investment in research, and enhancing the state’s R&D-related economic development opportunities. By promoting collaboration among the state’s research universities, research hospitals, corporations, and government agencies, the Alliance supports current research activities, strengthens the ability of Rhode Island investigators to attract federal and corporate research investment for new projects, and spurs economic development and job growth.

http://stac.ri.gov/rd

Rhode Island Science and Technology Advisory Council (STAC)

The Rhode Island Science and Technology Advisory Council (STAC) is a coalition of business, academic, medical, and government leaders with the mission to develop and lead strategic state investments that drive economic development and job creation by maximizing the economic impact of research, technology and innovation. STAC initiatives support the state’s research and development activities by promoting collaboration across institutions and encouraging entrepreneurship and new company creation through the transfer of new technologies and discoveries into the marketplace.

http://stac.ri.gov

Slater Technology Fund

The Slater Technology Fund is an independently chartered economic development fund that operates in accord with best practices of venture capital investing. Leveraging state and federal funding, Slater focuses its resources on the support of entrepreneurs who have the vision, leadership, and commitment to build substantial commercial enterprises. The fund backs startups committed to basing and building their business in Rhode Island. Slater typically invests at the inception stage in the development of a new venture, often based upon ideas and technologies originating in academic, commercial or government research laboratories located within the region. In most cases, investments are premised upon the possibility of raising substantial follow-on financing from venture capital investors and/or strategic partners with a view toward accelerating the generation of significant numbers of high-value, high-wage jobs over the intermediate to longer-term.

www.slaterfund.com

Tech Collective

Tech Collective is Rhode Island’s Bioscience and Information Technology Industry Association. Unitng industry, government, and academic stakeholders, our mission is to inspire, engage, educate, and employ a high-skill, high-wage Knowledge Economy in Rhode Island. Since its transition from the Rhode Island Technology Council (RITEO) in 2004, Tech Collective has received more than $8M in federal, state and private grant funding to foster industry and workforce awareness, collaboration, and development through forums and initiatives including: Tech10, the Rhode Island Bioscience Awards, GRRL Tech, Women in Technology, Bio-Ed, and STEM-based education and training programs for K-16 students as well as incumbent and transitioning workers.

www.tech-collective.org
Rhode Island’s Bioscience Industry
Bioscience Knowledge Applied to Human Challenges

Agriculture & BioFuels

BioProcess Algae, Portsmouth, designs, builds, and operates commercial scale Grower Harvester bioreactors that enable efficient conversion of light and CO₂ into high value microbial feedstock

BioprocessH₂O, Portsmouth, provides the industrial and municipal wastewater markets with innovative and technologically advanced equipment

Newport Biodiesel, Newport, produces a clean-burning and sustainable fuel from waste vegetable oil collected from restaurants

Tomorrow BioFuels, Cranston, carbon capture and liquid fuel delivered from algae

Medical Devices

Astro-Med, Inc., West Warwick, manufactures digital acquisition and recording systems for aerospace, industrial, and medical research applications.

Bio-Detek, Inc., Pawtucket, design and manufacture of sensors for the medical device community

BioIntraface, North Kingstown, bioactive & antimicrobial medical coatings

Biomedical Structures, Warwick, textiles for medical applications

Boston Scientific, Coventry, development and commercialization of less-invasive medical devices

Cadance Inc., Cranston, surgical device contract manufacturer

Contech Medical, Providence, medical device contract manufacturing

Davol BARD, Inc., Warwick, soft tissue repair products, mesh prosthetics, biologic implants and fixation systems to complement innovative techniques for inguinal, ventral and other hernia repair procedures

GeoTec, Warwick, design, development, prototyping, manufacturing of custom medical devices and instruments, optics and fiber optics

HANNA Instruments, Smithfield, manufacturer of analytical instrumentation

IlluminOss Medical, East Providence, developing a medical device for minimally invasive solutions for the stabilization and treatment of bone fractures. IlluminOss is an investigational device and is not yet approved for sale.

Iontera, Providence, design and development of intelligent transdermal drug delivery

LFI Medical, Smithfield, medical device contract manufacturer

Lucidux, Providence, advanced imaging and analytics platforms for surgical applications

Myomics, Providence, developing new therapeutics for improving muscle function

NABsys, Providence, DNA analysis, position sequencing platform

Narragansett Imaging, North Smithfield, medical imaging and biometrics equipment and systems

Perfuzia Medical Inc., Providence, developing ActiveFlowTM - a non-biologic, non-invasive medical device harnessing the therapeutic stimulation of blood flow to transform the way chronic wounds are treated and managed

Tepha Medical Devices, Providence, develops and manufactures absorbable medical devices: Monofilament Suture, Monofilament Mesh, Surgical Fil, Composite Mesh, Microspheres, Cardiovascular Stents, Implantable Drug Delivery

Unetixs Vascular, Inc., North Kingstown, noninvasive vascular diagnostic systems

Ximedica, Providence, product development firm with an exclusive focus on medical products

Chances are there are more Rhode Island companies active in the bioscience industry, that you know

If your company is active in bioscience and is not listed, please contact Tech Collective.
**Distribution, & Service**

**Alcore Scientific, Inc. (Ost),** Smithfield, distributor of clinical laboratory instrumentation  
**Claflin Company,** Warwick, medical equipment distribution and service, medical supply inventory management  
**Vital Diagnostics,** Lincoln, manufacturers and distributes clinical chemistry and hematology analyzers, along with reagents

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**Other Medical Specialty Manufacturing and Suppliers**

**Blow Molded Specialties,** Pawtucket, medical device molder serving the medical device, healthcare, laboratory diagnostics markets  
**Carpenter Powder Products,** Woonsocket, ultrafine, fine, medium and coarse metal powders used in medical device manufacture  
**Foresight Science & Technology,** Providence, technology transfer consulting firm  
**G&G Technologies Inc.,** North Kingstown, manufacturer of biomanufacturing equipment; WholeStream Bioprocessing System  
**MJ Data Corporation, LTD,** Smithfield, Smartphone Application for Asthma Patient Self Management and Telemonitoring  
**Polaris Medical Management,** Cranston, management service organization providing independent physician practices with operational support and expertise  
**Polystyrene, Slattersville, specialty packaging**  
**Pro-Change Behavior Systems, Inc.,** South Kingstown, Internet-based, Interactive Computer program to promote responsible drinking  
**Sealed Air Corporation,** Cranston, protective packaging  
**Teknor Apex Company,** Pawtucket, custom compounding of advanced polymer materials  
**Torbot Group, Inc.,** Cranston, manufacturer and distributor of ostomy supplies  
**Tytex, Inc.,** Lincoln, RI design, development and manufacture of a range of medical textile products  
**ULTRA Scientific Analytical Solutions,** North Kingstown, chemical solutions manufacturer of certified reference materials, Quality Control standards, reagents, and other laboratory solutions  
**Verichem Laboratories,** Providence, liquid protein-based reference materials for clinical quality control  
**Vitrimark,** Providence, nanoscale cryoinmaging to identify structural biomarkers for the early detection of disease

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**Research & Development**

**CRE Medical,** North Kingstown, RI neuromodulation and brain-computer interfacing  
**Ardane Therapeutics,** Providence, developing a drug, CN 2097, for stroke  
**BrainGate (Cyberkinetics) / Brown University,** Providence, collects and analyzes the brainwaves of individuals with pronounced physical disabilities, turning thoughts into muscle actions.  
**Care Technology, LLC,** Lincoln, developing technologies for healthcare including healthcare wireless monitoring devices and healthcare management software  
**CSCS Corp.,** West Warwick, contract research and fine chemicals  
**Dominion Diagnostics,** North Kingstown, medical laboratory, provides clinical quantitative urine drug testing, medication monitoring, and support services  
**EpiVax,** Providence, immunoinformatics, vaccines, protein deimmunization  
**Genexion,** Cranston, clinical research organization
Beechtree Labs, Providence, drug development. Has initiated an IND Phase 2b trial for recurrent oral herpes.

Calista Therapeutics, Providence, drugs for cystic fibrosis

Cytosolv, Inc., Providence, wound healing and delivery of regenerative factors

Denison Pharmaceuticals, Lincoln, analytical services, manufacturing and packaging of pharmaceuticals

IncYtu, Inc., Lincoln, biopolymer devices; cancer vaccines, tissue regeneration

Mnemosyne Pharmaceuticals, Inc., Providence, research and development of subunit-selective NMDA receptor modulators (SNRMs) for neuropsychiatric disorders

Multicell Technologies, Woonsocket, developing novel therapeutics and discovery tools that address unmet medical needs for the treatment of neurological disorders, hepatic disease and cancer

Neurotech USA, Cumberland, retinal diseases, genetically engineered eye implants

nsGene, Providence, encapsulate cell biodelivery for therapy of neurological diseases

Onst Dermatologics (subsidiary of PreCision Dermatology of NY), Cumberland, innovative topical therapies for the treatment of skin disorders

Organomed Corporation, Coventry, specialist in Organic Synthesis and Medicinal Products

ProThera Biologics, East Providence, biomolecules for sepsis and cancer

Rhodes Technologies (Purdue Pharma L.P), Coventry, pharmaceutical company focused on controlled substances and technically challenging products

Tedor Pharma, Cumberland, contract manufacturing of small molecules

Tivorsan Pharma, Providence, protein therapeutics company pioneering a unique approach to treat serious neuromuscular disorders

VeroScience, LLC, Tiverton, Biological clocks: new strategies for treating metabolic and immunological disorders