Biotech Career Panel
State of the Industry

Lauren Celano
CEO, Propel Careers
Lauren@propelcareers.com
Various Organizations / Career Paths

- Academic Research or Administration
- Companies Developing Technologies
- Private Research Institutions
- Investment Banking / Venture Capital / Finance
- Technical / Science Writing / Communications
- Consulting Firms
- Hospitals / Non Profits / Foundations
- Government / Policy
- Ecosystem

Making Connections that Fuel Innovation!
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Identifying a Career Path - Where to Start?

A few questions to ask yourself:

- What do you like?
- What are you passionate about?
- What are you good at?
- What do your peers/teachers think you are good at?
- What motivates you?
- What culture do you want to be in?
- What location do you want to be in?
- What else do you want in a role

Answers to these questions will narrow down your focus areas as you think about your career.
Career Paths
Areas of Career Opportunity
A Few Academic Career Areas

**Bench Research Roles**
- Biocontainment Core Facility (BL2+)
- Biospecimen Repository Core
- Biostatistics
- Clinical Research Laboratory
- Confocal and Light Microscopy Core
- Connell and O’Reilly Families Cell Manipulation Core
- Experimental Therapeutics Core
- Flow Cytometry Core
- Health Communication Core
- Leukemia/Lymphoma Xenograft (LLX) Core
- Medical Arts

**Research in a Core Facility**
- Medicinal Chemistry
- Microarray Core Facility
- Molecular Biology Core Facilities
- Molecular Diagnostics Laboratory
- Monoclonal Antibody Core
- Nuclear Magnetic Resonance Core
- RNA Interference (RNAi) Screening Facility
- Structural Biology Facility
- Tumor Imaging Metrics Core
- Survey and Data Management Core
- Translab Core
- Vivarium

Research Institutions

- Bench Research Roles
- Data Analysis / Computational Roles
- Scientific Writing Roles
- Alliance / Project / Program Management Roles
- Grant Administration / Evaluation
- Licensing / Partnership Roles
- Communications
- Operations
- Finance

Making Connections that Fuel Innovation!
# Industry Career Path Tracks

Research occurs in all areas from discovery to commercial

<table>
<thead>
<tr>
<th>Discovery</th>
<th>Preclinical</th>
<th>Clinical</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicinal Chemistry</td>
<td>Regulatory</td>
<td>Medical Writing</td>
<td>Market Access</td>
</tr>
<tr>
<td>Process Development</td>
<td>Quality Assurance</td>
<td>Scientific Writing</td>
<td>Health Economics</td>
</tr>
<tr>
<td>Analytical Chemistry</td>
<td>Quality Control</td>
<td>Medical Affairs</td>
<td>Patient Advocacy</td>
</tr>
<tr>
<td>Pharmacology</td>
<td>Compliance</td>
<td>Patient Advocacy</td>
<td>Product Launch</td>
</tr>
<tr>
<td>Molecular/Cell Biology</td>
<td>Operations</td>
<td>Clinical Research</td>
<td></td>
</tr>
<tr>
<td>Bioinformatics</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Functional Areas Include:**
- Medicinal Chemistry
- Process Development
- Analytical Chemistry
- Pharmacology
- Molecular/Cell Biology
- Bioinformatics
- Regulatory
- Quality Assurance
- Quality Control
- Compliance
- Operations
- Medical Writing
- Scientific Writing
- Medical Affairs
- Patient Advocacy
- Clinical Research
- Market Access
- Health Economics
- Patient Advocacy
- Product Launch
Industry is Very Broad

<table>
<thead>
<tr>
<th>Drug Companies</th>
<th>Tools Companies</th>
<th>CRO's and Consulting Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfizer</td>
<td>QIAGEN</td>
<td>Lonza</td>
</tr>
<tr>
<td>Bristol-Myers Squibb</td>
<td>BioLabs</td>
<td>PAREXEL</td>
</tr>
<tr>
<td>bluebirdbio</td>
<td></td>
<td>Charles River</td>
</tr>
<tr>
<td>UNUM Therapeutics</td>
<td></td>
<td>Health Advances</td>
</tr>
<tr>
<td></td>
<td>PerkinElmer</td>
<td>THOMSON REUTERS</td>
</tr>
</tbody>
</table>

Making Connections that Fuel Innovation!

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Non-Profit Disease Organizations – such as...

- Research Roles
- Alliance / Project / Program Management Roles
- Grant Administration / Evaluation
- Patient Advocacy Roles
- Licensing / Partnership Roles
Government Roles / Science Policy

- Research Roles (Full time and Contract)
- Alliance / Project / Program Management Roles
- Grant Administration / Evaluation
- Science Policy
- Licensing / Partnership Roles
- Communications
Big Data

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Additional Roles

Consulting
- Scientific Evaluation
- Strategic Analysis
- Competitive Landscape
- M&A Analysis
- Financial Valuation
- Partnership Strategy
- Intellectual Property
- Sales Strategy
- Marketing Strategy
- Grant Writing
- Pharmacoeconomics
- Pricing Scenarios
- Reimbursement
- Market Assess
- Health economics
- Operations
- Commercialization
- Emerging Markets
- Supply Chain
- Communications

Patent Law
- Technical Specialist
- Patent Analyst (licensed patent agent) (future)

Editor

Venture Capital / Investment Banking
- Analyst
- Associate
London-based The Unseen is one of few examples on this list that has actually launched to market. Founded by Lauren Bowker, who refers to herself as a material alchemist, this is a start-up that has captured the simple idea of colors that alter based on user interaction or the environment they’re placed in.
http://myidp.sciencecareers.org/
## 20 Different Career Paths

### Principal investigator in a research-intensive institution:
Independent researcher at a medical school, private research institute, government lab or university with minimal teaching responsibilities

### Research in industry:
Discovery or preclinical researcher; manager of a research team or facility

### Research staff in a research-intensive institution:
Staff scientist or researcher in academia or government, lab manager, director of a multi-user research facility in an academic institution

### Combined research and teaching careers:
Faculty at a liberal arts college or university whose job includes both research and major teaching responsibilities

### Teaching-intensive careers in academia:
A primarily teaching faculty position in a research university, liberal arts college, community college

### Science education for K-12 schools:
Classroom teacher; curriculum developer; science specialist

### Science education for non-scientists:
Education or public outreach specialist such as at a science museum or scientific society

### Clinical practice:
Clinician such as genetics counselor, therapist, physician

### Public health related careers:
Public health program analyst or evaluator; epidemiologist; biostatistician; medical informaticist

### Drug/device approval and production:
Regulatory affairs professional; quality control specialist

### Scientific/medical testing:
Testing specialist in an environmental, public health, genetics, or forensic science setting (intelligence agencies, federal/state departments of justice); clinical diagnostician

### Science writing:
Science, medical, or technical writer or journalist; science editor; science publisher

### Research administration:
Research administrator in private or public research institutions, government or academia, including compliance officers, grants and contracts officer; dean or director of research programs

### Science policy:
Public affairs/government affairs staff at scientific societies, foundations, government entities, or think tanks

### Intellectual property:
Patent agent; patent attorney; technology transfer specialist

### Business of science:
Management consultant; business development professional in a biotech company; venture capitalist; market researcher; investment analyst

### Entrepreneurship:
Starting your own business

### Sales and marketing of science-related products:
Medical science liaison; technical sales representative; marketing specialist

### Support of science-related products:
Technical support specialist; field application specialist; product development scientist or engineer

### Clinical research management:
Clinical research project/trials manager or coordinator
### Compare Skills Match to People in the Role

<table>
<thead>
<tr>
<th>Career Path</th>
<th>Skills Match</th>
<th>Interests Match</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Science education for non-scientists:</strong></td>
<td>81%</td>
<td>84%</td>
<td></td>
</tr>
<tr>
<td>Education or public outreach specialist such as at a science museum or scientific society</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sales and marketing of science-related products:</strong></td>
<td>82%</td>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>Medical science liaison; technical sales representative; marketing specialist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Science policy:</strong></td>
<td>77%</td>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>Public affairs/government affairs staff at scientific societies, foundations, government entities, or think tanks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Business of science:</strong></td>
<td>75%</td>
<td>78%</td>
<td></td>
</tr>
<tr>
<td>Management consultant; business development professional in a biotech company; venture capitalist; market researcher; investment analyst</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Research administration:</strong></td>
<td>73%</td>
<td>78%</td>
<td></td>
</tr>
<tr>
<td>Research administrator in private or public research institutions, government or academia, including compliance officers, grants and contracts officers; dean or director of research programs</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Scientific Knowledge

<table>
<thead>
<tr>
<th></th>
<th>Your Rating</th>
<th>Expert Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broad based knowledge of science</td>
<td>4</td>
<td>4.64</td>
</tr>
<tr>
<td>Deep knowledge of my specific research area</td>
<td>4</td>
<td>2.14</td>
</tr>
<tr>
<td>Critical evaluation of scientific literature</td>
<td>4</td>
<td>2.29</td>
</tr>
</tbody>
</table>
Resources
State Organizations

NH High Tech Council
Advancing Innovation
https://nhhtc.org/

MassMEDIC
Massachusetts Medical Device Industry Council
www.massmedic.com

MassBio
Massachusetts Biotechnology Council
www.massbio.org

Massachusetts Life Sciences Center
www.masslifesciences.com
### Largest BioPharma Industry Employers in Massachusetts, 2017

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sanofi Genzyme</td>
<td>5,000</td>
</tr>
<tr>
<td>2</td>
<td>Shire</td>
<td>3,040</td>
</tr>
<tr>
<td>3</td>
<td>Biogen</td>
<td>2,443</td>
</tr>
<tr>
<td>4</td>
<td>Novartis</td>
<td>2,333</td>
</tr>
<tr>
<td>5</td>
<td>Pfizer</td>
<td>2,200</td>
</tr>
<tr>
<td>6</td>
<td>Takeda</td>
<td>2,000</td>
</tr>
<tr>
<td>7</td>
<td>Vertex</td>
<td>1,600</td>
</tr>
<tr>
<td>8</td>
<td>Quest Diagnostics</td>
<td>1,550</td>
</tr>
<tr>
<td>9</td>
<td>Charles River Laboratories</td>
<td>1,446</td>
</tr>
<tr>
<td>10</td>
<td>MilliporeSigma</td>
<td>1,300</td>
</tr>
<tr>
<td>11</td>
<td>Parexel International</td>
<td>1,125</td>
</tr>
<tr>
<td>12</td>
<td>EMD Serono</td>
<td>1,039</td>
</tr>
<tr>
<td>13</td>
<td>AbbVie</td>
<td>911</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Alkermes</td>
<td>656</td>
</tr>
<tr>
<td>15</td>
<td>Sunovion Pharmaceuticals</td>
<td>602</td>
</tr>
<tr>
<td>16</td>
<td>Alnylam</td>
<td>608</td>
</tr>
<tr>
<td>17</td>
<td>Foundation Medicine</td>
<td>600</td>
</tr>
<tr>
<td>18</td>
<td>Merck</td>
<td>600</td>
</tr>
<tr>
<td>19</td>
<td>Moderna</td>
<td>550</td>
</tr>
<tr>
<td>20</td>
<td>Amgen</td>
<td>500</td>
</tr>
<tr>
<td>21</td>
<td>GE Healthcare Life Sciences</td>
<td>471</td>
</tr>
<tr>
<td>22</td>
<td>Tesaro</td>
<td>415</td>
</tr>
<tr>
<td>23</td>
<td>AstraZeneca</td>
<td>400</td>
</tr>
<tr>
<td>24</td>
<td>Bristol-Myers Squibb</td>
<td>400</td>
</tr>
<tr>
<td>25</td>
<td>Ironwood</td>
<td>375</td>
</tr>
</tbody>
</table>
## Top NIH-Funded Independent Hospitals, 2016

<table>
<thead>
<tr>
<th>Organization</th>
<th>City</th>
<th>State</th>
<th>Awards</th>
<th>Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Massachusetts General Hospital</td>
<td>Boston</td>
<td>MA</td>
<td>796</td>
<td>$364,981,379</td>
</tr>
<tr>
<td>Brigham and Women's Hospital</td>
<td>Boston</td>
<td>MA</td>
<td>570</td>
<td>$349,521,979</td>
</tr>
<tr>
<td>Vanderbilt University Medical Center</td>
<td>Nashville</td>
<td>TN</td>
<td>459</td>
<td>$241,415,324</td>
</tr>
<tr>
<td>Children's Hospital Corporation</td>
<td>Boston</td>
<td>MA</td>
<td>331</td>
<td>$147,762,034</td>
</tr>
<tr>
<td>Beth Israel Deaconess Medical Medical Center</td>
<td>Boston</td>
<td>MA</td>
<td>256</td>
<td>$132,229,333</td>
</tr>
<tr>
<td>Dana-Farber Cancer Institute</td>
<td>Boston</td>
<td>MA</td>
<td>217</td>
<td>$128,050,993</td>
</tr>
<tr>
<td>Cincinnati Children's Hospital Medical Center</td>
<td>Cincinnati</td>
<td>OH</td>
<td>267</td>
<td>$111,850,379</td>
</tr>
<tr>
<td>Children's Hospital of Philadelphia</td>
<td>Philadelphia</td>
<td>PA</td>
<td>201</td>
<td>$111,253,000</td>
</tr>
<tr>
<td>St. Jude's Children's Research Hospital</td>
<td>Memphis</td>
<td>TN</td>
<td>99</td>
<td>$71,090,742</td>
</tr>
<tr>
<td>Seattle Children's Hospital</td>
<td>Seattle</td>
<td>WA</td>
<td>102</td>
<td>$50,107,892</td>
</tr>
<tr>
<td>Cedars-Sinai Medical Center</td>
<td>Los Angeles</td>
<td>CA</td>
<td>107</td>
<td>$47,454,095</td>
</tr>
<tr>
<td>New York State Psychiatric Institute</td>
<td>New York</td>
<td>NY</td>
<td>99</td>
<td>$42,984,276</td>
</tr>
<tr>
<td>National Jewish Health</td>
<td>Denver</td>
<td>CO</td>
<td>56</td>
<td>$32,869,336</td>
</tr>
<tr>
<td>Rhode Island Hospital</td>
<td>Providence</td>
<td>RI</td>
<td>76</td>
<td>$29,152,940</td>
</tr>
<tr>
<td>McLean Hospital</td>
<td>Belmont</td>
<td>MA</td>
<td>74</td>
<td>$27,927,109</td>
</tr>
<tr>
<td>Roswell Park Cancer Institute Corporation</td>
<td>Buffalo</td>
<td>NY</td>
<td>73</td>
<td>$27,887,985</td>
</tr>
<tr>
<td>Boston Medical Center</td>
<td>Boston</td>
<td>MA</td>
<td>67</td>
<td>$27,152,542</td>
</tr>
<tr>
<td>Children's Hospital of Los Angeles</td>
<td>Los Angeles</td>
<td>CA</td>
<td>41</td>
<td>$20,236,544</td>
</tr>
<tr>
<td>Massachusetts Eye and Ear Infirmary</td>
<td>Boston</td>
<td>MA</td>
<td>47</td>
<td>$19,813,390</td>
</tr>
<tr>
<td>Tufts Medical Center</td>
<td>Boston</td>
<td>MA</td>
<td>38</td>
<td>$19,794,122</td>
</tr>
</tbody>
</table>
## Massachusetts Pipeline by Medical Indication (Top 25)

<table>
<thead>
<tr>
<th>Medical Indication</th>
<th># of Investigational Drugs</th>
<th>% of all Investigational Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>General cancer indications</td>
<td>192</td>
<td>11.40%</td>
</tr>
<tr>
<td>Solid tumour indications</td>
<td>147</td>
<td>8.73%</td>
</tr>
<tr>
<td>Other neurological indications</td>
<td>73</td>
<td>4.33%</td>
</tr>
<tr>
<td>Undisclosed</td>
<td>66</td>
<td>3.92%</td>
</tr>
<tr>
<td>Other immune indications</td>
<td>49</td>
<td>2.91%</td>
</tr>
<tr>
<td>General inflammatory disorders</td>
<td>42</td>
<td>2.49%</td>
</tr>
<tr>
<td>General blood malignancies</td>
<td>41</td>
<td>2.43%</td>
</tr>
<tr>
<td>Duchenne muscular dystrophy</td>
<td>39</td>
<td>2.32%</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>38</td>
<td>2.26%</td>
</tr>
<tr>
<td>Alzheimer's disease</td>
<td>38</td>
<td>2.26%</td>
</tr>
<tr>
<td>Cystic fibrosis (CF)</td>
<td>35</td>
<td>2.08%</td>
</tr>
<tr>
<td>Diabetes, type II (maturity onset)</td>
<td>32</td>
<td>1.90%</td>
</tr>
<tr>
<td>Leukaemia, acute myeloid (AML)</td>
<td>31</td>
<td>1.84%</td>
</tr>
<tr>
<td>General bacterial indications</td>
<td>30</td>
<td>1.78%</td>
</tr>
<tr>
<td>Other musculoskeletal disorders</td>
<td>29</td>
<td>1.72%</td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma (NHL)</td>
<td>27</td>
<td>1.60%</td>
</tr>
<tr>
<td>Other metabolic indications</td>
<td>27</td>
<td>1.60%</td>
</tr>
<tr>
<td>Amyotrophic lateral sclerosis (ALS)</td>
<td>27</td>
<td>1.60%</td>
</tr>
<tr>
<td>Melanoma</td>
<td>26</td>
<td>1.54%</td>
</tr>
<tr>
<td>Ovarian cancer</td>
<td>26</td>
<td>1.54%</td>
</tr>
<tr>
<td>Multiple sclerosis (MS)</td>
<td>26</td>
<td>1.54%</td>
</tr>
<tr>
<td>Gram negative infections</td>
<td>26</td>
<td>1.54%</td>
</tr>
<tr>
<td>Non-small cell lung cancer (NSCLC)</td>
<td>23</td>
<td>1.37%</td>
</tr>
<tr>
<td>Diabetes, type I (juvenile onset)</td>
<td>23</td>
<td>1.37%</td>
</tr>
<tr>
<td>Multiple myeloma</td>
<td>22</td>
<td>1.31%</td>
</tr>
</tbody>
</table>
MassBioEd Job Trends

Job Trends

MassBioEd develops analysis of job trends in the life sciences for the purpose of forecasting job trends, identifying skills required for high trending jobs, highlighting best practices in educational and training and serving as an effective guide on the workforce needs for the industry.

Job Trends Forecast

Annual Job Trends Forecast 2016 (Biopharma Industry)
Read Industry News


World Preview 2013, Outlook to 2018
The Future of Medtech

Propel Careers
Making Connections that Fuel Innovation!
Innovation capital raised by leading biotech clusters, 2016

Size of bubbles shows number of financings per region.

Innovation capital is the amount of equity capital raised by companies with revenues of less than US$500 million.

Source: EY, Capital IQ and VentureSource.

Embracing digital disruption

Make no mistake: technology firms, wellness companies and other non-traditional players awash in consumer and patient data are encroaching on traditional biopharmaceutical territory.

Augmenting R&D with artificial intelligence

Convergence of Technologies

Deloitte: Global life sciences sector trends in 2017

- Managing cost & pricing
- Driving clinical innovation
- Connecting with customers & consumers
- Transforming business & operating models
- Meeting regulatory compliance

Figure 9: Trends in clinical innovation

- Genetics, epigenomics, and genomics
  By 2020, genetic testing is expected to be part of mainstream medical practice, paving the way for stratified or personalized medicine.

- Molecular biology
  Pharma technologies of the future will be better-positioned to analyze the molecular basis of diseases, enabling development of targeted medicines.

- Biomechanical/biomedical engineering
  New clinical engineering methods will drive innovation around regenerative medicine (e.g., tissue-repair products like skin grafts, tissue-replacement products using 3D bioprinters to print living tissue with ink derived from human cells).

- Biotechnological/biopharmaceutical technologies
  Advancements will support continued development of lower-cost biosimilars, including monoclonal antibiotics and recombinant products.

- Breakthrough drugs and devices
  Bone-rebuilding drug Romosozumab (awaiting FDA approval); 3D-printed epilepsy drug, Spritam; bioelectric implants; and surgical robots are anticipated to improve health outcomes and drive future life sciences sector growth.

Deloitte 2017 Global life sciences sector outlook
Your Career is a Journey
Career Panel

Moderator: Lauren Celano, Founder and CEO of Propel Careers

Panelists:
- Aaron Hubbell, Senior Manage QA/Validation at Lonza
- Kathleen Gorczyca, Director of Laboratory Medicine and Representing Research Labs at Boston Children’s Hospital
- Chris Johnson, Director of Operations Procurement at Bristol-Myers-Squibb
- Anthony Palermo, Talent Acquisition Recruiter, WRD at Pfizer
Contact Details: Connect with Propel

Lauren Celano
Founder and CEO
Propel Careers

cell: 215-370-2285

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Twitter: @Propel_Careers
Facebook: Propel Careers
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Web: www.propelcareers.com