

FORWARD CHARLESTON



Targeted Economic Development and Marketing Strategy

Biosciences Cluster Analysis

April 2005

Target Industry 1: Biosciences

Industry Overview

Biosciences, as its name implies, combines biology with science. It applies knowledge of molecular, cellular, and genetic processes to real world products and services. It refers to scientific work related to genetic engineering for humans, animals and agriculture, environmental work, genetic data mining, and firms involved in the neurosciences and genome work.

In its strictest definition, bioscience includes companies involved in processes that require biological inputs, such as biopharmaceuticals, biological products, gene and protein therapy, tissue engineering, genetically modified crops, etc. However, it is common to expand the definition of the cluster to include related businesses in medical devices and pharmaceutical manufacturing. Even though these large industries do not necessarily utilize biological inputs (medical devices are closely associated with electronic manufacturing, and the pharmaceutical industry largely uses chemical inputs, not biological), they both serve the same end market, human health. The biosciences comprise a wide array of industry sectors that cut across a range of functions.

Using this broader definition, the biosciences serve three primary end markets: **Human Health / Medical, Agricultural, and Industrial.** Applications, devices, and therapeutics are supplied to these industries through a range of functions including *manufacturing, testing services, and research and development.*

Despite a recent dip, the biosciences industry has experienced tremendous growth over the past ten years. Employment in the cluster has expanded by nearly 130,000 jobs from 1993-2003. Average wages in the cluster have increased at an even more explosive rate. The average annual wage in the biosciences cluster grew by 85% since 1993 to \$67,760 currently. Growth in this cluster is projected to continue. National employment projections indicate that this cluster will grow at a 13% higher rate than the average rate of employment across all industry sectors. The general aging of the U.S. population, coupled with higher disposable incomes are increasing the demand for life enhancing products.

Biosciences

NAICS Definition

- 325411 Medicinals/Botanicals
- 325412 Pharmaceutical PreparationMfg
- 325413 In Vitro Diagnostic Substances
- 345414 Biological Products
- 54171 Life Sciences R&D

Industry Employment

- 200,000 employed - US
- 1.2 Million employed (when including Pharma and Medical Devices)

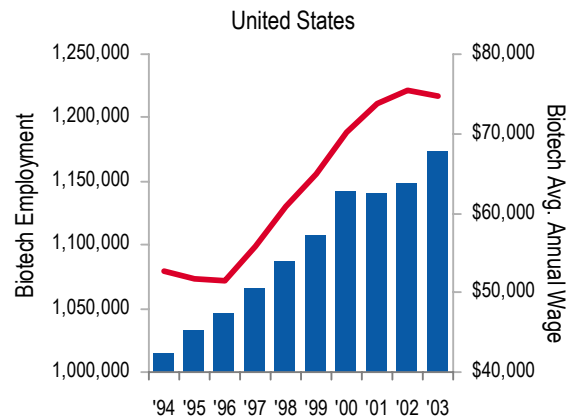
Wage Rates

- \$67,800 annual wage in the US

Location Criteria

- Educated workforce
- Access to capital
- Affordable lab space
- Major research presence

Biosciences Industry, 1994 - 2003



Source: Biotechnology Industry Organization; BLS

Because of these impressive growth projections and high average wages, competition for bioscience firms will be fierce, as almost every major metro includes it among its list of target industries. The Brookings Institute reports that out of 77 local and 36 state economic development agencies surveyed, 83% list biotechnology as one of their top two target industries. Biotech and health services, however, will likely experience growth in a broad cross-section of markets. There are opportunities for those communities that target specific bioscience niches and prepare themselves appropriately. Successful communities will be those that excel in research and are able connect that research with the business community to turn it into marketable products.

Human Health / Medical Market

The human health/medical end market, also referred to as biomedical, provides direct applications to improve human health and/or sustain and extend life. This is by far the largest biosciences market and is the area that is most commonly known by the public. According to a Battelle study, there are approximately 14,000 biomedical firms in the U.S. that employ approximately 730,000 individuals. This market has the two largest sub sector groups in the biosciences cluster: pharmaceutical and drug makers and medical device manufacturers. Together, these sub sectors comprise 70% of the total employment in the biosciences industry cluster. The remainder of the cluster consists of research, development, and testing services. Firms in this group provide valuable research discovery to fuel the industries pipeline of products. They also support major medical device or big pharma companies by providing contract testing, research, and manufacturing services.

The two highest paying sub sectors of the biosciences market are the pharmaceutical, and the R&D and testing services, with annual wages of \$73,700 and \$73,500 respectively. The annual wages in the medical device sector were \$52,000 in 2003.

In the pharmaceutical and medical device markets, firms tend to be large and centralized in specific areas of the U.S. Namely, California, Massachusetts, and Minnesota are central states for medical devices and New Jersey, Pennsylvania, and North Carolina have high concentrations in pharmaceuticals. In contrast to this, R&D and testing service companies tend to be much smaller in size (10-50 employees) and more geographically spread out.

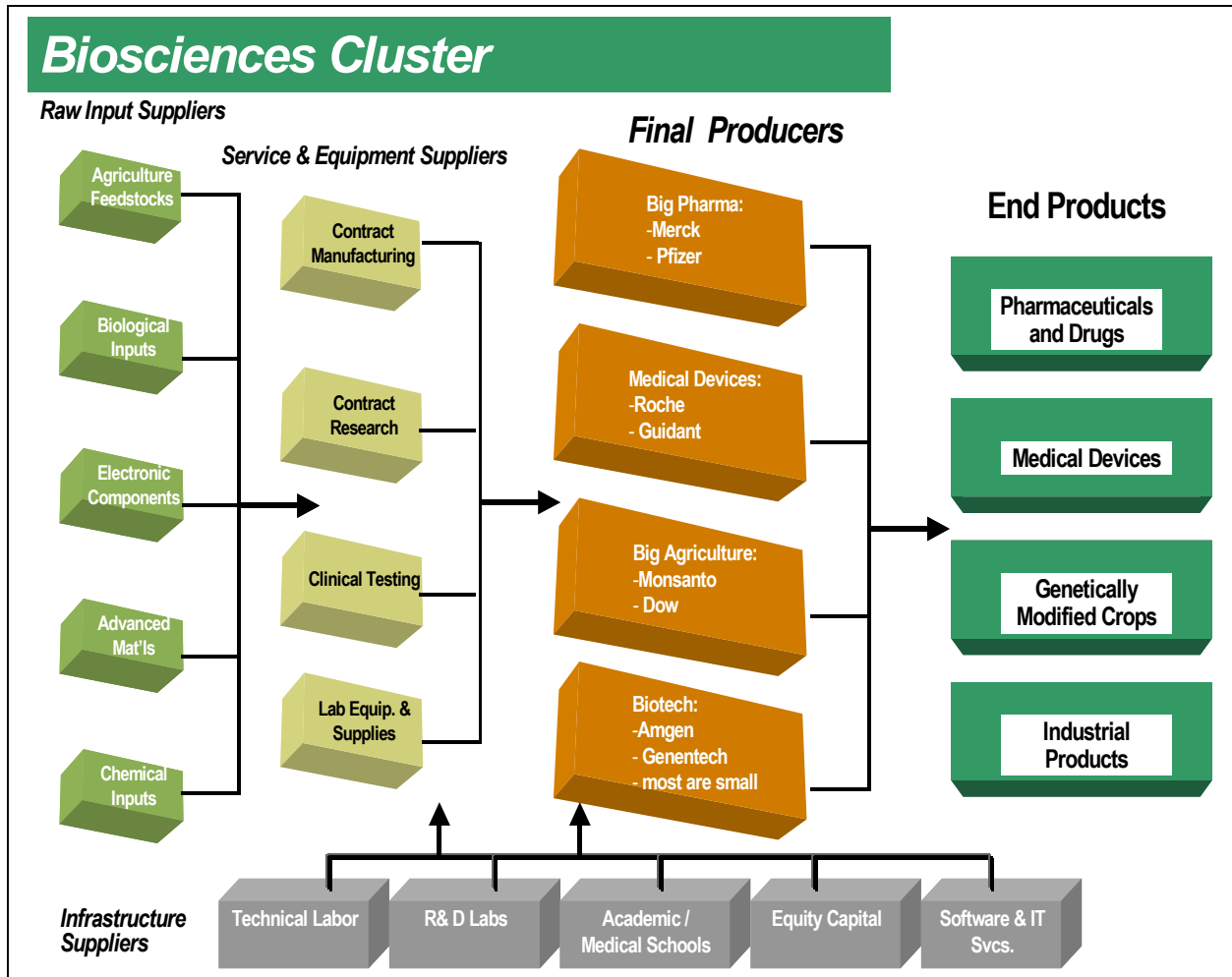
Agricultural and Industrial Markets

In addition to the human health end market, there are also growing bioscience applications in the industrial and agricultural markets. Agribusiness applications range from the use of genomics to create genetically modified crops, to nutraceuticals, which use foods to provide medical and health benefits. In the industrial segment, bioscience companies are using enzymes to clean up hazardous spills, and other biological inputs to manufacture paints, and plastics.

The agricultural and industrial bioscience markets comprise nearly 20% of the total cluster employment. In 2003, Battelle estimates that there were approximately 3,300 firms in this sector, which employed over 150,000 individuals. The average annual wage in this sector was \$55,200 in 2003.

This sector is largely concentrated in the Midwest and South areas of the U.S. in areas that have large land areas used for agriculture. Many of the Midwestern agricultural states use corn and soybean inputs, while Southern states center more on organic and agricultural chemicals. **South Carolina, with a cluster concentration quotient (LQ) of 4.39 in organic and agricultural chemicals, has the highest concentration of any other U.S. state.** South Carolina has 73 firms that employ over 9,000 workers. Other states that are specialized in the industrial and agricultural biosciences are Tennessee, Illinois, North Carolina, and Virginia.

The map below gives a graphical view of the broad array of functions and segments within the biosciences cluster. It is clear from this map that there are a variety of different niches that make up the cluster, from contract manufacturing to agricultural R&D.



Industry Requirements

Bioscience firms have specific needs and have clustered around the few metros that can address those requirements. There is an acute shortage of research dollars and skilled life science workers. Locating near a large research university can allow start-ups access to cheap lab space, technology transfer opportunities, and potential employees. Bioscience companies will also desire established venture capital or angel networks they can tap for funding.

Economic Conditions. Bioscience firms seek locations in highly vibrant and well-educated communities. Firms also desire a growing population that is large enough to support workforce needs in a growing industry. Finally, because of the emerging nature of the industry, bioscience companies seek communities with a young and diverse population. Many of the bioscience industry's employees are young, recent graduates and often include high representation from minority groups.

Structural Assets. Bioscience firms have specific, but feasible infrastructure needs, namely available "wet lab" space and reliable utilities. The typical bioscience firm is relatively small and the majority of any capital investment will be tied up in equipment.

More important are the financial needs of the industry. Bioscience is an industry in its infancy, still relatively small even after a decade of substantial growth. Today, less than 50 industry companies have over 1,000 employees and even the largest still do not rank among the top 25 employers in the largest bioscience metros. Less than 1 out of every 1,000 bioscience-related patents produces a successful commercial innovation. Even the successful products can take more than a decade to come to market. Because of the intricacies of this industry, bioscience firms need access to a venture capital base that is familiar with the industry. These financial backers should not only understand the industry, but also have long-term funds available and predisposal to higher levels of risk in their investments.

Facility Requirements for a Biosciences Facility:

Bioscience Research Employer Requirements		
	Input	Details
Activity	Biotech R&D	Biological, agriculture, or chemical research
Size	30,000 sf	1 story building
Acres	5-10 acres	
Employees	50 employees	2 shifts / 5 days per week
High Demand Occupations	Computer software engineers Electrical engineers Computer hardware engineers	Mechanical engineers Biomedical engineers Industrial engineers
Water	2,500 gallons / day	250 gal/shift
Wastewater	2,250 gallons / day	does not need to be treated
Electricity	600 kw Demand	dual substations, possibly on separate grids
	324,000 kwh per month	70% average load factor
Natural Gas	150 mcf / month	
Investment (\$) (for a typical U.S. facility)		
Building/Land	\$2 million	
Equipment	\$30 million	about \$1,000 per sf
Biomanufacturing facility:	- At least 15 acres land - Outside of the FEMA 100-year Floodplain	
Source: AngelouEconomics		

Workforce. Attracting and retaining a quality workforce is more important in high tech fields such as biotech. Workers tend to be highly mobile; they are willing to venture into a community, but they are also easily swayed away. In an industry with high turnover, people tend to seek communities with numerous employment options. The typical bioscience firm has less than 50 employees and most are very well educated. Bioscience firms employ many life science PhDs, and will require an area research university with graduate life-sciences programs.

The table below gives the occupational breakdown for the biosciences industry cluster. The most concentrated occupational groups in the biosciences are those pertaining to life and physical science. Nearly all of these occupations require at least a bachelor's degree and many require at least a PhD. The bioscience cluster also requires skilled laboratory technicians and semi-skilled production occupations. Training for these occupations can be accomplished at a 2-year technical college (lab technicians) or on the job (production occupations).

Biosciences Occupations

SOC Code	Occupation	Cluster Employment	% of Cluster Employment	10-year Growth Forecast	Relative Growth Level	% Jobs Requiring Bachelor's
11-0000	Management occupations	100,120	12.07%	12.1%	–	
11-1021	General and operations managers	17,260	2.08%	18.4%	H	48%
11-9121	Natural sciences managers	11,830	1.43%	11.3%	L	87%
15-1011	Comp. and info. scientists, research	3,780	0.46%	30%	VH	62%
17-0000	Arch. and engineering	90,390	10.89%	8.6%	–	
17-2031	Biomedical engineers	2,200	0.27%	26.1%	VH	75%
17-2041	Chemical engineers	5,480	0.66%	0.4%	VL	93%
19-0000	Life, physical, and Soc. Sci.	164,870	19.87%	17.2%	–	
19-1021	Biochemists and biophysicists	9,680	1.17%	22.9%	VH	96%
19-1022	Microbiologists	5,380	0.65%	20%	H	96%
19-1042	Medical scientists, except epidemiologist	29,260	3.53%	26.9%	VH	98%
19-2012	Physicists	4,460	0.54%	6.9%	VL	94%
19-2031	Chemists	27,480	3.31%	12.7%	L	94%
19-2032	Materials scientists	2,100	0.25%	8.6%	VL	91%
19-4021	Biological technicians	21,130	2.55%	19.4%	H	59%
19-4031	Chemical technicians	11,500	1.39%	4.6%	VL	29%
29-0000	Healthcare pract. and tech.	15,050	1.81%	26%	–	
41-0000	Sales and related	19,440	2.34%	12.9%	–	
41-4011	Sales representatives	11,150	1.34%	19.3%	H	48%
51-0000	Production occupations	99,570	12.00%	3.2%	–	
51-9111	Pkg. and filling machine operators	20,220	2.44%	21.2%	H	3%
51-9011	Chemical equip. operators	11,210	1.35%	-3.8%	VL	18%
51-9061	Inspectors, testers, sorters, etc.	10,160	1.22%	4.7%	VL	13%
51-1011	First-line supervisors/managers	10,060	1.21%	9.5%	L	12%
43-0000	Office and admin. Support	116,560	14.05%	6.8%	–	

Source: BLS; AngelouEconomics

Research & Development. Research and development is critical for this industry. It fuels every product created. R&D costs are the largest expense categories for nearly all bioscience companies. Because many of these companies are not yet profitable, they need to have ways to subsidize their R&D expenses. In addition, the large bioscience firm is a rarity. Even in established markets, bioscience firms are not considered large employers. Firms that specialize in research are generally no more than a small lab. These firms sell or license their marketable products to large vertically integrated powerhouses such as Merck and Pfizer (pharmaceuticals), Monsanto (agricultural), or DuPont and Dow Chemical (industrial).

Because R&D costs account for much of the industry and most companies are not sufficiently large enough to defray these costs, it is important to have large research organizations in the area. Small bioscience firms benefit greatly from a research hospital or other large research institutions. They are able to use lab space and instruments they might not be able to afford,

license technology, and gain invaluable intelligence from industry peers. All of the largest bioscience metros in the U.S. have both a large research university and research hospital.

Charleston's Assets and Constraints in Bioscience

Assets.

- **A good cross section of R&D assets.** As mentioned, one of the most important functions in the biosciences industry is research and development. The Charleston region is home to a wide variety of research institutions in the academic, federal, and industry sectors. Some of the region's research assets include:
 - *Medical University of South Carolina (MUSC).* MUSC is an academic & research teaching hospital that has experienced booming growth in its R&D expenditures. From '90-'04, R&D grew by 200% at MUSC to \$175 million. In addition to research, MUSC has had 12 spin-off companies formed from MUSC developed technologies in the past several years.
 - *Agriculture R&D.* The region is home to both private and public institutions involved in agriculture R&D. This includes the USDA's U.S. Vegetable Lab, which performs research in genetically modified plants, and Arborgen, a private company that is working with the local Forestry Industry on transgenic tree innovations.
 - *Aquaculture R&D.* The Hollings Marine Lab is a center for marine R&D that is comprised of five partner institutions. The Laboratory is a "multi-disciplinary institution providing science and biotechnology applications to sustain, protect, and restore coastal ecosystems, emphasizing linkages between environmental and human health." The five partner institutions involved in this effort are: the NCCOS, South Carolina Department of Natural Resources, College of Charleston, National Institute of Standards and Technology (NIST), and the Medical University of South Carolina.
- **A quality education and training system to prepare a sound bioscience workforce.** Both the Citadel and the College of Charleston offer a variety of degree programs in biology and chemistry. Trident Technical College has associate degree programs in Medical Laboratory Technology, which allows students to become accredited laboratory technicians. In addition to these undergraduate and associate degree programs, both the College of Charleston and MUSC offer advanced graduate degree programs in the biological sciences:
 - College of Charleston: *Grice Marine Lab's graduate program in Marine Biology*
 - MUSC: the following graduate programs are offered through its Molecular & Cellular Biology and Pathobiology Program:
 - *Genetics & Development, Structural Biology, Cancer Biology, Cardiovascular Biology, Cell Regulation, Marine Biomedicine, Bio-statistics and Bio-informatics*
- **A strong infrastructure for contract biopharmaceutical manufacturing.** The region has an advantageous infrastructure to attract potential biopharmaceutical manufacturing facilities. Among the region's strengths are a low cost labor force, low electricity and utility costs, abundant water supply, and relatively low land costs in the rural areas of the 3-County Region.

- **A small but growing bioscience cluster in Charleston.** While the Charleston region does not yet have an above average cluster concentration (i.e. $LQ > 1$), the cluster exists and is expanding. Currently, the 3-County area is home to 65 biosciences companies. Employment grew by 13% from 1998-2003 and currently stands at just over 2,300. This cluster has the potential to be constantly strengthened by spin-off technologies from MUSC and the subsequent formation of start-up businesses.
- **Statewide bioscience assets and a new emphasis on growing the biosciences in the state.** The State of South Carolina has placed new emphasis on the growing biosciences cluster. The State's Life Sciences Act, although possibly targeted at investments that are too large and unlikely to occur in small stage bioscience companies, is a step in the right direction in attracting contract biopharmaceutical operations if its investment and job numbers are scaled back. Likewise, the State's Venture Capital Act, which uses state tax credits to fund private venture capital in the state, could provide critical funding to emerging biosciences companies.
- **A new statewide collaboration focused on increasing health sciences research, accelerating economic development, and improving public health and patient care.** The South Carolina Health Sciences Collaborative (SCHSC) joins together the state's largest universities and health systems to create a research foundation to provide a structure and vehicle for medical research, including clinical trials conducted by the universities and hospitals. By pooling their resources, the member organizations hope to increase funding from other sources such as the State's Life Sciences Act, the federal government, national research foundations and private entities.

Constraints.

- **Almost no venture capital funding.** Bioscience companies need access to equity funding from seasoned investors that understand the intricacies of the industry. The state's Venture Capital Act could help spur venture capital investing in the state.
- **Limited wet lab space.** There is currently a limited supply of fully developed and usable wet lab space in the 3-County Region. These facilities are critical for small research oriented biosciences firms. However, with the recent renovation of the Baker Hospital Complex in Charleston, the region does have a potential location that is currently being utilized for wet lab space and that could be further developed into a larger bioscience wet lab facility. This facility should be analyzed in more detail to determine its suitability and potential to be the site of a full-fledged bioscience research park.
- **A lack of appropriately targeted incentives.** Although, the Life Sciences Act is a step in the right direction, it only provides incentives for companies that make a minimum investment of \$100 million or more and create at least 200 jobs. The majority of firms in the biosciences industry are small, less than 50 employees. Even the larger biopharmaceutical manufacturing facilities do not reach this level of investment or job creation.
- **The region lacks a bioscience focus and a clear group leader.** While the region has a number of dispersed bioscience assets, it will be important to focus on niche sectors where Charleston can set itself apart. This is especially important because Charleston has a bit of work to do to catch up with other regions. By targeting, Charleston can compete more effectively in those specific niches and does not have to rival the comprehensive bioscience development that is offered in San Diego (for example).

Final Niche Targets

1. Contract Research Organizations

Definition: A contract research organization (CRO) specializes in performing clinical and laboratory research services, as well as product development for client companies that have ownership of the process, product, or patent. The services performed by these organizations span the entire range of possible research areas.

Why a fit? Charleston can leverage its research assets and young labor pool coming out of MUSC. These companies tend to be smaller (<25 employees) and not geographically tied to a particular region of the country. Location decisions can be driven largely by quality of life.

Type of Target: *Recruitment / Retention*

Organization responsible: *CRDA for recruiting potential outside companies*
Three Counties and Chambers of Commerce for retention efforts of companies present in the region

Timeline: *Immediate (6-12 months)*

2. Clinical Testing Organizations

Definition: A clinical testing organization, similar to a CRO, provides outsourced support to other biopharmaceutical companies, typically drug developers. The clinical testing organization can handle all or just certain stages in the clinical trial process that is mandated by the FDA for drug approval. This requires identifying and screening test subjects, performing testing in accordance with FDA procedures, and certification of results.

Why a fit? Clinical Testing Organizations usually prefer to locate in an area with access to a large percentage of young residents. Younger individuals are more likely to agree to take part in clinical trials. Often, these companies locate in close proximity to a large 4-year university to pull testing candidates from the large group of young students. Charleston has a relatively large young populace that is bolstered by the presence of many undergraduate institutions.

Type of Target: *Recruitment / Retention*

Organization responsible: *CRDA for recruiting potential outside companies*
Three Counties and Chambers of Commerce for retention efforts of companies present in the region

Timeline: *Immediate (6-12 months)*

3. Contract Biopharmaceutical Manufacturing

Definition: A biopharmaceutical manufacturing organization provides outsourced manufacturing services to drug makers to scale up the production of drugs or biopharmaceuticals. Many drug discovery bioscience companies are small and

do not have the financial means to support capital-intensive manufacturing equipment. For these companies, the ability to outsource production is critical.

Why a fit? Relative to many pharmaceutical production locations in the Northeast, Charleston is a low cost manufacturing alternative. That, coupled with an abundance of water / wastewater make Charleston a good fit. These facilities also employ a larger number of employees that can be semi-skilled technicians, rather than highly educated master's or PhD level employees.

Type of Target: *Recruitment / Retention*
Organization responsible: *CRDA for recruiting potential outside companies
Three Counties and Chambers of Commerce for retention efforts of companies present in the region*
Timeline: *Immediate (6-12 months)*

4. Agribusiness, Nutraceuticals

Definition: Agribusiness refers to the use of biotechnology to modify agricultural feedstocks to be more enhanced. This could be an enhancement of crop productivity, resistance to disease, or a genetic modification for added human health benefits. Nutraceuticals is the use of food or agricultural inputs to provide health and medical benefits, including the prevention and treatment of disease.

Why a fit? Charleston can connect its agricultural base in more rural areas of the 3-County Region with its growing bioscience research assets. Arborgen, a Charleston-based company is a firm that is already succeeding in the agribusiness sector. The company has pioneered transgenic tree applications that benefit the forestry industry. The region is also home to the USDA U.S. Vegetable lab, which performs research on genetically modified plants.

Type of Target: *Entrepreneurship & Recruitment / Retention*
Organization responsible: *Entrepreneurship will drive the development of this niche (organization unknown, perhaps the formation of a new Biosciences Industry Organization can be the umbrella group)
CRDA for recruiting potential outside companies
Three Counties and Chambers of Commerce for retention efforts of companies present in the region*
Timeline: *Intermediate (1-3 years)*

5. Aquaculture, Marine Biomedicine

Definition: Aquaculture is the growth of aquatic organisms in a controlled environment. It allows scientists to study the uses for biotechnology in increasing the production of marine food products on a massive scale. Marine biomedicine refers to the study of marine ecosystems, including plant and marine life, to identify potential therapeutic discoveries in marine life that would be applicable to human health.

Why a fit? Charleston is home to the Hollings Marine Lab, a \$23 million federal facility that combines five partner institutions primarily for the study of marine ecosystems with the goal of discovering biomedicine applications. This is a one of a kind institution in the U.S. that not only attracts federal research dollars, but also attracts and educates PhD candidates, scientists and clinicians.

Type of Target: *Entrepreneurship & Recruitment / Retention*

Organization responsible: *Entrepreneurship will drive the development of this niche (organization unknown, perhaps the formation of a new Biosciences Industry Organization can be the umbrella group)*

CRDA for minimal recruiting

Timeline: *Long-term (3-5 years or beyond)*

6. **Bioinformatics**

Definition: The science of informatics as applied to biological research. Informatics is the management and analysis of data using advanced computing techniques. Bioinformatics is particularly important as an adjunct to genomics research because of the large amount of complex data this research generates. (*Bio.org definition*)

Why a fit? Charleston can leverage the master's level program currently in place in bioinformatics at the MUSC. In addition, the College of Charleston is slated to unveil its *Discovery Informatics* undergraduate degree program, which will be the first of its kind in the U.S.

Type of Target: *Entrepreneurship & Recruitment / Retention*

Organization responsible: *Entrepreneurship will drive the development of this niche (organization unknown, perhaps the formation of a new Biosciences Industry Organization can be the umbrella group)*

CRDA for minimal recruiting

Timeline: *Long-term (3-5 years or beyond)*

Biosciences Specific Recommendations

1. *Develop a wet lab incubator and bioscience park.*

The availability of usable and affordable lab space is critical for biosciences companies in any stage of their development. But, this space at affordable rates or even partially subsidized is critical for seed stage bioscience companies. The presence of wet lab space could be a powerful draw for emerging companies to relocate to Charleston, or could act as an incubator for companies to commercialize MUSC spin-off technologies.

2. *Grow entrepreneurial and capital networks.*

The availability of capital and a strong entrepreneurial support network are critical components to grow the biosciences cluster. The state's Venture Capital Act should be supported and amended so that it incentivizes earlier stage, smaller bioscience companies. It will begin to build the venture capital base in South Carolina, a state that is woefully behind other states in this area. Access to venture capital will be a draw for entrepreneurs outside the state as well as an incentive for local entrepreneurs to stay in the state to launch their ventures.

3. *Amend and promote the State's Life Sciences Act.*

This legislation is a good signal that the State of South Carolina is active in its pursuit of the biosciences industry. Unfortunately, the investment and job creation targets associated with the Act are far too aggressive for the types of biosciences companies that the state should be targeting. Even some of the largest bio-manufacturing facilities do not reach the \$100 million, 200-job creation level. More appropriately targeted incentives would include: ***R&D tax incentives, escalated depreciation schedule on lab equipment, and subsidizations on wet lab lease costs.*** MUSC and Charleston's economic development leaders should actively lobby the State to amend and pass this legislation.

4. *MUSC must be a leader in this initiative.*

For the biosciences to grow in Charleston, there must be a concerted effort that utilizes all of the dispersed bioscience-related assets in the region. This includes academic and federal labs, emerging private companies, and institutions of higher learning. To bring these groups together requires a visible and highly regarded leadership institution. MUSC should be that leader in Charleston. MUSC should drive the formation of a **biosciences industry group** in the region, similar to successful programs like BIOCUM in Southern California. It should also play a vocal advocacy and lobbying role both at the local and state level in support of growing the biosciences cluster.

5. *Expand degree offerings at the Low Country Grad Center: mechanical, computer, biomedical, and electrical engineering.*

Bioengineering is an important segment of the biosciences cluster. This field covers a range of applications in medical devices, patient monitoring, advanced tissue engineering, prosthetics, drug delivery, genetic mapping, and the list could go on. Bioengineering typically requires engineers with specialized advanced degrees such as master's degrees in bioelectricity, biomechanics, bioinformatics, biochemistry, and biophysics. These degree programs should be studied on a case by case basis to determine the local demand and availability of quality candidates, as well as the likelihood of partnership opportunities with state academic institutions such as MUSC, Clemson, and USC.

Bioscience Benchmarks

1. Richmond, VA.

Richmond is home to the Virginia BioTechnology Research Park, which is a dynamic biosciences community strategically headquartered in the downtown area. The presence of this park has helped to give the region a growing presence in the biosciences. The lead economic development organization for the Richmond, VA region is the **Greater Richmond Partnership, Inc.**, www.grpva.com.



Overview of E.D. Activities

The Greater Richmond Partnership, Inc. is an economic development effort representing Chesterfield, Hanover, and Henrico counties and the City of Richmond, Virginia both domestically and globally. It operates an American office staffed by 10, a European office, and a Korean office. Funding comes from the governments of the four partners and from approximately 300 local businesses. Services provided include site selection assistance, information and research support, public relations services, and relocation services.

A mission statement and six guiding principles direct the Partnership's efforts. Its mission is "to deliver significant global investment and business expansion to one of American's most dynamic communities" and its guiding principles are:

1. *New business development*
2. *Expansion of regional businesses*
3. *Quality jobs*
4. *Targeted industry and site analysis experience*
5. *Regional knowledge and cooperation*
6. *Highest quality of life*

Bioscience Initiatives

One of Richmond's most important clusters and a target of the Greater Richmond Partnership is the Life Sciences/Biotechnology industry. Richmond boasts a Virginia BioTechnology Research Park adjacent to the Virginia Commonwealth University Medical Center campus and many existing industry leaders such as Boehringer Ingelheim Pharmaceuticals Inc., Commonwealth Biotechnologies, PPD Development, and Insmed.

A primary method by which the Greater Richmond Partnership has been targeting the Life Sciences/Biotechnology industry is through an initiative called Greater Richmond Bio Synthesis. It consists of a quarterly website and newsletter boasting the advantages offered by the region to this industry and reporting news concerning life science technologies, products, and businesses from the Richmond area. In addition, it provides access to the Life Sciences Knowledge Base, a directory and searchable index of Richmond-area life sciences-related resources, businesses, and professionals.

2. **Winston-Salem, NC.**

North Carolina is known for its biosciences cluster in the Research Triangle Park area of the state.

However, the state is making a concerted effort to spread the biosciences to other areas of the state.

The state bioscience organization is **The North Carolina Biotechnology Center**

(www.NCbiotech.org), which is funded by the state's General Assembly, and is one of the most active state-level bioscience centers in the U.S. It provides assistance to the bioscience cluster in many ways including research grants, business consulting, small business incubation, and education. The center has opened a new facility that will be located at the Piedmont Triad Research Park and will cultivate bioscience companies in the Triad region.



The region's main economic development organization is **The Piedmont Triad Partnership**, www.piedmonttriadnc.com.

Overview of E.D. Activities

The Piedmont Triad Partnership is a regional economic development effort anchored by the Triad cities of Greensboro, Winston-Salem, and High Point in central North Carolina. The region is comprised of the 12 counties surrounding these cities:

- Alamance
- Caswell
- Davidson
- Davie
- Forsyth
- Guilford
- Montgomery
- Randolph
- Rockingham
- Stokes
- Surry
- Yadkin

A staff of seven runs the Partnership: a president, a senior vice president, two vice presidents, a research manager, an executive secretary, and an administrative assistant. The Partnership exists to market the Triad region both domestically and internationally to claim business investment and new job creation. To leverage its own economic development efforts, the Partnership teams with both the North Carolina Department of Commerce and local economic development organizations in providing services to site selectors and local businesses.

Bioscience Initiatives

They are currently targeting their economic development activities toward biotechnology as this industry, as well as those of medicine, high tech, banking, and higher education, are the industries driving the region's recent growth. Overseas companies setting up U.S. operations are among the biotechnology firms attracted to the area. German firm MWG Biotech, for example, established a base in High Point and quickly expanded, building a second site in Greensboro.

A boost to the region's biotech attraction efforts will likely be felt this year when the new Federal Express Mid-Atlantic cargo-sorting hub opens at the Piedmont Triad Airport. Other key selling points for the region include:

- 25% state tax credit for research and development,
- Ranked the 3rd hottest real estate market in the U.S. for expanding and relocating companies, and
- Ranked #1 business climate by Site Selection magazine

Benchmark Data Comparison

Biosciences Benchmarks	Charleston MSA	Richmond, VA	Winston- Salem, NC
Total Population, 2004	578,667	1,044,749	1,308,695
Total Population, 2000	548,986	996,504	1,251,512
Total Population, 1990	506,837	865,640	1,050,312
Population Growth:			
1990 - 2004	14.2%	20.7%	24.6%
2000 - 2004	5.4%	4.8%	4.6%
Total Civilian Labor Force 16+	316,795	552,854	690,745
Unemployment rate	4.5%	4.1%	4.7%
Average Wage 2003	\$31,186	\$36,670	\$33,780
Average Wage 2001	\$28,887	\$35,879	\$31,730
Wage growth: '01-'03	8.0%	2.2%	6.5%
Gross Metro Product(GMP)-\$Bn	\$17.0	\$50.4	\$50.6
Growth in GMP, '00-'03	12.3%	15.5%	7.7%
Median Age	35	37	37
% Age 25-44	30.0%	29.2%	29.0%
% without HS diploma	18.8%	17.5%	21.7%
% with bachelor's degree or higher	24.9%	29.0%	22.6%
Median Household Income	\$42,708	\$50,774	\$44,098
Average Cost of Living	98.4	100.8	92.7
Average Rent	\$722	\$750	\$611
Average Home Price	\$233,846	\$228,701	\$223,394
Total R&D State Rank*	29	13	16
Venture Capital Funds, '00-'04 (\$M)	\$17.8	\$35.6	\$45.7
Top Personal Income Tax Rate	7.00	5.75	8.25
Top Corporate Tax Rate	5.00	6.00	6.90
Property Tax Rate	2.96	2.81	2.35
Sales, Gross Rec., Excise Tax	2.88	2.38	2.88
Workers Compensation rate	1.82	1.5	2.17
Unemployment Tax rate	1.42	1.41	2.82

* Total R&D funds from Industry, Academia, and Federal Government; Source: NSF