

Shaping Infinity

BEATA D. KOCHUT
Research Analyst
and
JEFFREY M. HUMPHREYS
Director
Selig Center for Economic Growth



THE GEORGIA LIFE SCIENCES
INDUSTRY ANALYSIS 2009

Shaping Infinity

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For more information:

Selig Center for Economic Growth
www.selig.uga.edu

Georgia Bio
www.gabio.org

Major contributor to *Shaping Infinity*
Lorena Akioka, Editor

From the President of Georgia Bio

Georgia Bio (GaBio) welcomes you to the fourth annual *Shaping Infinity*, the Georgia Life Sciences Industry Analysis 2009. This year's report not only provides data and commentary on the progress of the state's life sciences companies, but also features the first-ever study of the economic impact of the life sciences industry on Georgia.

The Georgia Life Sciences Industry Analysis 2009 was produced by the University of Georgia's Selig Center for Economic Growth in the Terry College of Business. Selig Center Director Dr. Jeffrey Humphreys conducted the economic impact study. This study shows the life sciences industry is responsible for more than 62,000 jobs with an annual economic impact of \$16 billion.

In addition, Governor Sonny Perdue and Georgia Department of Economic Development Commissioner Kenneth Stewart have written articles on the state's efforts to support the life sciences industry. Articles describing the breakthrough research and product development in Georgia also feature:

Solvay Pharmaceuticals President and CEO Stephen Hill;

Georgia State University President Mark Becker;

Georgia Center of Energy Innovation Director Jill Stuckey;

Georgia Institute of Technology's Mark Allen, Vice Provost for Research and Innovation, and James Meindl, Director of the Nanotechnology Research Center; and

Quintiles' Dan Brown, Vice President and General Manager Quintiles North American Laboratories, and Andrew Cunningham, Executive Director of Quintiles Southeast Clinical Development Services.

In the pages that follow, *Shaping Infinity* also plots the growth of Georgia's life sciences industry by examining trends over the past four years. Publication of the report coincides with the 2009 Biotechnology Industry Organization International Convention, May 18-21, in Atlanta. This is the largest biotechnology convention in the world. It is a reflection of the dramatic growth in Georgia's life sciences industry that this international convention is in Georgia and the Southeast for the first time.

GaBio is a private, non-profit association representing 300 life sciences companies, universities, research institutes, government groups, and other business organizations. The organization sincerely thanks this year's sponsors—Georgia Department of Economic Development and Georgia Allies—and the Selig Center for making this report possible.

Charles Craig, President
Georgia Bio
www.gabio.org

Georgia: The Crossroads of Global Health



*The Honorable Sonny Perdue
Governor of Georgia*

Georgia's life sciences industry is in a uniquely enviable position. Our state is taking the world stage by hosting the annual BIO International Convention in May. We are the crossroads of global health: a national leader in connecting life sciences developments with healthcare, agriculture and bioenergy, and our universities and research centers are helping pave the way. We are capitalizing on an unbeatable combination: global reach, vast reserves of talent and a spirit of collaboration that helps life sciences ventures succeed.

All areas of our state play key roles in helping to heal, fuel, and feed the world—from Georgia's Innovation Crescent, which stretches from Atlanta to Athens, to cutting-edge bioenergy facilities across Middle and South Georgia. The state's Centers of Innovation support Georgia's strategic industries, including Life Sciences, Agriculture, Energy, and Manufacturing. The Centers help connect companies and entrepreneurs with leading research and resources to grow their businesses.

We have the assets that life sciences companies need to grow. Our state's global connections start with the world's most efficient airport, an unmatched transportation network, the nation's fastest-growing port and the most wired city in the U.S. Georgia is home to more than 100 consulates, international trade offices, and bi-national chambers of commerce to help companies connect with colleagues around the globe.

Georgia's 300-plus biosciences companies come from a broad range of sectors, including pharma, biotech, medical devices, diagnostics, R&D, ag-biotech and biofuels. Our state has a wealth of talent to fill the employee roster at any life sciences firm. Each year, 44,000 Georgians graduate from institutions of higher learning like the University of Georgia, Emory University, and Georgia Tech. And Georgia Quick Start, the nation's top workforce training program, prepares employees with customized training that is free to the employer.

We are also home to a unique set of non-profit global health institutions. The Centers for Disease Control and Prevention, CARE, the Carter Center, the American Cancer Society, and the Arthritis Foundation are all world-class organizations that are based in Georgia.

What is perhaps most remarkable is the energetic collaboration that is so frequent and productive in Georgia. The Georgia Research Alliance helps bring top research talent to the state to work with Georgia's biosciences companies. Georgia Tech and Emory University have a biomedical engineering program that is ranked second in the nation. In addition, our state's many business incubators provide priceless space, equipment, and mentoring to early-stage companies.

With all of this talent working together and drawing on international resources, it's no surprise that Georgia's life sciences industry is on the rise.

Georgia has a business-friendly environment that encourages growth. Our corporate tax rate—6 percent—has not changed since 1969 and we are the first state in the Southeast to introduce a single factor tax rate. We are continually seeking new ways to make investing in Georgia the best decision for life sciences companies. I invite you to learn more about how Georgia can help your company grow.

Executive Summary

The Selig Center's analysis shows that Georgia's life sciences industry is relatively young, and it is home grown, with the largest group of firms established between 1997 and 2007. Over 80 percent of the surveyed companies for which data were available are headquartered in Georgia. Atlanta, Athens, and Augusta are the hubs of the state's life sciences industry.

In 2007, private establishments in the life sciences industries provided 15,190 jobs, over \$961 million in wages, and an average annual wage of \$63,317. In addition to jobs in life sciences core industries, 2,751 jobs were provided by agricultural life sciences industries.

The analysis of data from the U.S. Bureau of Labor Statistics shows that Georgia's life sciences industry has grown much faster than the state's overall economy. Fast-paced growth not only means more job openings, but talent and performance are more likely to be rewarded in growth industries than in stable or declining industries. From 2001 to 2007, the number of life sciences jobs grew twice as fast as the number of jobs in all industries. Life sciences jobs rose by 10.6 percent compared to 5.3 percent for all industries. Even though life sciences jobs grew faster than the state's overall job count, the pace of job growth slowed considerably between 2005 and 2006. Moreover, in 2007, employment in the life sciences industry decreased for the first time since 2001. Also, the percentage increase in total wages lagged behind the average increase for all industries. Still, between 2006 and 2007, the number of establishments in Georgia's life sciences industry grew faster than the number of establishments in the state's overall economy.

By subsector, the primary drivers of life sciences job growth were medical and diagnostic laboratories, surgical appliance and supplies manufacturing, and life sciences R&D. Pharmaceutical manufacturing also contributed to job growth, but at a slower pace. Finally, it should be noted that the emergence of a sizable group of bio-fuel and bio-energy firms was a new development that boosted life sciences employment in Georgia.

Another way to look at Georgia's life sciences jobs is to

focus on occupational employment rankings. Based on the 2007 data, Georgia ranks high in terms of the number of jobs in many life sciences occupations. It is:

- 4 among the states in the number of animal scientists;
- 7 in the number of zoologists;
- 8 in the number of microbiologists;
- 8 in the number of foresters;
- 13 in the number of biological scientists; and
- 13 in the number of forensic science technicians.

Indeed, Georgia does not rank below 30 in the number of jobs for any life sciences occupation.

Georgia's life sciences industry pays very well, too. In the private sector, the average annual salary in the state's life sciences fields was \$63,317 in 2007. All life sciences subsectors pay better than the statewide average of \$42,178 for all industries.

Pharmaceutical manufacturing was the highest paying subsector at \$89,672 per year. Surgical and medical instrument manufacturing was the second highest paying subsector at \$71,031 per year. Research and development companies was third, paying \$70,185 annually.

Salaries in Georgia's major life sciences occupations compare well to salaries paid in other states. For example:

- Georgia's medical scientists earn the highest median annual salaries in the nation: \$130,650;
- microbiologists rank third nationally – \$81,220;
- soil and plant scientists rank seventh – \$67,580;
- chemists rank tenth – \$67,820; and
- biological scientists rank eleventh – \$65,120.

But, in some life sciences occupations, Georgia's median annual salaries rank relatively low. For instance, pay for environmental science and protective technicians rank 42 among the states.

Economic Impact Highlights

The fundamental finding of this study is that Georgia's life sciences companies contribute substantially to the state's

economy, and that translates into jobs, higher incomes, greater production of goods and services, and higher revenue collections for state and local government.

The statewide economic impacts of the life sciences industry in 2007 were:

- 17,941 jobs in life sciences companies;
- 62,033 jobs in all industries (including life sciences);
- \$16 billion in output (sales);
- \$6.2 billion in state GDP;
- \$3.6 billion in labor income (earnings); and
- \$517 million in tax revenues for state and local governments.

In addition, life sciences research at the state's colleges and universities generated the following impacts in fiscal year 2006:

- 14,919 jobs on- and off-campus;
- \$1.3 billion in output (sales);
- \$807 million in state GDP;
- \$616 million in income (earnings);
- \$61 million in tax revenues for state and local governments.

On average, for every direct job created by life sciences companies, an additional 2.5 jobs are created in other industries. So the bottom line is that one job out of every 68 in the state owes its existence to either the life sciences industry or to life sciences research and development. The statewide estimates excludes the 6,500 jobs at the Centers for Disease Control and Prevention in Atlanta, however.

Survey Highlights

Life sciences companies in Georgia tend to be small in employment size, with 39 percent of responding companies having fewer than ten employees. Companies employing between 11 and 20 and between 21 and 50 employees make up 20 percent, and 17 percent of the surveyed companies, respectively. Companies employing over 50 staffers account for 23 percent of surveyed companies.

Finding and hiring specialized managers and skilled technicians is considered the most pressing labor force issue. In contrast, the availability of skilled researchers is considered a strong point.

Twenty-seven out of 47 companies responding in 2008 planned to add a total of 228 new jobs in the coming year, the majority of them in sales, marketing, and office support (74 jobs), research and technology (58 jobs), and manufacturing (50 jobs). Compared to prior years, Georgia's life sciences companies appear to be shifting their primary focus from hiring scientists and technologists to hiring sales, marketing, and other support staff.

Products and Focus

Medical devices, pharmaceutical, and diagnostics firms are most common among the surveyed companies, with manufacturing and R&D highlighted as the most prevalent occupations. Between 2006 and 2008, the surveyed companies have had 348 products under development or pending approval and report 414 marketed products. The product pipeline to the FDA is fairly well stocked, which is likely to result in more marketed products in the coming years.

Cancer, infections, and neurological conditions are the most commonly cited targets for pharmaceutical, biopharmaceutical, and diagnostic firms. General hospital devices, cardiovascular, neurological, and radiological devices are the most common specialties among the medical devices firms. Biologics companies identified therapeutics, blood, vaccines, cell cultures, and research materials as their main products.

Funding

The distribution of companies according to their Georgia-generated revenues remained fairly constant from 2006 to 2008 with about 70 percent of companies falling within the lowest range of \$10 million or less. In 2008, 51 percent of respondents reported operating at a loss, compared to 43 percent in 2007, and 56 percent in 2006. The majority of the compa-

nies that generated income between 2006 and 2008 reported income of \$1 to \$5 million.

Survey respondents reported over \$977 million in capital raised between 2003 and 2005, followed by \$991,405,472 raised between 2006 and 2008.

Founders, private equity, partnerships, grants, and venture capital top the list as the most common sources of funding.

Access to capital was considered as critical or very important by 48 percent of survey respondents. Seventeen percent of them considered access to capital to be a strong point of operating in Georgia, while 44 percent considered it to be a weakness.

Georgia's Business Environment

Life sciences companies identified the cost of living, quality of life, labor force, and infrastructure as the most important factors for their operations. While the majority of respondents considered the quality of life a strong point in Georgia, the availability of specialized managers was identified as a weakness. Infrastructure was considered to be a strong point, or an issue of no concern, by 60 percent of respondents, while 40 percent considered it a weakness.

In both 2006 and 2007, traffic problems and the airport were identified as the two top infrastructure issues. Although traffic was still the top infrastructure issue in 2008, the availability of water moved to second place, displacing the airport, land use, and the cost of energy.

The proximity to academic institutions is vital to the operations of life sciences companies in Georgia. Indeed, 52 percent of the 2006-2008 survey respondents reported university affiliations. The Georgia Institute of Technology and Emory University in Atlanta, and the University of Georgia in Athens were identified as the most likely to cooperate with the life sciences industry, with licensing, and technology transfer identified as the most common forms of cooperation.



For the past three years, the Georgia Life Sciences Industry Survey was sent to nearly 300 companies, and 111 companies responded. One hundred of these companies are still active. The tabulations for the 227 companies in this analysis include data for 100 survey respondents (2006-2008) and an additional 127 companies for which data were obtained from publicly available sources.

Life Sciences Industry Overview

The life sciences industry uses modern biological techniques and supporting technologies with a goal to improve human and animal health, address threats to the environment, improve crop production, contain emerging and existing diseases, and improve currently used manufacturing technologies. These industries also utilize a specialized workforce, manufacturing procedures and facilities, and often require targeted funding.

This broad definition encompasses biotechnology, pharmaceuticals, diagnostics and medical devices branches, as well as the agricultural, bio-fuel and bio-energy industries, as they all are a part of the state's life sciences base that reaches from the high tech labs at the leading universities to manufacturing facilities scattered around the state.

General Trends

The growth of the life sciences industry in Georgia has been captured by the U.S. Economic Census, which reported that the number of life sciences companies in the state climbed by 30 percent from 1997 to 2002, with the largest jump—77 percent—reported in life sciences research and development. While the industry's annual payroll almost doubled, the number of paid employees increased by 33 percent, with the highest—almost triple-fold—growth occurring in blood and organ banks and life sciences R&D. At the same time, industry-wide sales jumped by over 30 percent. In 2002, Georgia ranked

fourteen in the number of life sciences establishments and had the eighteenth largest private sector workforce of its kind in the country.

The most recent U.S. Bureau of Labor Statistics data show that the number of life sciences companies kept increasing through 2007, but, for the first time since 2001, the number of employees fell by 0.9 percent (140 jobs) in 2007 compared to 2006. According to this source, Georgia's life sciences sector employed 15,190 people in 2007: 3,283 in surgical, electro-medical and electrotherapeutic instruments manufacturing, 6,674 in medical and diagnostic laboratories and blood and organ banks, and 1,971 in life sciences research and development. Since the BLS data report only private employment covered by unemployment insurance, the actual size of the life sciences industry workforce is much larger, and includes, for example, 6,500 employees of the Centers for Disease Control and Prevention.

Although a relatively small part of the state's economy, Georgia's life sciences industry as a whole expanded at a much faster pace than the rest of the state's economy between 2001 and 2007. The number of life sciences establishments increased by an impressive 48 percent (compared to the 17.4 percent average for all industries), employment jumped by 10.6 percent (compared to the 5.3 percent all-industry average), and total wages jumped by over 41.6 percent, compared to the 26.4 percent increase in the state's economy as a whole.

Although the 2006-2007 percentage increase in the number of life sciences industry establishments outpaced the growth in the rest of the economy by 2.9 percent, employment

in the industry decreased for the first time since 2001, and the percentage increase in total wages lagged behind the state average.

Medical and diagnostic laboratories, the largest of the Georgia's life sciences sectors, provided 5,260 jobs and over \$248 million in wages in 2007. Although employment in this field had increased at an average 4.7 percent annual rate of growth since 2001, and reported a 2001-2007 increase in employment second only to the R&D firms, the pace of growth slowed down to 0.5 percent in 2006 and 2.3 percent in 2007. Total wages increased by 7.5 percent in 2007, just below the annual average of 7.6 percent (2001-2007), and the 2001-2007 growth in the number of medical and diagnostic laboratories was the strongest in the industry.

Although the 2001-2007 growth in medical and diagnostic laboratories fueled the job growth in the sector as a whole, the average wage in this sector increased by a modest pace of 2.9 percent on average, annually. In 2007, however, the average salary in this field jumped by 5.1 percent, from \$44,962 to

\$47,237. But even with this increase, this salary was the lowest in the life sciences; however, it was still higher than the all-industry average for the state (\$42,189).

Altogether, the electromedical, surgical and medical instruments manufacturing subsectors provided 3,283 jobs in 2007, a 3 percent loss from 2006, and had fewer employees in 2007 than in 2001. Despite shedding workers in 2006 and 2007, the largest of the medical devices specialties—surgical appliance and supplies manufacturing, (2,296 jobs)—still provided more jobs in 2007 than in 2001, however.

Pharmaceutical and medicine manufacturing, which provides 3,262 jobs and close to \$300 million in wages (21.5 percent and 30.4 percent of the life sciences industry total, respectively), also shrank in 2007, albeit by a tiny margin of 0.3 percent (9 jobs). The 2007 job losses followed a modest 1.2 percent increase in 2006. Even though pharmaceutical manufacturing lagged the state's average increases in annual wages by over 3 percent in 2007, this group still enjoys the highest average salary in the life sciences. In fact, at an annual salary

Table 1
The Life Sciences Industry in Georgia, 2007

	Number of Establishments	All Employees	Average Annual Pay (\$)	Total Wages (\$000)
Total, all industries	270,337	4,077,184	42,178	171,966,831
Life sciences industries*				
Pharmaceutical and medicine manufacturing	49	3,262	89,672	292,504
Medicinal and botanical manufacturing	4	ND	ND	ND
Pharmaceutical preparation manufacturing	35	2,398	94,019	225,441
In-vitro diagnostic substance manufacturing	8	343	99,653	34,189
Other biological product manufacturing	2	ND	ND	ND
Electromedical apparatus manufacturing	8	242	62,643	15,160
Surgical and medical instrument manufacturing	11	745	71,301	52,941
Surgical appliance and supplies manufacturing	53	2,296	64,422	147,907
Research and development in the life sciences	136	1,971	70,185	141,359
Medical and diagnostic laboratories	432	5,260	47,237	248,452
Blood and organ banks	27	1,414	44,880	63,464
Core life sciences industry total	716	15,190	63,317	961,787
Agricultural life sciences industry total	77	2,751	NA	NA

*Estimated by the Selig Center for Economic Growth, Terry College of Business, The University of Georgia.
Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages, preliminary, 2007.

Table 2
Dynamics of Growth in Georgia's Life Sciences Industry

	2006-2007 Change (Percent)		
	Number of Establishments	All Employees	Total Wages (\$000)
Total, all industries	3.4	1.3	5.8
Pharmaceutical and medicine manufacturing	2.1	-0.3	1.1
Electromedical apparatus manufacturing	14.3	2.5	8.5
Surgical and medical instrument manufacturing	10.0	-2.1	-2.8
Surgical appliance and supplies manufacturing	6.0	-3.9	21.8
Research and development*	-8.4	-6.1	-3.5
Medical and diagnostic laboratories	13.4	2.3	7.5
Blood and organ banks	-6.9	-1.2	-27.3
Life sciences industry total	6.3	-0.9	1.9

	2001-2007 Change (Percent)		
	Number of Establishments	All Employees	Total Wages (\$000)
Total, all industries	17.4	5.3	26.4
Pharmaceutical and medicine manufacturing	28.9	2.9	47.5
Electromedical apparatus manufacturing	-11.1	-40.8	-16.6
Surgical and medical instrument manufacturing	0.0	-18.8	-8.0
Surgical appliance and supplies manufacturing	17.8	8.3	70.4
Research and development*	48.0	44.4	72.9
Medical and diagnostic laboratories	69.4	31.4	55.6
Blood and organ banks	-20.6	-19.1	-17.4
Life sciences industry total	48.0	10.6	41.6

*Estimated by the Selig Center for Economic Growth, Terry College of Business, The University of Georgia.

Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages, preliminary, 2007.

of \$89,672, pharmaceutical manufacturing pays over twice as much as the average salary in the state (\$42,189). Average salaries in pharmaceutical manufacturing have increased by 6.2 percent annually since 2001, one of the steepest increases in the life sciences industry.

Life sciences R&D employed 1,971 people and paid over \$141 million in annual wages in 2007 (13 percent and 14.7 percent of the life sciences industry total, respectively). This sector's employment expanded at a rapid 6.3 average annual rate of growth between 2001 and 2007 (fastest in the industry), but, for the first time since 2001, it too lost jobs in 2007 (6.1 percent or 129 jobs). The average annual salary in this sector expanded only at half the pace of the Georgia average (2.3 percent), however, which was slightly below the 2001-2007 average rate of growth.

The average annual salary for those (including professionals, manufacturing workers, and administrative support) in the private sector of the industry reached an estimated \$63,317 in 2007, up 2.8 percent from the previous year. The average annual salary of \$89,672 in pharmaceutical manufacturing topped the sector's pay scale but exhibited only a modest increase of 1.4 percent in 2007. Salaries in medical devices manufacturing ranged from \$62,643 to \$71,031 while those working in life sciences R&D earned \$70,185.

Economic Impact

The life sciences industry is both a pillar of and a driver of the state's economy that translates into jobs, higher incomes, greater production of goods and services, and higher revenue collections for state and local government.

The statewide economic impacts of the industry in 2007 were:

- 17,941 jobs in life sciences companies;
- 62,033 jobs in all industries (including life sciences);
- \$16 billion in output (sales);
- \$6.2 billion in state GDP;
- \$3.6 billion in labor income (earnings); and
- \$517 million in tax revenues for state and local governments.

In addition, life sciences research at the state's colleges and universities generated the following impacts in fiscal year 2006:

- 14,919 jobs (on- and off-campus);
- \$1.3 billion in output (sales);
- \$807 million in state GDP;
- \$616 million in income (earnings); and
- \$61 million in tax revenues for state and local governments.

On average, for every direct job created by life sciences companies, an additional 2.5 jobs are created in other industries. In fact, one job out of every 68 in the state owes its existence to either the life sciences industry or to life sciences research and development.

The economic impact of Georgia's life sciences industries probably is most easily understood in terms of its effects on employment. In 2007, Georgia's life sciences supported 62,033 full- and part-time jobs. This means that the life sciences industry directly or indirectly accounts for 1.2 percent of the state's total employment (5.2 million jobs), or about one out of every 85 jobs. Of the 2007 total employment impact, 17,941 jobs represent direct employment in life sciences industries or the direct economic impact; 44,092 jobs constitute the indirect and induced effect of direct employment (spending), or the multiplier (re-spending) impact. Dividing the 2007 total job impact (62,033 jobs) by the direct job impact (17,941 jobs) yields an average multiplier value of 3.5. On average, for every job created directly by life sciences industries, there are an additional 2.5 jobs that exist because of spending related to the core life sciences fields. The high employment multiplier reflects both above-average salaries in many life sciences occupations as well as a relatively high degree of interaction between the life sciences and the state's overall economy.

The core life sciences group accounts for 69 percent of the total employment impact, or 42,842 of the 62,033 jobs. Within this core, medical and diagnostic laboratories have the largest direct employment impact (5,260 jobs), but due to its very high employment multiplier (5.4), the pharmaceutical and medicine manufacturing sector generates the largest total employment impact (17,688 jobs).

The agricultural life sciences group accounts for 31 percent of the total employment impact, or 19,191 of the 62,033 jobs. Within this group, other basic organic chemical manu-

Table 3
Employment Impact of Life Sciences Industries
on Georgia's Economy in 2007

Industry Sector	NAICS CODE	Direct Employment (jobs)	Total Employment Impact (jobs)
Core Life Sciences Industries			
Pharmaceutical & Medicine Manufacturing	325400	3,262	17,688
Electromedical Apparatus Manufacturing	334510	242	775
Surgical & Medical Instrument Manufacturing	339112	745	2,087
Surgical Appliance & Supplies Manufacturing	339113	2,296	5,449
Research & Development	541710	1,971	3,904
Medical & Diagnostic Laboratories	621500	5,260	10,198
Blood & Organ Banks	621991	1,414	2,741
Total Core Industries		15,190	42,842
Agricultural Life Sciences Industries			
Wet Corn Milling	311221	0	0
Soybean Processing	311222	261	3,911
Other Oilseed Processing	311223	241	3,927
Ethyl Alcohol Manufacturing	325193	175	844
Other Basic Organic Chemical Manufacturing	325199	977	4,709
Cellulosic Organic Fiber Manufacturing	325221	0	0
Nitrogenous Fertilizer Manufacturing	325311	257	943
Phosphatic Fertilizer Manufacturing	325312	264	1,336
Fertilizer, Mixing Only	325314	64	157
Pesticide & Other Ag. Chemicals	325320	512	3,364
Total Agricultural Life Sciences Industries		2,751	19,191
Grand Total, Life Sciences Industries		17,941	62,033

Notes:

The U.S. Bureau of Labor Statistics provided estimates of direct employment, but to preserve confidentiality direct employment for Soybean Processing, Other Oilseed Processing, Ethyl Alcohol Manufacturing, Phosphatic Fertilizer Manufacturing, and Fertilizer Mixing industries were not disclosed. The reported values for these industries were imputed by the Selig Center based on the number of establishments (which was disclosed), data disclosed at other levels of industrial aggregation, and national averages regarding employment per establishment.

Employment includes both full-time and part-time jobs. The Selig Center estimated total employment impacts using the IMPLAN Professional Modeling System, version 2.0. Type SAM multipliers were provided by MIG, Inc. The region was defined as the State of Georgia.

Source: Selig Center for Economic Growth, Terry College of Business, University of Georgia.

facturing has the largest direct and total employment impacts, followed by other oilseed processing, soybean processing, and pesticide and other agricultural chemical manufacturing.

In addition to the employment impacts of the life sciences themselves, academic research and development generates a substantial employment impact. In FY 2006, the direct and total employment impacts of life sciences academic R&D were 9,807 jobs and 14,919 jobs, respectively. The job multiplier for academic research and development is 1.5, which is considerably lower than the average multiplier of 3.5 for the state's life sciences companies, reflecting a lesser degree of interaction with the local economy (as well as lower salaries) than is true of life sciences as a whole.

In combination, the total employment impact of the life science industries (62,033 jobs) plus academic research and development (14,919 jobs) equals 76,952 jobs, or 1.5 percent of total statewide employment in 2007. Hence, one out of every 68 jobs in Georgia owes its existence to either the life sciences industry or to life sciences academic research and development.

Measured in the simplest and broadest possible terms, the total output impact of Georgia's life sciences industry was \$16 billion in 2007. Of the total, \$9.5 billion is direct spending by the companies that comprise life sciences industry, while \$6.5 billion represents the indirect and induced effects of re-spending or the multiplier effect (i.e., the difference between output impact and direct spending). The average output multiplier is 1.69, obtained by dividing the total output impact (\$16 billion) by direct spending (\$9.5 billion). On average, therefore, every dollar of direct spending by life sciences companies generates an additional 69 cents for Georgia's economy. Thus, for all life sciences industries, the output impact is 1.69 times greater than initial direct spending. Output multipliers that exceed 1.5 are considered to be relatively strong. With the single exception of the fertilizer mixing sector, all of Georgia's life sciences sectors have output multipliers higher than 1.5. The life sciences sectors with the highest multipliers were other oilseed processing, R&D, and electromedical apparatus manufacturing.

The core life sciences group generates an output impact of \$9.3 billion, or 58 percent of the \$16 billion total output impact. Pharmaceutical and medicine manufacturing accounts for a major portion—\$5.4 billion or 58 percent—of the combined output impact.

Agricultural life sciences generate an output impact of \$6.7 billion, or 42 percent of the total output impact. Among

them, the other basic organic chemical manufacturing subsector generates the largest output impact (\$2 billion), followed by soybean processing (\$1.3 billion), and pesticide and other agricultural chemical manufacturing (\$1.2 billion).

According to the National Science Foundation, direct spending for academic life sciences research and development was \$698 million in FY 2006, which generated a total output impact of \$1.3 billion. The output multiplier was very strong—1.88.

By comparison, the \$16 billion output impact of the life sciences industry is larger than the output impact generated by the University System of Georgia (\$11 billion in FY 2007), but it is smaller than that of the state's forestry industry (\$28.5 billion in 2007).

State GDP (value added) impacts exclude expenditures related to foreign and domestic trade. Consequently, they provide a much more accurate measure of the actual economic benefits flowing to businesses and households in Georgia than the more inclusive output impacts. In 2007, the state GDP impact for Georgia's life sciences industry was \$6.2 billion, which represents approximately 1.6 percent of Georgia's GDP.

Georgia's core life sciences sectors generated \$4.3 billion in state GDP in 2007, with pharmaceutical and medicine manufacturing making the largest (\$2.2 billion) contribution. Agricultural life sciences companies contributed \$1.9 billion to Georgia's GDP, led by other basic organic chemical manufacturing's contribution of \$497 million. In addition to these amounts, in FY 2006, \$698 million in academic spending for life sciences R&D generated \$807 million in state GDP.

The life sciences industry also generated \$3.6 billion in labor income impacts: the core group produced \$2.6 billion in labor income, and the agricultural group contributed \$1.1 billion in labor income. In addition, life sciences academic research and development generated \$617 million in labor income for Georgia's economy in FY 2006.

The impact of Georgia's life sciences industry on tax collections by state and local governments was \$517 million, with core life sciences occupations generating \$323 million and agricultural life sciences generating \$194 million. Academic R&D generated tax collections of \$61 million for state and local governments in FY 2006.

The distribution of the employment impacts generated by core life sciences sectors shows that the impacts are heavily concentrated in three areas of Georgia's economy. Health

Table 4
Direct Spending, Output, State GDP, and Labor Income Impact of
Life Sciences Industry on Georgia's Economy in 2007
(in 2007 dollars)

Industry Sector	Direct Spending	Total Output Impact	Total State GDP Impact	Total Labor Income Impact
Core Life Sciences Industries				
Pharmaceutical & Medicine Mfg	3,242,449,920	5,363,542,708	2,221,368,210	1,216,200,789
Electromedical Apparatus Mfg	97,441,024	175,982,069	63,489,732	45,303,171
Surgical & Medical Instrument Mfg	268,751,040	447,357,262	253,909,926	157,493,876
Surgical Appliance & Supplies Mfg	668,703,040	1,091,312,551	575,967,367	346,291,987
Research & Development	236,477,376	468,526,806	258,514,998	215,816,298
Medical & Diagnostic Laboratories	790,537,152	1,384,706,638	746,900,667	486,583,964
Blood & Organ Banks	212,513,216	372,238,619	200,782,811	130,804,124
Total Core Industries	5,516,872,768	9,303,666,653	4,320,933,711	2,598,494,209
Agricultural Life Sciences Industries				
Wet Corn Milling	0	0	0	0
Soybean Processing	769,979,840	1,290,027,220	337,785,910	199,467,367
Other Oilseed Processing	528,736,928	1,051,549,063	342,280,793	193,514,742
Ethyl Alcohol Mfg	204,677,696	353,519,533	89,021,658	52,655,524
Other Basic Organic Chemical Mfg	1,142,686,336	1,970,709,987	496,995,229	293,968,247
Cellulosic Organic Fiber Mfg	0	0	0	0
Nitrogenous Fertilizer Mfg	348,297,728	458,365,487	124,524,778	58,865,651
Phosphatic Fertilizer Mfg	232,463,456	388,060,872	101,801,786	69,180,740
Fertilizer, Mixing Only	32,364,024	45,864,158	12,792,826	7,874,767
Pesticide & Other Ag. Chemicals	702,697,600	1,153,558,108	392,747,060	175,295,353
Total Agricultural Life Sciences Industries	3,961,903,608	6,711,654,428	1,897,950,040	1,050,822,391
Grand Total, Life Sciences Industries	9,478,776,376	16,015,321,081	6,218,883,751	3,649,316,600

Notes: See Table 3.

Source: Selig Center for Economic Growth, Terry College of Business, University of Georgia.

and social sciences (21.1 percent); manufacturing (18.3 percent); and professional, scientific, and technical services (10.9 percent) account for high percentages of the total employment impact attributable to life sciences' spending. Manufacturing

(17.5 percent), wholesale trade (12.8 percent), and transportation and warehousing (10.8 percent) account for much of the total employment impact attributable to spending by agricultural life sciences companies.

Table 5
Impact of Georgia's Life Sciences Industry on Tax Collections
by State and Local Government in 2007
(in 2007 dollars)

Industry Sector	Total State & Local Tax Impact
Core Life Sciences Industries	
Pharmaceutical & Medicine Mfg	171,400,768
Electromedical Apparatus Mfg	6,045,618
Surgical & Medical Instrument Mfg	17,446,064
Surgical Appliance & Supplies Mfg	39,218,852
Research & Development	20,060,394
Medical & Diagnostic Laboratories	54,445,868
Blood & Organ Banks	14,636,209
Total Core Industries	323,253,773
Agricultural Life Sciences Industries	
Wet Corn Milling	0
Soybean Processing	45,695,782
Other Oilseed Processing	43,252,784
Ethyl Alcohol Mfg.	8,067,247
Other Basic Organic Chemical Mfg	44,971,216
Cellulosic Organic Fiber Mfg	0
Nitrogenous Fertilizer Mfg	10,092,149
Phosphatic Fertilizer Mfg	9,420,749
Fertilizer, Mixing Only	1,070,284
Pesticide & Other Ag. Chemicals	31,610,626
Total Agricultural Life Sciences Industries	194,180,837
Grand Total, Life Sciences Industries	517,434,611
Notes:	
Tax impacts were estimated by the IMPLAN Professional System, version 2.0 based on the estimates of direct employment reported in Table 3. Type SAM multipliers were provided by MIG, Inc. The region was defined as the State of Georgia.	
Source: Selig Center for Economic Growth, Terry College of Business, University of Georgia.	

Table 6
Economic Impact of Georgia's Core Life Sciences Industry
by Impacted Industry in 2007
(in 2007 dollars)

Impacted Industry Sector	NAICS	Total Output Impact	Total Employment Impact
Ag., Forestry, Fish & Hunting	11000	22,323,877	300
Mining	21000	1,160,155	4
Utilities	22000	96,876,398	143
Construction	23000	28,409,740	247
Manufacturing	31-33000	4,694,465,183	7,845
Wholesale Trade	42000	409,533,897	2,083
Transportation & Warehousing	48-49000	171,828,772	1,788
Retail Trade	44-45000	244,396,098	3,556
Information	51000	190,214,382	578
Finance & Insurance	52000	290,158,654	1,353
Real Estate & Rental	53000	333,122,877	1,335
Prof., Scientific, & Tech. Services	54000	650,449,498	4,665
Management of Companies	55000	245,403,084	1,175
Administrative & Waste Services	56000	157,233,299	2,851
Educational Services	61000	35,803,239	584
Health & Social Services	62000	1,200,864,485	9,052
Arts Entertainment & Recreation	71000	31,920,476	576
Accommodations & Food Service	72000	148,550,866	2,568
Other Services	81000	104,023,747	1,925
Government and non NAICs	92000	246,927,934	221
		9,303,666,661	42,849

Notes:

The output and employment impact estimates reported in Table 6 include impacts generated by the core life sciences industries and do not include impacts generated by agricultural life sciences industries, which are reported in Table 7. Totals may differ slightly from those reported in elsewhere due to the effects of rounding by industry sector.

Output and Employment impacts were estimated by the IMPLAN Professional System, version 2.0 based on the estimates of direct employment reported in Table 3. Type SAM multipliers were provided by MIG, Inc. The region was defined as the State of Georgia. Output refers to the value of total production (business sales or gross receipts) including domestic and foreign trade. Employment includes both full-time and part-time jobs.

Source: Selig Center for Economic Growth, Terry College of Business, University of Georgia.

Table 7
Economic Impact of Georgia's Agricultural Life Sciences Industry
by Impacted Sector in 2007
(in 2007 dollars)

Impacted Industry Sector	NAICS	Total Output Impact	Total Employment Impact
Ag., Forestry, Fish & Hunting	11000	60,866,762	764
Mining	21000	6,155,874	18
Utilities	22000	119,486,947	169
Construction	23000	27,915,217	241
Manufacturing	31-33000	4,535,028,601	3,355
Wholesale Trade	42000	483,030,231	2,456
Transportation & Warehousing	48-49000	252,746,451	2,079
Retail Trade	44-45000	105,254,064	1,531
Information	51000	66,985,114	191
Finance & Insurance	52000	165,119,854	779
Real Estate & Rental	53000	107,182,679	542
Prof., Scientific, & Tech. Services	54000	247,749,065	1,590
Management of Companies	55000	110,165,715	528
Administrative & Waste Services	56000	73,562,389	1,198
Educational Services	61000	11,427,255	194
Health & Social Services	62000	85,881,872	983
Arts Entertainment & Recreation	71000	14,483,004	268
Accommodations & Food Service	72000	72,206,191	1,204
Other Services	81000	61,540,026	970
Government and non NAICs	92000	104,867,225	136
		6,711,654,536	19,196

Notes:

The output and employment impact estimates reported in Table 7 include impacts generated by the agricultural life sciences industries and do not include impacts generated by the core life sciences industries, which are reported in Table 6. Totals may differ slightly from those reported elsewhere due to the effects of rounding by industry sector.

Output and Employment impacts were estimated by the IMPLAN Professional System, version 2.0 based on the estimates of direct employment reported in Table 3. Type SAM multipliers were provided by MIG, Inc. The region was defined as the State of Georgia. Output refers to the value of total production (business sales or gross receipts) including domestic and foreign trade. Employment includes both full-time and part-time jobs.

Source: Selig Center for Economic Growth, Terry College of Business, University of Georgia.

Table 8
Economic Impact of
Life Sciences Academic Research and Development
on Georgia's Economy in 2006

Impacted Category	Economic Impacts
Direct Employment (jobs)	9,807
Total Employment Impact (jobs)	14,919
Direct Spending (\$ 2006)	698,145,000
Total Output Impact (\$ 2006)	1,313,822,102
Total State GDP Impact (\$ 2006)	807,245,619
Total Labor Income Impact (\$ 2006)	616,614,837
Total State & Local Government Tax Impact (\$ 2006)	60,640,922

Notes:

Direct Spending for Academic Research and Development for FY 2006 was obtained from the National Science Foundation, Directorate for Social, Behavioral, and Economic Sciences, as reported in Info Brief (NSF 07-336) September 2007.

Output, State GDP, and Labor Income impacts were estimated by the IMPLAN Professional System, version 2.0 based on the estimates of direct employment reported in Table 3. Type SAM multipliers were provided by MIG, Inc. The region was defined as the State of Georgia.

Employment includes both full-time and part-time jobs. Output refers to the value of total production (business sales or gross receipts) including domestic and foreign trade. State GDP, or value added, includes employee compensation, proprietary income, other property income, and indirect business taxes. Labor income includes both the total payroll costs (including fringe benefits) of workers who are paid by employers and payments received by self-employed individuals.

Source: Selig Center for Economic Growth, Terry College of Business, University of Georgia.

2006-2008 Surveys Overview

The Selig Center for Economic Growth identified 316 companies active in the life sciences industry in Georgia in 2009. One hundred of these companies responded to the 2006-2008 Georgia Life Sciences Industry Survey. Data for 127 non responding companies was gathered from publicly available sources. The results of the survey were published each year in *Shaping Infinity*, the Georgia Life Sciences Industry Analysis, and presented at the annual Georgia BIO Summits in Atlanta. This year's publication presents the review of the data gathered

by the annual surveys. By combining three years of data, we are providing the broadest coverage of the industry, covering over 30 percent of the identified companies. The survey was sent to only a sample of diagnostic labs active in the state.

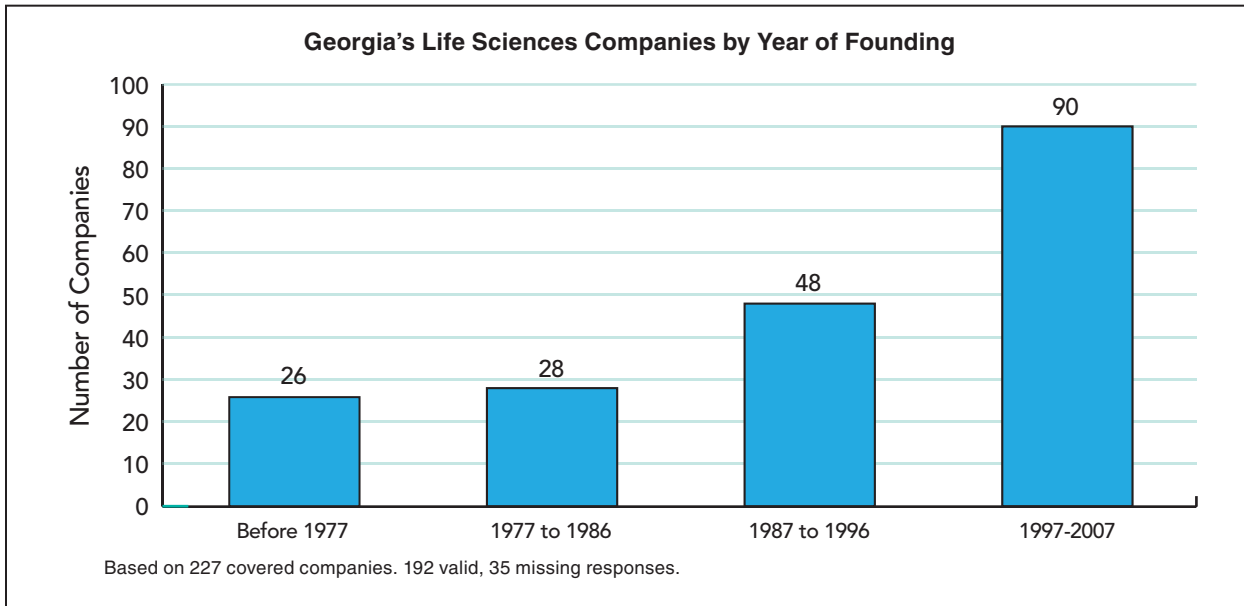
The life sciences industry's growth in Georgia has been fast paced, recent, and mostly homegrown. In fact, 47 percent of the companies for which data are available, were founded in the last decade, and over 80 percent of them are headquartered in Georgia.

Table 9
Life Sciences Companies in Georgia, by Location, 2009

MSA	Number of Companies
Atlanta	230
Albany	2
Athens	32
Augusta	18
Columbus	2
Dalton	2
Gainesville	3
Macon	4
Rome	1
Savannah	2
Valdosta	2
Warner Robins	1
Non metropolitan areas	17
Total	316

Table 10
Life Sciences Companies by Primary Product

MSA	Number of Companies
Medical devices and technology	104
Pharmaceutical, biopharmaceutical, therapeutics (inc. veterinary)	75
Diagnostics	36
Biofuels, bioenergy	19
Biotechnology	16
R & D, platform technology, product discovery	16
Services	12
Agricultural, food, nutrition (human and animal)	12
Biologics	8
Industrial, environmental	7
Chemical	4
Health informatics	4
Blood and organ banks	3
Total	316



Trends in Employment and Occupations

Georgia's life sciences industry is a varied field of companies that ranges from manufacturing plants employing more than a thousand workers to small start-ups with a very small staff. The 2006-2008 group of surveyed companies includes a mix of small companies—with less than 10 employees—which comprise the core of the industry (38.8 percent), and larger firms (with between 11 and 50 staffers) making up 36.1 percent of the total. Close to 12 percent of companies have more than 100 employees, including seven with more than 250 employees.

Although the 2008 survey showed that the appetite for workers decreased in 2008 compared to 2007, 27 out of 47 survey respondents still anticipated adding workers in 2008-2009. Sixteen companies planned to maintain current staffing levels, and only one company expected to reduce employment of manufacturing workers and management.

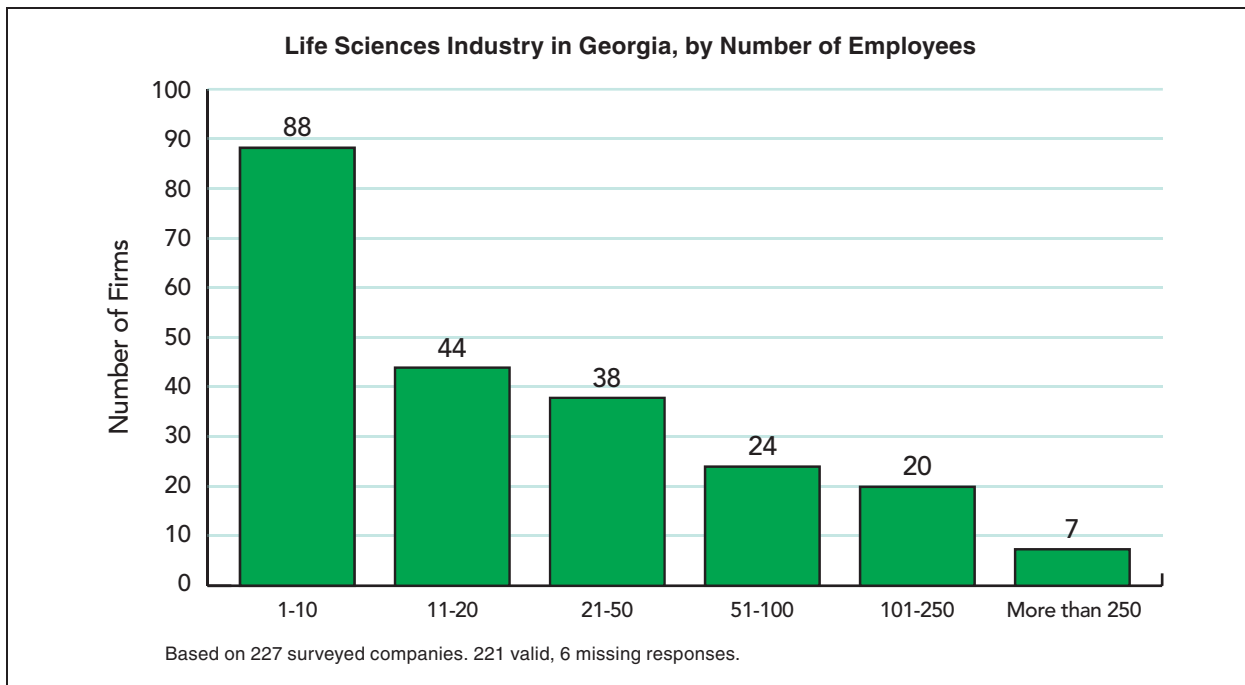
Respondents to the 2008 survey anticipated adding a total of 228 new jobs in 2008-2009. In contrast to 2007, when the majority of new jobs went to scientists and technologists, the majority of new jobs in 2008 and 2009 will be in sales, market-

ing and office support (74 jobs). Fifty-eight jobs will be added in the areas of science and technology. The surveyed companies also anticipate hiring 50 manufacturing workers. Senior and other management positions comprise the fourth largest group of the anticipated new hires (39 jobs), while seven new jobs will bolster regulatory and legal staffs.

Since our first survey in 2006, a top concern of industry executives has been the availability of a skilled workforce. Fifty percent of respondents deemed this a crucial issue for their operations, and 34 percent considered it a major challenge. In 2007 and 2008, however, survey respondents said that a vital factor was finding and hiring specialized managers and skilled technicians for their companies. While opinions were somewhat split on whether the availability of skilled technicians is a strongpoint or a weakness in Georgia, most respondents agreed that there are not enough specialized managers in the state.

The availability of skilled researchers, on the other hand, is considered very important or critical to the operations of over 50 percent of the responding companies, and most saw this as either a strongpoint or an issue of no concern in Georgia. In fact, the availability of researchers received the smallest number of negative responses, and should be considered a bright star in the life sciences industry labor force in the state.

The need for managers and technical personnel combined with a perceived inadequate supply of these workers in the state means that prospective new hires could command



**Table 11
Anticipated Changes in Employment, 2008-2009**

	Number of Jobs	Number of Companies	Percent of Valid Cases	Percent of All Cases
No changes in employment		16	36.4	34.0
Expand employment		27	61.4	57.4
Ph.D./M.S. scientists	28	15	34.1	31.9
Bench technologists	30	14	31.8	29.8
Manufacturing workers	50	10	22.7	21.3
Senior management	15	13	29.5	27.7
Management	24	14	31.8	29.8
Regulatory/legal	7	7	15.9	14.9
Sales/marketing	55	16	36.4	34.0
Office support	19	12	27.3	25.5

Based on responses to the 2008 Survey (44 valid, 3 missing).

Table 12
Labor Force Availability in Georgia, 2007-2008

Availability	Importance to Operations		
	Critical	Moderate	Not Important
Technicians	46	22	6
Managers	43	23	6
Researchers	39	26	8
Manufacturing labor	26	18	28
	Percent of Total Valid Responses		
Technicians	62.2	29.7	8.1
Managers	58.1	31.1	8.1
Researchers	52.7	35.1	10.8
Manufacturing labor	35.1	24.3	37.8
	Weakness or Strength in Georgia		
	Weakness		Strength
Technicians	20		25
Managers	28		16
Researchers	14		34
Manufacturing labor	20		17
	Percent of Total		
Technicians	27.0		33.8
Managers	37.8		21.6
Researchers	18.9		45.9
Manufacturing labor	27.0		23.0

Based on 74 valid responses to the 2007 and 2008 surveys.

higher salaries. It also exposes a potential weakness, however, which, in this highly competitive environment, may put Georgia at a disadvantage with firms seeking to relocate. More programs to train managers specifically for the needs of this rapidly expanding industry would be a practical solution.

Survey respondents said the proximity to academic institutions was very important or critical to their operations in Georgia. In fact, 49 out of the combined group of 2007-2008 survey respondents consider it a definite strength in Georgia's business environment, and only four considered it a weakness.

University facilities, research cooperation and technology transfer play important roles in moving cutting edge research out of university laboratories and onto the market. Not surprisingly, over half of the 2006-2008 survey respondents report some kind of university affiliations. Georgia Institute of Technology, Emory University, and the University of Georgia in Athens are most active in this area, with Georgia State

University and the Medical College of Georgia also important players. In addition, Georgia companies collaborate with top research universities in Alabama, Florida, Colorado, Utah, Arizona, and Washington. Some mention specific ties with Cornell University, Columbia University, Duke University, and Johns Hopkins University. Moreover, companies said they had international contacts with research institutions in Canada, South Africa, Great Britain, and Belgium.

Licensing and technology transfers are the most common types of collaboration between life sciences companies and universities. Research collaboration is the second most important, and the use of university facilities is third.

In 2007, Georgia ranked among the top ten in the nation in the number of animal scientists (4), zoologists (7), microbiologists (8), and foresters (8) in the workforce. Out of these categories, microbiologists in Georgia also ranked second and third in the country in terms of average and median annual salaries. Medical scientists, on the other hand, rank lower in

Table 13
University Affiliations of Life Sciences Companies in Georgia, 2006-2008

	Number of Companies
No university affiliations	48
University affiliations	52
The University of Georgia (Athens)	11
Georgia Institute of Technology (Atlanta)	14
Emory University (Atlanta)	14
Georgia State University (Atlanta)	6
Medical College of Georgia (Augusta)	3
Georgia Southern University (Statesboro)	1
Clark Atlanta University (Atlanta)	1
	Number of Institutions
Research institutions in other states	14
Research institutions in other countries	5
Type of association:	
Licensing, patent/technology transfer	17
Contract research/testing	12
Use of facilities	14
Consulting	4
Research collaboration/students	9
Based on 100 responses to 2006-2008 surveys.	

Table 14
Georgia's 2007 Life Sciences Workforce: Employment and Salaries

	Rank*		Total Employment	Mean Annual Salary	Median Annual Salary
	Total Employment	Mean Annual Salary			
Animal scientists	4	14	100	54,090	58,110
Agricultural and food science technicians	14	18	450	36,110	35,090
Biochemists and biophysicists	NA	NA	NA	NA	NA
Biological scientists, all other	13	13	660	66,430	65,120
Microbiologists	8	2	520	85,720	81,220
Biological technicians	25	23	690	35,820	34,240
Chemists	20	14	1210	69,490	67,820
Chemical technicians	15	31	1360	38,950	37,100
Environmental scientists and specialists, including health	27	26	790	58,060	54,190
Environmental science and protection technicians, including health	19	42	620	34,480	32,540
Conservation scientists	29	28	210	58,220	60,100
Foresters	8	17	320	55,160	51,970
Forest and conservation technicians	22	10	290	38,180	36,110
Epidemiologists	NA	25	**	55,640	55,190
Food scientists and technologists	15	21	220	56,380	55,530
Medical scientists, except epidemiologists	30	1	320	132,930	130,650
Soil and plant scientists	13	13	240	64,560	67,580
Zoologists and wildlife biologists	7	40	550	44,820	42,060
Life scientists, all other	17	2	130	108,630	107,680
Forensic science technicians	13	22	230	44,620	37,480

*Ranked by the Selig Center for Economic Growth.

Source: U.S. Department of Labor, Bureau of Labor Statistics, 2007 State Occupational Employment and Wage Estimates.

numbers (30), but earn the highest median annual salaries in the nation. The number of life sciences technicians in Georgia ranks relatively low, compared to other states, however. The annual salaries for this category also rank relatively low, except for forest and conservation technicians who earn the tenth highest average paychecks in the country.

Government institutions are the largest employer of life scientists, followed by life sciences research and development firms, and colleges and universities. Life sciences professionals also find employment in pharmaceutical manufacturing, hospitals, consulting, engineering, and testing services.

(continued on page 32)



Industry Insight

Special Articles Contributed by University and Industry Leaders



Industry Insight

Georgia: Helping Heal, Fuel, and Feed the World

Kenneth C. Stewart
Commissioner
Georgia Department of Economic Development



As Georgia's biosciences assets continue to grow, its reputation as the crossroads of global health continues to develop simultaneously. Georgia is home to the world's premier public health institute, the Centers for Disease Control and Prevention (CDC) as well as the headquarters of the American Cancer Society, CARE, the Carter Center, and the Arthritis Foundation. Our state's ability to capitalize on these existing assets, while creating an environment that attracts new business, demonstrates our commitment to the biosciences industry.

Georgia's research universities are making groundbreaking discoveries, which have significant commercial applications. Georgia State University's Viral Immunology Center focuses on viruses that affect the central nervous system, and it is recognized worldwide for its expertise in testing for the Herpes B virus. The Emory Vaccine Center created one of the most promising HIV/AIDS vaccines, which is licensed and being tested by a Georgia-based company, GeoVax, Inc. Emory University researchers discovered the HIV drug Emtriva, and researchers at the Medical College of Georgia are leading the world's largest study of the determinants of Type 1 diabetes.

Georgia biosciences companies are currently marketing 160 products, with over 300 more in the pipeline. These products cover a variety of fields including AIDS, cancer, heart disease, infectious disease, neurological disorders, diabetes, inflammatory disease, and vaccines. We are proud to know that our research is effectively making the transition to commercial production.

The state is also growing in bioenergy and agricultural biotech. Agriculture has long been Georgia's largest industry. The economic impact of food, fiber, and related industries is estimated at more than \$56 billion, which equates to 16 percent of the state's total economic output. Approximately 11.1 million acres of Georgia's land is devoted to farms, and one in six jobs is supported by agriculture. Further demonstrating the strength of Georgia's agricultural industry is the state's agricultural research facilities. The USDA Agricultural Research Service has an outpost that focuses on infectious diseases of poultry, molecular diagnostics, vaccine development, and food quality/safety. The University of Georgia's Center for Food Safety in Griffin develops new methods for detecting, controlling, and eliminating disease-causing microorganisms and their toxins.

Bioenergy is an emerging field of interest in Georgia. *Forbes* magazine recently ranked the state third in the nation for alternative energy production, recognizing our entrepreneur-friendly culture, reduced tax burden on bioenergy companies, and expedited environmental permits for biofuel plants. Agriculture and forestry combine to generate more than 18 million tons of byproduct biomass, waste material that is ripe for energy production. A significant portion of this is found in Georgia's 24 million acres of forests. Companies such as Rollcast Energy and Oglethorpe Power Company have already announced plans to build dozens of power plants fueled by woody biomass.

As biofuel technologies continue to advance, the state's research institutions are actively pursuing new ways to produce them. The Complex Carbohydrate Research Center at the University of Georgia recently teamed with national partners to win a \$125 million federal grant to research biofuel production.

Biosciences companies are learning that Georgia's vibrant research community, depth of talent, and mix of industry sectors combine to make a formula for success. Georgia clearly has momentum in the biosciences and we intend to continue moving forward alongside this important and growing industry.

Industry Insight

Solvay Pharmaceuticals Embracing Future of Precision Medicine

*Stephen Hill, BM, BCh, MA, FRCS
President and CEO
Solvay Pharmaceuticals, Inc.*



Anyone who has studied the healthcare industry in America will surely appreciate that the future will herald change. The relationship between the overall costs of healthcare and the quality and breadth of its provision appear to require a significant reorganization. We read increasingly frequent reports about how the biopharmaceutical companies of the future will have to work differently.

Innovation is at the heart of our business model and this will not change, at least for those companies that hope to remain successful. Our innovation efforts to date have focused on novel science, novel technologies, and to some degree, novel processes. Yet despite ever increasing investments and a decade of genomics, combinatorial chemistry, high throughput screening, and the identification of novel targets and disease pathways, the number of novel medicines launched is declining.

So what does the future hold for our industry? We know acute and chronic disease will be with us for the foreseeable future. Medicines will continue to play an important role in the overall healthcare of our population. The market for medicines will likely continue to grow as our population ages. Pricing pressures will grow, regulation will get even tighter, but the demand for health and relief from discomfort and disease will remain strong.

Clayton Christensen, a professor at Harvard Business School, has recently applied his research into disruptive innovation to the healthcare industry. In his 2009 book, *The Innovator's Prescription* with fellow authors Jerome H. Grossman, M.D., and Jason Hwang, M.D., Christensen describes the challenges facing all aspects of healthcare provision, ranging from hospitals, to physicians, to regulators, biopharmaceutical

companies, insurers, and industry (the primary purchasers of healthcare) in general. His work is insightful and highlights opportunities for disruptive change. Perhaps most importantly, he points out that innovation at the scientific level will not succeed without innovation in business models. He makes recommendations for how these opportunities can be exploited for the benefit of businesses, patients, doctors and hospitals alike, provided they each change their business models and behaviors. Why is this relevant for a company like Solvay Pharmaceuticals and for a region like Georgia?

For Solvay Pharmaceuticals, it is clear that we need to think carefully about our customers and their needs. Christensen differentiates traditional medicine—the trial and error art of understanding symptoms and trying various treatment—from what he calls “precision medicine.” The latter is the increasing ability to accurately diagnose specific diseases and direct curative treatments. Streptococcal sore throat is an example he uses—once accurately diagnosed it can be specifically treated. As diagnostic tests become more prevalent, precision medicine becomes more achievable and less costly. For Solvay Pharmaceuticals, this means an increasing focus on diagnostics while we continue to pursue therapeutics development. Our recent acquisition of Innogenetics, a diagnostics company, demonstrates our commitment to this area of innovation.

For chronic diseases, Christensen talks about the importance of patient-managed self-support networks. Patients who are connected to an effective network often understand the nuances and details of their disease extremely well. As a company, we need to go beyond simply providing medicines, but also supporting those networks. And we have extensive experience doing just that: for example, our long-standing commitment to the cystic fibrosis community.

What is the relevance of Christensen’s work for Georgia, the home of our U.S. headquarters and a region poised for growth in the industry? A key conclusion of his research is the need for different relationships and roles for the traditional players in healthcare provision. The businesses that provide healthcare to their employees, the hospitals, the insurers, the doctors, the research institutes, the contract organizations, the support systems, all need to reconsider their role in disruptive innovation. Christensen’s earlier work outside of healthcare, and re-emphasized in regard to healthcare, suggests that the leading incumbents struggle to implement disruptive change.

In Georgia we have an emerging, nascent biopharmaceutical industry. We have, through Georgia Bio, an incredible network which connects virtually every aspect of healthcare provision, in a fashion which I suspect may be unique in the country. We have some of the nation’s biggest and best companies headquartered here. We are not yet entrenched in our ways of doing business together and we should not be averse to exploring disruptive innovation together. Our region’s relatively recent focus on biopharmaceuticals as a growth opportunity may therefore turn out to be a strongpoint.

Now is the time to explore novel business models to take advantage of our innovative science. We have all the pieces in Georgia—from the hospitals, physicians, companies and service providers, to universities, science, research institutes and insurers. Can we be innovative in how we connect these pieces in dramatically different, disruptive fashion? I hope and believe we can.

Industry Insight

Georgia Tech Among Leaders in Nanotechnology Research

Mark Allen, Ph.D.
*Senior Vice Provost for
Research and Innovation*

James Meindl, Ph.D.
*Director
Microelectronics Research Center*



The Nanotechnology Research Center (NRC) at Georgia Institute of Technology is an interdisciplinary user research center that is open to all research and development communities from academia and industry.

Nanotechnology research at the NRC ranges in discipline, from electrical, computer, mechanical, chemical, materials and biomedical engineering to physics, chemistry, and biology. The NRC's mission is to establish and maintain nanotechnology resources like fabrication and characterization tools, laboratory facilities, and skilled staff to enable Georgia Tech to be the hub of nanotechnology research in the Southeast, unsurpassed nationally. The mission is also to provide expertise, facilities, infrastructure, and a teaming environment that facilitates interdisciplinary research in nanoscience, nanoengineering, microelectronics, nanobio systems, nano/microfluidics, and micro-electromechanical systems (MEMS and Bio-MEMS).

The NRC is located in the Marcus Nanotechnology Building (MNB) and the Joseph Mayo Pettit Microelectronics Research Building (MiRC). Together, these two facilities provide fully integrated inorganic and organic/biological cleanrooms, supporting labs, equipments, technical expertise, office and meeting space that enable Georgia Tech faculty and students, and non-GT users from academia, state and federal labs and industry to carry out pioneering research in nanoengineering and nanoscience. The Pettit building houses an 8,500 sq. ft. cleanroom (75% class 100, 25% class 10). The Marcus building includes 10,000 sq. ft. inorganic cleanroom space for nanofabrication as well as 5,000 sq. ft. of organic and biological cleanroom space, including biosafety level 1 and 2 labs. The inorganic cleanroom enables users to conduct nanoengineering and nanoscience research. Nano-fabrication and processing capabilities that are available to users in this clean-

room include nanolithography, wet processing, plasma etching, diffusion processes, chemical vapor deposition processes, nanostructure growth and synthesis, and characterization, testing and metrology. The overall MNB cleanroom design contains an organic and biological cleanroom adjacent to the inorganic cleanroom. This rare design of adjacent physical and biological cleanrooms enables a fusion of the top-down (physical) directed assembly approach and the bottom-up (biological) self assembly approach to nanotechnology.

The NRC provides its users with a unique advantage in their research pursuits. NRC research themes include Nanostructures, Nanoelectronics, Bio-MEMS, Biological/Chemical Sensors and Systems, Biomaterials, Biometrology, Photonics, Materials Growth, and Process Chemistry. The NRC actively supports several nanotechnology research themes in Biomedical Engineering and Life Sciences. One of the fastest growing areas of research is the integration of MEMS with biology. The NRC offers a unique possibility for creating highly functional integrated systems that include MEMS, sensors and transducers. The nanostructures and integrated systems that fall under this area of research include metallic and semiconductor quantum dots for cancer diagnosis and treatment, biomedical microsystems, micro patterned substrates for bio-adhesion studies, and scanning electrochemical nanopores. The nano/micro-fabrication processes used to build micromechanical devices and structures, and the application of these devices to engineering problems are actively pursued at NRC. One of the goals of NRC support of bioengineering research is the production of portable, handheld, microchemical and bioanalytical systems—the micro-chem lab-on-a-chip technology. Another important focus area is biosensing. Several biomedical sensor issues including the biocompatibility of surfaces for implantable sensors, microdialysis for subcutaneous sampling, glucose sensors, and DNA sequencing by hybridization are also studied at NRC. Research activity on biomaterials includes micro/nano-scale chemically modified surfaces for cellular adhesion studies, fabrication of bone cell culture scaffolds, and fabrication of high-aspect-ratio (3D) cell culturing scaffolds for tissue regeneration.

The NRC at Georgia Tech is a member of the National Nanotechnology Infrastructure Network (NNIN) and is among 14 elite universities across the nation participating in the network created by the National Science Foundation (NSF). The NNIN is an integrated networked partnership of user facilities serving the needs of the research communities in nanoscale science, engineering, and technology. Currently, NRC supports over 500 users (both internal and external) from academia and industry in their research and development work. The Georgia Tech-NNIN site emphasizes the application of nanofabrication to bioengineering and biomedicine. It is also the center for nanotechnology K-12 educational efforts. The NRC hosts a bi-weekly Nano@Tech seminar series that is focused on promoting nanotechnology research and education. The NRC also hosts NanoFANS (Focusing on Advanced Nanobio Systems), which is a bi-annual forum that meets to connect the medical/life sciences/biology and nanotechnology communities. The goal is to reach out to the biomedical/life sciences communities and inform them about the capabilities that nanotechnology can offer them in the advancement of their research.

For detailed information related to NRC cleanroom facilities and capabilities, please visit our website: <http://grover.mirc.gatech.edu>.

Industry Insight

Georgia State University's New Science Park Will Foster Biotechnology Growth

Mark P. Becker, Ph.D.
President
Georgia State University



Georgia State University is part of Georgia's effort to foster economic growth through attracting and expanding new biotechnology and biomedical enterprises. In 2010, that effort will advance further through the opening of the university's new, state-of-the-art science park in the heart of downtown Atlanta.

The Parker H. Petit Science Center will provide a home for discoveries that will detect and treat diseases, a place for health related inquiry and research, and a training ground for future health professionals and researchers.

The 350,000-square-foot, \$150 million facility will be at the center of Georgia State's research and education mission, an effort that spans from examining the smallest parts of a cell better at detecting cancer, to seeking better treatments for neurological diseases and disorders, such as autism and Alzheimer's disease. The new center will also be an \$800 million economic engine for the local economy, and has been designed to help conserve approximately 2.8 million gallons of water per year.

The science center will be home to the university's continuing research and education programs in biology, chemistry, nursing, nutrition, physical and respiratory therapies, the Institute of Public Health, and the Neuroscience Institute. Additionally, Georgia State's research foci, including three Georgia Research Alliance Centers of Research Excellence, have also set the stage for new initiatives that will help stimulate the growth of the biotechnology industry in Georgia:

Georgia State's Neuroscience Institute seeks to explore the vast mysteries of the mind and brain through interdisciplinary research in multiple fields, such as biology, chemistry, psychology, physics, computer science, and mathematics and statistics. From behavioral disorders, to mapping the brain and discovering brain activity patterns that impact our behavior, the institute is advancing research in an incredibly complex field. The NI is an outgrowth of the NSF funded Center for Behavioral Neuroscience, a center headquartered at Georgia State that brings together scientists from a coalition of seven colleges and universities.

The Center for Biotechnology and Drug Design encourages collaboration between the biotechnology industry and the university with the chief aim of contributing to Georgia's economic development by helping attract and develop new high-tech businesses in Georgia. The center supports initiatives toward commercialization and assists in obtaining major center and program grants from federal agencies through its intellectual property commercialization programs and advanced core facilities.

The Viral Immunology Center conducts investigations of viruses that directly affect the central nervous system. The mission of this center is to better understand the pathogen–host interactions that take place during infection and evolution of clinical disease. The center houses the National B Virus Resource Center, as well as biosafety-level 3 and biosafety-level 4 maximum containment facilities which are uniquely situated in a university setting.

Georgia State's Molecular Basis of Disease initiative works to research diseases at the molecular level. Researchers across multiple departments, including biology, chemistry, computer science, physics, mathematics and statistics, and computer information systems are supported by federal and private grants that fund work on cancer-detecting proteins, as well as enzymes crucial to new anti-HIV/AIDS drugs.

With a research strategy focused on promoting collaborative, cross-disciplinary research and education, and developing strong partnerships with Georgia's life sciences industry, Georgia State is contributing to the development of Georgia's biotechnology and health sciences economy.

Industry Insight

Quintiles Atlanta: Playing A Pivotal Role in the Pharmaceutical Industry

*Dan Brown, Ph.D.
Vice President and General Manager
Quintiles North American Laboratories*

*Andrew Cunningham, Ph.D.
Executive Director
Quintiles Southeast
Clinical Development Services*



Quintiles Atlanta is the worldwide headquarters of Quintiles Global Central Laboratories and home of the Southeast division of Clinical Development Services (CDS) operations. In 2008, the two divisions of Quintiles relocated, bringing the Global Central Laboratories division (formerly in Smyrna, Georgia) and its CDS southeastern office (formerly in Atlanta) to the expanded Marietta, Georgia site. With 201,000-plus square feet of space, the new site is more than twice as large as the two previous locations, providing Quintiles with the ability to add 400 new jobs through 2011.

The parent company, Quintiles Transnational, is the leading Contract Research Organization (CRO) in the world. Pharmaceutical companies use CROs to assist in the development of new drugs. Today, in these pressing economic times, Quintiles is helping the pharmaceutical industry transform its business model for the 21st century, using new technology and improved processes to increase efficiency and get more effective, safer medicines to patients faster.

Quintiles has played a role in the development or commercialization of the top 30 best-selling pharmaceutical products and nine of the top 10 biotech products on the market today. Based in the Raleigh-Durham, NC, “Research Triangle,” the industry giant has facilities in 57 countries, employing more than 22,000 worldwide. The Atlanta facility has approximately 600 employees in Cobb County, Georgia.

Quintiles Global Central Laboratories is committed to providing fully integrated, globally harmonized clinical laboratory services that support all phases of both global and regional clinical trials, while retaining a strong emphasis on patient care. The laboratory division of Quintiles offers one of the broadest areas of geographic coverage in the industry, with owned facilities in the U.S., Europe, South Africa, China, Singapore, and India.

Additionally, Quintiles Laboratories has staff at the College of American Pathologists-certified Medca Laboratory in Saitama, Japan, in addition to sub-contracted facilities in Brazil and Argentina. With the largest global footprint of wholly owned central laboratories in the industry, Quintiles can ensure better control of everything from laboratory kits and sample storage to analytical methods and data capture, as well as uniform instrumentation and SOPs. Quintiles recently acquired Targeted Molecular Diagnostics, strengthening its laboratory offerings in the oncology area.

Clinical Development Services provides clinical trial design and monitoring services for the assessment of safety and efficacy of new drug and medical device development on behalf of pharmaceutical and biotech customers. CDS works with customers to provide clinical study design, identify physicians with appropriate patients, and provide regulatory oversight for these investigator sites. On active studies, research sites are monitored by Clinical Research Associates to ensure patients treated with the drug or device have adequate standards of care and also that the reporting of safety concerns and clinical trial protocol adhere to federal and international regulatory standards.

Industry Insight

Renewable Energy Could Mean \$5 Billion for Georgia In Next Ten Years

Jill Stuckey

Director

Center of Innovation for Energy



The Centers of Innovation program was formed in 2005 as part of Governor Sonny Perdue's Strategic Industry Initiative. Six Centers of Innovation were established to support the expansion of strategic industries in Georgia.

The Center of Innovation for Energy (COI-Energy) was created by Executive Order in April 2008 in response to the surge of renewable energy companies needing assistance. The Center's mission is to increase the production and use of renewable energy in Georgia. We collaborate with the Center of Innovation for Agribusiness (COI-Ag) on bioenergy projects, i.e., those using feedstocks derived from agriculture and forestry. In addition to bioenergy projects, the COI-Energy supports other renewable energy projects, including solar, wind, and waste to energy.

The Center assists companies through direct consultation, introductions to the regulatory and research communities, and strategic industry connections. Assistance is tailored to fit the unique needs of each client company. Engaging new and expanding firms with state and federal environmental regulators early in their business planning can avert obstacles later. The net effect is the expedited commercialization of innovations.

Renewable energy is poised to pump an estimated \$5 billion into the state's economy over the next 10 years. Georgia industries are uniquely positioned to capitalize on the state's abundance of renewable natural resources such as pine forests and agricultural products, along with waste streams from municipalities and industries. Companies gain a competitive edge when paired with the state's research universities, cutting-edge

research facilities, and well-developed highway, rail and shipping systems. With these resources and plentiful feedstocks, Georgia is emerging as an influential leader in the bioenergy revolution.

Market scenarios change rapidly in today's energy economy. The future of the traditional biodiesel facilities is uncertain due to price volatility of the commodity feedstocks and the falling price of competing petroleum diesel.

In contrast, there has been a marked increase in activity in the waste to energy sector, primarily liquid fuels. Some companies deploy anaerobic thermal processes capable of converting plastics diverted from municipal solid waste streams. If these companies are able to come on line during the current recession, they should be able to capitalize on the depressed market for traditional recyclables. Others gasify cellulosic feedstocks and then produce liquid fuel using the Fischer-Tropes process or gas to liquid technologies. These projects are eligible for a federal production tax credit for cellulosic biofuels that went into effect in January 2009.

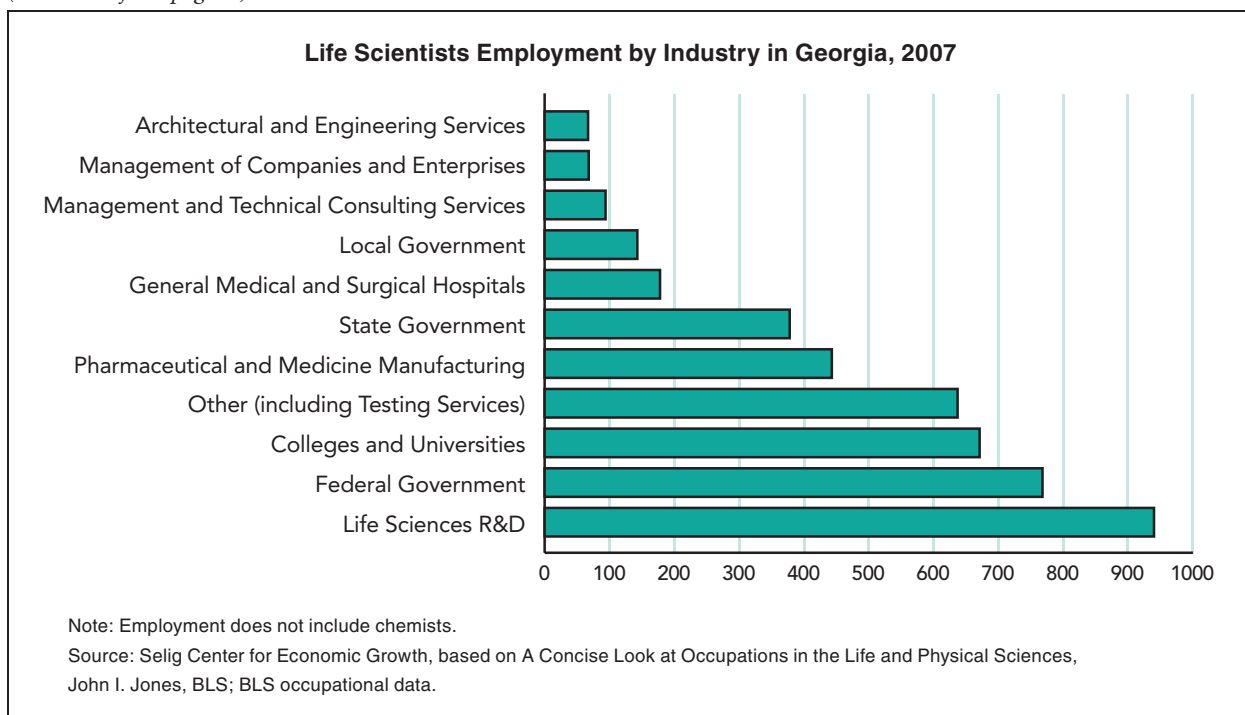
Another trend in Georgia's renewable energy industry is pellet production from woody biomass, which can be easily stored and transported. Ready markets exist in Scandinavia, Western Europe, and more recently in the northeastern U.S. where fuel oil is still widely used for heating. To date, 32 states have established renewable portfolio standards (RPS) mandating increasing percentages of renewable electricity by set target years. A national renewable portfolio standard establishing base level percentages is widely anticipated. If so, or if the trend in state mandates continues, it would bode well for the production of wood pellets or similar bio-based products that could be co-fired in traditional coal fired power plants.

The most significant bioenergy projects announced in the past year are utility scale wood chip-to-electricity plants slated for construction over the next six years. These plants will serve to diversify the state's energy portfolio and will reduce dependence on coal for base load electricity. In addition to increasing renewable energy production, wood chip electricity will enhance energy security in the event of a disruption in the coal supply.

Traditional forest product companies are struggling due to the decline in demand for building materials. Large production facilities for plywood, lumber, and oriented strand board (OSB) have cut production or closed, resulting in layoffs and sidelining suppliers. These companies are actively exploring opportunities to fill a niche within the growing bioenergy industry. They may be able to reposition themselves as suppliers for processed wood feedstock, which could be shipped by rail to bio-refineries, pellet mills, or wood to electricity power plants.

Since July 2007, 16 new bioenergy projects have been publicly announced. If built as planned, this will represent investments of more than \$2.4 billion and create more than 500 direct jobs. The bioenergy industry continues to grow in Georgia, strengthening the economic future of the state.

(Continued from page 17)



Companies and Products

Life sciences companies develop and manufacture drugs, diagnostics, medical devices, and biological substances, and provide related services to other companies or consumers. The areas of focus and product applications include, among others, human and animal health, environment, agriculture, and bio-energy.

Medical and diagnostic laboratories comprise over 54 percent of companies active in the life sciences industry in Georgia; R&D constitutes 17.2 percent; medical devices and supplies manufacturers constitute just under 10 percent, and agricultural and pharmaceutical manufacturing firms provide the balance (9.7 percent and 6.1 percent, respectively).

Devices and pharmaceutical manufacturing firms are the largest group of companies covered by the Georgia Life Sciences Industry Survey, but R&D firms also are well represented. Medical and diagnostic labs are underrepresented, given this sector's relative size in Georgia.

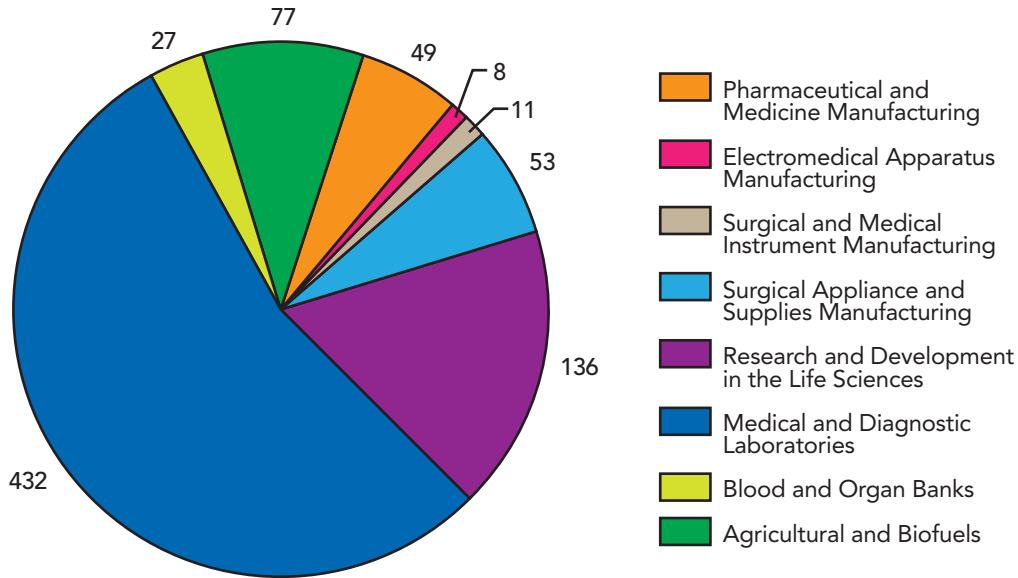
Many companies are involved in more than one type

of production. For example, many firms that specialize in medical devices also handle pharmaceutical and diagnostic products. Pharmaceutical firms are also involved in biopharmaceuticals and biologics. Diagnostics are sometimes paired with medical devices, pharmaceuticals and biologics. Firms that provide services most typically are involved in platform technology and general research technology, too.

The operations of pharmaceutical, biologics, industrial, agricultural and biofuel firms most often include manufacturing and research and development. The majority of medical devices and technology firms are also involved in manufacturing, with sales and R&D important components of their operations. Diagnostic firms, on the other hand, most often operate medical and diagnostic laboratories, although their operations also involve manufacturing and R&D. Life sciences services firms offer R&D, laboratory, biotechnology, and sales and marketing expertise. Sixty out of the 207 companies surveyed in 2007 and 2008 are involved in research and development, which all types of companies utilize in their operations.

In general, cancer, infections, and neurological conditions were the most commonly cited targets for pharmaceutical, biopharmaceutical, and medical diagnostics firms. Pharmaceutical firms tended to focus on inflammations and the

Number of Life Sciences Companies, By Industry, 2007



Source: Selig Center for Economic Growth, based on Bureau of Labor Statistics data, 2008.

**Table 15
Life Sciences Companies by Type of Product**

	Responses	Percent of Cases
Medical devices	82	36.3
Pharmaceuticals/therapeutics	67	29.6
Diagnostics	34	15.0
Biologics	18	8.0
Biopharmaceuticals	17	7.5
Services	14	6.2
Platform technology/discovery	13	5.8
Industrial	11	4.9
General research technologies	10	4.4
Agricultural	9	4.0
Biofuel/bioenergy	6	2.7
Other	5	2.2
Total	286	126.5

Based on 227 companies covered by the 2006-2008 surveys. Multiple choice question. Percentages do not add to 100.

Table 16
Life Sciences Companies by Industry
(Percent)

	Manufacturing	R&D	Biotechnology	Medical And Diagnostic Labs	Blood and Organ Banks	Sales/ Marketing Business Services	Other
Medical devices	68.9	20.3	0.0	2.7	0.0	21.6	2.7
Pharmaceuticals/ therapeutics	56.7	41.7	10.0	0.0	0.0	20.0	1.7
Diagnostics	20.0	13.3	6.7	60.0	6.7	3.3	0.0
Biologics	43.8	62.5	31.3	12.5	0.0	6.3	6.3
Biopharmaceuticals	7.7	53.8	61.5	0.0	7.7	23.1	0.0
Services	0.0	53.8	23.1	30.8	0.0	23.1	0.0
Industrial	33.3	44.4	11.1	11.1	0.0	11.1	0.0
Agricultural	55.6	44.4	0.0	22.2	0.0	0.0	0.0
Biofuel/Bioenergy	83.3	16.7	0.0	0.0	0.0	0.0	0.0
Platform technology/ discovery	20.0	40.0	80.0	0.0	0.0	0.0	0.0
General research technologies	40.0	40.0	60.0	0.0	0.0	0.0	0.0
Other	0.0	33.3	33.3	0.0	0.0	0.0	66.7
Total							
Number	105	60	18	25	2	32	3
Percent	51.7	29.6	8.9	12.3	1.0	15.8	1.5

Based on 207 surveyed companies covered by the 2007-2008 surveys. Multiple-choice question. Percentages do not add to 100.

heart. Medical diagnostics companies concentrated on reproductive, urologic, metabolic, and endocrine conditions.

Amplifying the medical application of the life sciences, medical devices firms that responded to the survey most commonly specialize in hospital, cardiovascular, radiological, neurological, and other diagnostic devices. The reproductive/abdominal devices category is well represented, too, which magnifies the importance of this area of focus in Georgia, since many pharmaceutical and diagnostics firms also specialize in both neurological and reproductive/abdominal conditions.

Georgia companies that focus on biologics most commonly develop and manufacture biological therapeutics, tissue, vaccines, and blood products. Cell cultures, proteins, and research materials are also important. Microchip technology, cell analysis and separation, nanotechnology, and bioinformatics are the most common focus of discovery and platform technology firms.

Life sciences companies that provide services to others in the industry are crucial to the life sciences environment. Most of these companies specialize in contract research and laboratory work, but also offer sales, marketing, and other business services. Still others handle drug screening and development, clinical trials, product design and commercialization, quality assurance, and data management services.

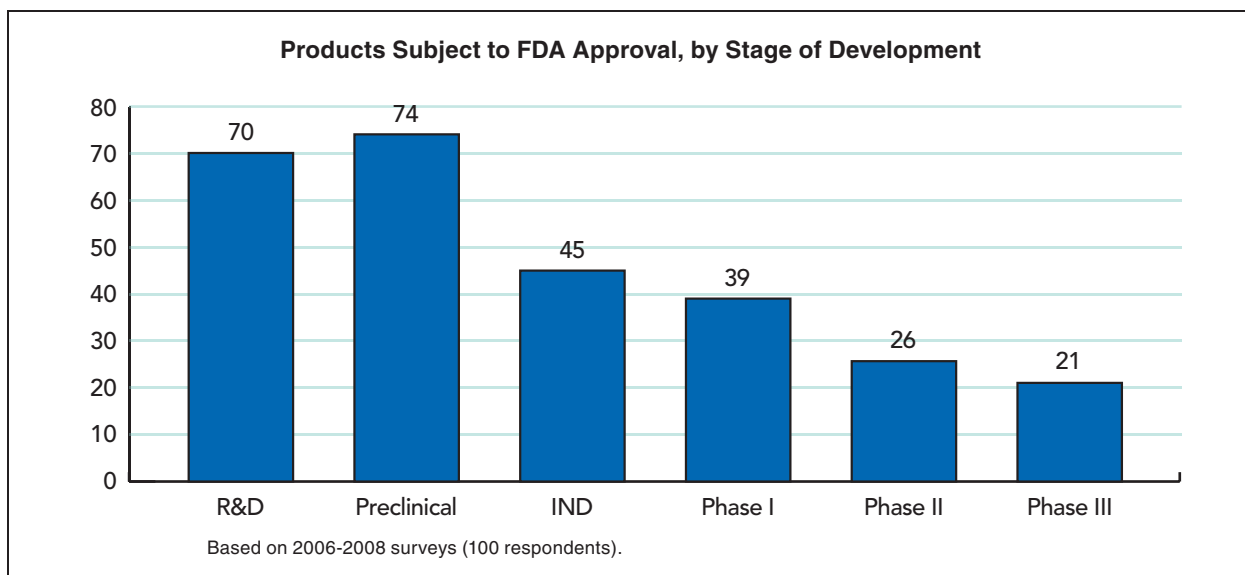
The importance of service providers cannot be overstated. Among the respondents to the 2007 and 2008 survey, only five deemed it unimportant to their company operations, while 31 respondents stated that it was very important or even critical to their companies. Twenty-eight respondents reported that the availability of service providers is one of Georgia's strong points, but 13 considered it weakness.

Between 2006 and 2008, survey respondents had 348 products under development or pending approval, out of which 275 require FDA approval. Luckily, the product pipe-

Table 17
Surveyed Companies by Product Application

Product/Application	Number of Companies	Product/Application	Number of Companies
Agricultural		Industrial/Biofuels/Bioenergy	
Animal food and supplements	2	Biodiesel/ethanol	3
Agricultural testing lab	1	Cellulosic ethanol, methanol & higher alcohols	1
Pesticides	1	Paper	1
Plant nutrition	1		
Poultry research	1	Pharmaceutical	
Agrochemical	1	Oncologic	8
		Anti-infective	15
Biologics		Neuropharmacological	13
Biological therapeutics	7	Inflammatory/analgesic	13
Tissue	6	Cardio-renal	10
Vaccines	5	Metabolic	9
Blood	5	Anti-viral	9
Cell and proteins	4	Endocrine	9
Allergenic	1	Gastrointestinal	8
		Pathogen/immunologic	8
Devices		Pulmonary	7
Hospital devices	34	Dermatologic	6
Cardiovascular	16	Reproductive/urologic	5
General, restorative	14	Ophthalmologic	4
Radiological	14	Coagulation	3
Neurological	13	Dental	3
Clinical/laboratory	11	Anesthetic	2
Reproductive/abdominal	11	Medical imaging	1
Ophthalmic	9	Radiopharmaceutical	1
ENT devices	5		
Respiratory	4		
Infection control	4		
Dental	2		
		Diagnostic (continued)	
Diagnostic		Dermatologic	3
Oncologic	8	Endocrine	3
Pathogen/immunologic	8	Inflammatory/analgesic	2
Reproductive.urologic	6	Pulmonary	2
Neuropharmacological	6	Dental	2
Metabolic	5	Medical imaging	1
Anti-viral	5	Radiopharmaceutical	1
Cardio-renal	4	Ophthalmologic	1
Gastrointestinal	3	Anesthetic	1
Coagulation	3	Addiction	1
Anti-infective	3		

Based on 207 surveyed companies. Multiple-choice question. Numbers do not add up to previously listed totals.



**Table 18
Products By Stage of Development**

	Subject to FDA Approval	Other Products	Total
R&D	70	54	124
In approval	205	19	224
Marketed	88	326	414

Based on 2006-2008 surveys (100 respondents).

line headed to the FDA is fairly well stocked. The relatively low number of products in the earliest stages of development, however, may be a concern, since only a fraction of products in R&D eventually make it into pre-clinical and clinical trials. Survey respondents also reported that 414 products are on the market.

Funding

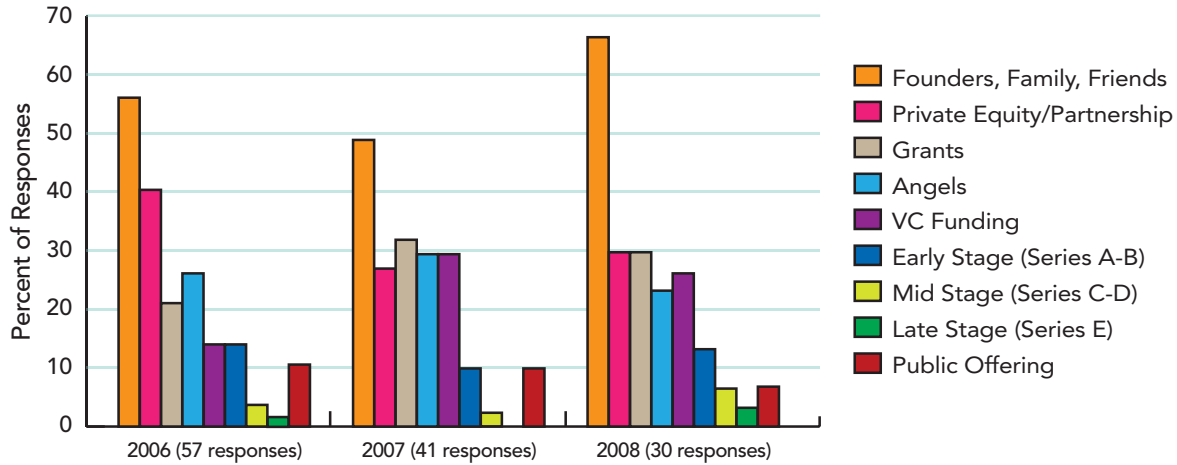
Thirty-nine of the 227 surveyed companies are publicly traded. Overall, the Georgia-generated revenues of these companies remained fairly constant from 2006 to 2008 with about

70 percent of companies, for which data was available, falling within the lowest range of \$10 million or less.

Fifty-six percent of 2006's respondents operated at a loss, compared to 43 percent in 2007, and 51 percent in 2008. But most of the companies that did generate income between 2006 and 2008 said they made between \$1 million and \$5 million.

The operations of life sciences firms whose new products require FDA approval differ from other companies in terms of high development costs and a lengthy approval process. Since this entire process takes an average of 15 years before the product hits the market, access to capital is a major obstacle. This is true especially for young companies with no marketed products. Since so many companies are both young, and are involved in pharmaceutical research and development, the financing challenge is even more pronounced.

Sources of Capital Raised by Georgia's Life Sciences Companies



**Table 19
Venture Capital Raised in Biotechnology, Top 14 States, 2006-2008**

State	Investment (\$)	Deals
California	6,095,821,500	470
Massachusetts	2,638,235,500	242
New Jersey	842,013,200	68
Pennsylvania	825,704,800	88
North Carolina	564,072,200	60
Washington	536,391,400	62
Maryland	388,172,500	71
Connecticut	325,440,500	20
Illinois	302,948,300	30
Colorado	261,815,600	28
Texas	227,198,300	22
New York	180,071,000	30
Michigan	160,312,400	33
Georgia	148,047,100	24

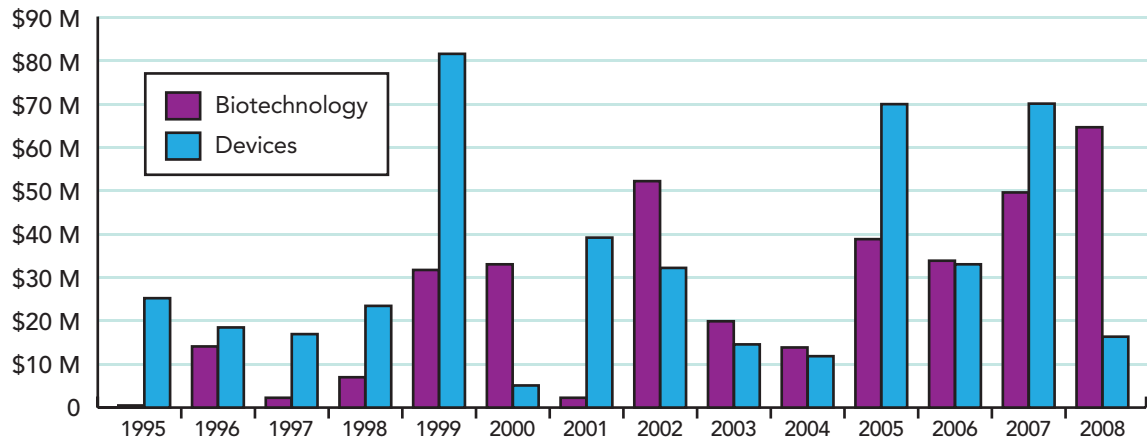
Source: Selig Center for Economic Growth, based on PricewaterhouseCoopers, Money Tree Report.

Table 20
Venture Capital Invested in Georgia's Biotechnology Companies, 1995-2008

	Investment Amount (\$)	Number of Deals	State Rank
1995-2000	88,022,100	15	17
2001-2005	127,356,000	16	13
2006-2008	148,047,100	24	14

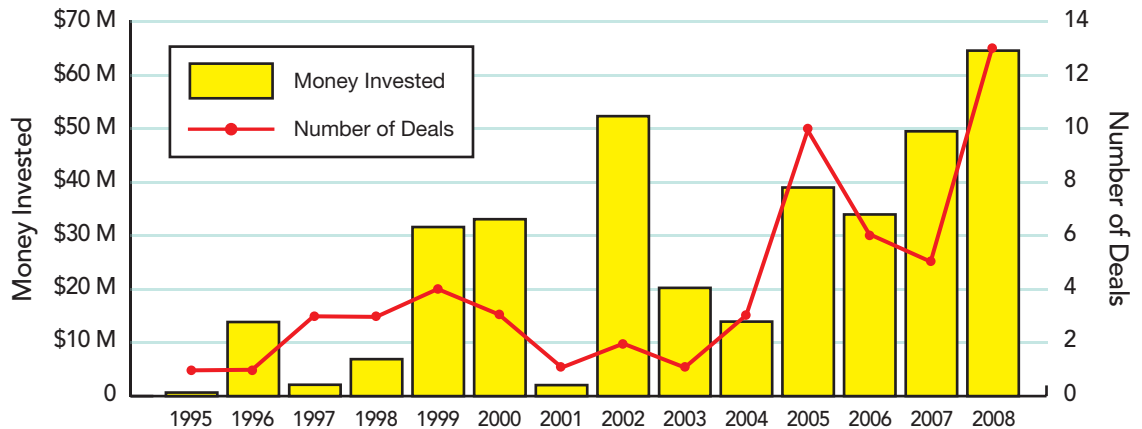
Source: Selig Center for Economic Growth, based on PricewaterhouseCoopers, Money Tree Report.

Venture Capital Invested in Life Sciences Companies in Georgia

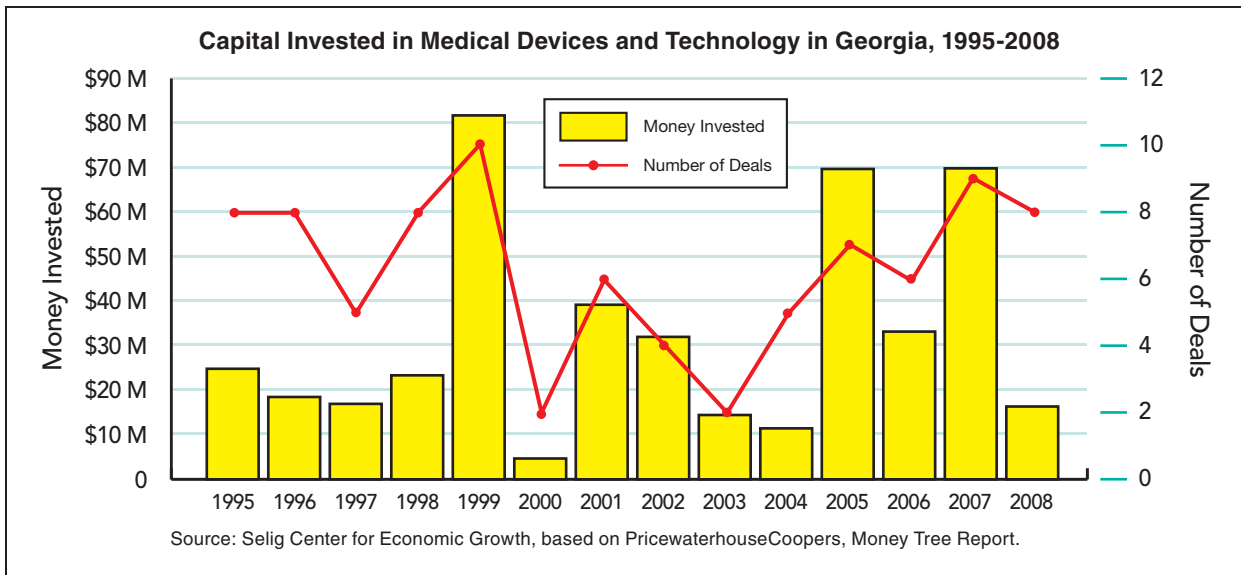


Source: Selig Center for Economic Growth, based on PricewaterhouseCoopers, Money Tree Report.

Capital Invested in Biotechnology Firms in Georgia, 1995-2008



Source: Selig Center for Economic Growth, based on PricewaterhouseCoopers, Money Tree Report.



The survey respondents reported over \$977 million in capital raised between 2003 and 2005. Between 2006 and 2008, they raised another \$ 797,030,499, and expected to raise an additional \$194,374,973 in the remaining three quarters of 2008, for a total of \$991,405,472.

Although founders, family, and friends were the primary source of capital, private equity investment, partnerships, grants, and angel capital were also important. Venture capital was listed as a source of funding by 14 percent of respondents in 2006, compared to 29.3 percent in 2007, and 26.7 percent in 2008.

Private equity and partnerships consistently placed among the most important sources of funding for the survey respondents. In fact, 60 percent of the respondents to the survey were interested in partnerships—and especially in R&D and funding partners. Sales, marketing, and contract manufacturing were also cited as reasons for seeking partnerships.

Nationwide, close to a quarter of the total funding for biotechnology firms comes from venture capital, which is a solid indication of investors' confidence. Between 1995 and 2000, Georgia ranked 17 both in the amount of capital raised and the number of financing deals. The state moved up to 14 in rank in the amount of capital raised between 2006 and 2008, with a total of over \$148 million in venture capital.

Venture capital investment also plays a pivotal role for medical devices and technology firms. In previous years, these

firms were able to raise more capital than biotechnology firms, but beginning in 2000, biotechnology firms in Georgia repeatedly attracted more investment than companies specializing in medical devices.

Medical devices firms raised \$119.4 million in venture capital between 2006 and 2008. Together, biotechnology and medical device firms attracted \$267.5 million during that time.

Access to capital was cited by 36 (48.6 percent) of the respondents as very important or critical to their operations in Georgia. In addition, 33 (44.6 percent) of the respondents said access to government incentives was critically important. While 33 respondents considered access to capital a weakness in Georgia, 13 considered it a strongpoint, and 28 were neutral. The same group of respondents regarded access to government institutions much more positively: 47 considered it a strongpoint or an issue of no concern, and 27 saw it as a weakness.

Georgia's Business Climate

The quality of life, cost of living, infrastructure, and labor force issues top the list of factors that are either critically or very important to life sciences companies' operations in

Georgia. Proximity to academic institution was vital to the operations of 40 responding companies (54.1 percent) with only 17 respondents (23 percent) considering it less important. Government regulation and access to capital was critical to the operations of about half of the respondents. While 37.8 percent of the respondents did not consider access to capital as a vital issue, only 20.3 percent said that Georgia's regulatory environment was slightly or not important. The state's image ranged in importance from moderate to critical for 49 respondents (66.2 percent), and only five considered it unimportant.

In previous years, traffic problems and the airport were the leading infrastructure issues singled out by the survey respondents. In 2008, traffic was still the top infrastructure issue, but the availability of water moved to second place, ahead of the airport, land use, and the cost of energy. Tax policy and incentives, R&D regulations and capital formation, and the quality of public education were mentioned as the top state policy and regulatory issues.

It speaks well for Georgia's business climate that most of the issues deemed vital for company operations were singled

out as strengths by the majority of respondents, namely, the cost of living (56 respondents), quality of life (55 respondents), and the proximity to academic institutions (49). Thirty-five respondents felt that the availability of suitable space and facilities was a strong point.

Access to capital, infrastructure (transportation, water, energy), and the availability of specialized managers tell a different story, however: while 47 respondents consider infrastructure as either extremely or very important to their operations, only 24 see it as one of Georgia's strengths and 30 respondents consider it a weakness. Thirty-six firms said that access to capital is vital to their operations; however, only 13 respondents considered this as one of Georgia's strengths, while 33 said it was a weakness. Skilled managers are important to the operations of 43 firms, but only 16 consider it a strong point and 28 saw it as a weakness. The vote is somewhat more balanced on the availability of skilled technicians, which is important to the operations of 46 responding firms: 25 companies said it was a strong point and 20 indicated it was one of Georgia's weaknesses. ❖

Table 21
Respondents' Viewpoint: Issues Relevant to Life Science Companies' Operations in Georgia

	Number of Responses	Percent of Valid Responses
Crucial/ Very Important		
Quality of life	56	75.7
Cost of living (e.g. housing)	53	71.6
Infrastructure (e.g. traffic, energy, etc.)	47	63.5
Availability of skilled technicians	46	62.2
Availability of skilled managers	43	58.1
Availability of suitable space and facilities	41	55.4
Proximity to academic institutions and facilities	40	54.1
Availability of skilled researchers	39	52.7
Regulatory/legislative environment	37	50.0
Access to capital	36	48.6
Access to government financial incentives/support	33	44.6
Availability/Quality of service providers	31	41.9
Availability /cost of skilled manufacturing labor	26	35.1
State's image	26	35.1
Availability/cost of land	21	28.4
Slightly or Not Important		
Availability/cost of land	38	51.4
Availability /cost of skilled manufacturing labor	37	50.0
Access to government financial incentives/support	32	43.2
Access to capital	28	37.8
State's image	22	29.7
Availability/Quality of service providers	18	24.3
Proximity to academic institutions and facilities	17	23.0
Availability of skilled researchers	17	23.0
Availability of suitable space and facilities	15	20.3
Regulatory/legislative environment	15	20.3
Availability of skilled technicians	11	14.9
Availability of skilled managers	11	14.9
Infrastructure (e.g. traffic, energy, etc.)	5	6.8
Quality of life	3	4.1
Cost of living (e.g. housing)	2	2.7

Based on 74 valid responses to the 2007-2008 surveys.

Table 22
Factors Impacting Life Sciences Companies' Operations in Georgia

	Not Important	Slightly Important	Moderately Important	Very Important	Extremely Important/ Critical
Funding					
Access to capital	21	7	9	9	27
Access to government financial incentives/support	26	6	7	21	12
Labor force					
Availability /cost of skilled manufacturing labor	28	9	9	12	14
Availability of skilled managers	6	5	18	23	20
Availability of skilled researchers	8	9	17	17	22
Availability of skilled technicians	6	5	17	25	21
Infrastructure and related issues					
Availability of suitable space and facilities	9	6	18	21	20
Availability/cost of land	26	12	16	15	6
Availability/Quality of service providers	5	13	23	23	8
Regulatory/legislative environment	9	6	20	23	14
Proximity to academic institutions/facilities	4	13	17	18	22
Infrastructure (e.g., traffic, energy, etc.)	1	4	20	32	15
Quality of life					
Quality of life	2	1	16	32	24
Cost of living (e.g., housing)	0	2	18	38	15
State's image	5	17	23	18	8
Based on 74 valid responses (2007-2008 survey participants).					

Table 23
Georgia's Business Environment, Strengths and Weaknesses

	Strength	Neutral	Weakness
Proximity to academic institutions	49	21	4
Availability of skilled researchers	34	26	14
Availability of skilled technicians	25	29	20
Availability of skilled managers	16	30	28
Availability and cost of skilled manufacturing labor	17	37	20
Availability and cost of land	36	31	7
Availability of suitable space and facilities	35	21	18
Availability/quality of service providers	28	33	13
Regulatory/legislative environment	22	35	17
Access to capital	13	28	33
Access to government financial incentives/support	17	30	27
Quality of life	55	18	1
Cost of living	56	16	2
Infrastructure (e.g., traffic, water, energy)	24	20	30
State's image	22	29	23

Based on 74 valid responses (2007-2008 survey participants).

Appendix

LIST OF COMPANIES

Company	Location	MSA/Location	Product/Focus
1st America Prescription Drugs	Valdosta	VAL	PHARM
Abare Enterprises Inc	Forsyth	ATL	DEV
Abbott Laboratories	Lizella	MAC	PHARM
ABC Safety Inc	Rincon	SAV	DEV
Abeome, Inc.	Athens	ATH	PHARM
Adagen Medical International Inc	Atlanta	ATL	DEV, SERV
Aderans Research Institute	Marietta	ATL	BIOTECH
Advanced Applications Inst	Atlanta	ATL	PHARM
Advanced Biotechnologies LLC	Madison	Madison	BIOFUELS
Advanced Technology Pharmaceuticals Corporations	Dacula	ATL	PHARM
AerovectRx Corporation	Norcross	ATL	DEV
Agri Biofuels, Inc.	Camilla	Camilla	BIOFUELS
Agriagnostics, Inc.	Watkinsville	ATH	DIAG
AgTeck Industries, LLC	Stone Mountain	ATL	BIOFUELS
Ajay North America LLC	Powder Springs	ATL	CHEM
Alcott Chromatography, Inc.	Norcross	ATL	DEV
Alimera Sciences, Inc.	Alpharetta	ATL	PHARM
Alion Science & Technology	Athens	ATH	PHARM, IND
Allied Dgnstc Imaging Resources/CPAC	Norcross	ATL	DIAG
Alpha Omega Co USA Inc	Alpharetta	ATL	DEV
Altea Therapeutics	Tucker	ATL	DEV, PHARM
Alterra Bioenergy of Middle Georgia	Macon	MAC	BIOFUELS
American Biosurgical LLC	Norcross	ATL	DEV
American Clinical Laboratory	Stone Mountain	ATL	DIAG
American Medical Devices Inc/Retinalabs	Atlanta	ATL	DEV
American Red Cross	Douglasville	ATL	BIOL
Ana-Gen Technologies, Inc.	Atlanta	ATL	BIOL
Analytical Development, Inc.	Lawrenceville	ATL	DEV
Angionics	Athens	ATH	PHARM, BIOTECH
Any Test Inc	Kennesaw	ATL	DIAG
Apeliotus Technologies, Inc.	Atlanta	ATL	DEV, R&D
Applied PhytoGenetics, Inc. (APGEN)	Athens	ATH	IND
AptoTec	Athens	ATH	R&D
Aqua Solutions, Inc.	Jasper	ATL	SERV
Aquesys	Duluth	ATL	DEV

Company	Location	MSA/Location	Product/Focus
Archaea Solutions	Tyrone	ATL	DIAG, IND
Argent Diagnostics	Athens	ATH	DIAG
Aruna Biomedical	Athens	ATH	BIOTECH
Athens Research and Technology, Inc.	Athens	ATH	BIOL
AtheroGenics, Inc.	Alpharetta	ATL	PHARM
Atlanta Biologicals, Inc.	Lawrenceville	ATL	BIOL
Atlanta Center for Medical Research	Atlanta	ATL	R&D, PHARM
Atlanta Pathology Professional Association	Atlanta	ATL	DIAG
Atlanta Research Laboratory Supplies Inc.	Atlanta	ATL	SERV
Atrium Imaging Group of America LLC	Dalton	DALTON	DIAG
Augusta Laboratory Inc	Augusta	AUG	DIAG
AuraZyme Pharmaceuticals, Inc.	Kennesaw	ATL	PHARM
Auriga Laboratories	Norcross	ATL	PHARM
Axion	Atlanta	ATL	R&D
Axona	Atlanta	ATL	R&D
Bacterial Barcodes	Athens	ATH	R&D
Bard Medical Division (C.R. Bard)	Covington	ATL	DEV
Bard Urological Division (C.R. Bard)	Covington	ATL	DEV
Bimeco Group	Tyrone	ATL	DEV
Biofisica Inc.	Duluth	ATL	DEV
Biomedical Consultant Group	Albany	ALB	R&D
Biomedical Design, Inc.	Dunwoody	ATL	DEV
Biomedical Disposal, Inc.	Norcross	ATL	DEV
Bioniche Animal Health USA, Inc.	Bogart	ATH	PHARM
Bio-Plus Inc	Madison	Madison	AGR
BioSentry, Inc.	Stone Mountain	ATL	AGR
BioStrategies	Marietta	ATL	PHARM
Biosystems, Inc.	Stone Mountain	ATL	DEV
Body Surface Translation	Athens	ATH	DEV
Brace International Inc	Atlanta	ATL	DEV, PHARM
BresaGen, Inc./Novocell, Inc.	Athens	ATH	BIOTECH
Brettech Alternative Fuel, Inc.	Tifton	Tifton	BIOFUELS
Bristol-Myers Squibb	Atlanta	ATL	PHARM
Burdock Inc	Griffin	ATL	DEV
C A P S Pharmacy	Norcross	ATL	PHARM
C2 Biofuels Inc	Atlanta	ATL	BIOFUELS
Caire Inc.	Marietta	ATL	PHARM, DEV
CardioMEMS, Inc.	Atlanta	ATL	DEV
Care Technologies Inc	Roswell	ATL	DEV
Carticept Medical Inc.	Alpharetta	ATL	DEV
Cell Constructs	Atlanta	ATL	R&D
Celliance/Millipore	Norcross	ATL	BIOL

Company	Location	MSA/Location	Product/Focus
Cellutions Inc.	Duluth	ATL	DEV
CeloNova BioSciences	Newnan	ATL	DEV
Celtaxsys	Atlanta	ATL	R&D
Cerebral Vascular Applications, Inc.	Duluth	ATL	DEV
CIBA Vision Corp.	Duluth	ATL	DEV
CIS Biotech, Inc.	Atlanta	ATL	BIOTECH
ClariPath Laboratories, Inc.	Augusta	AUG	DIAG
Clinical Laboratory Services	Winder	ATH	DIAG
Clinimetrics Research Associates, Inc.	Atlanta	ATL	SERV, R&D
Covidien/Kendall Healthcare	Augusta	AUG	DEV
Cptmed Inc	Jackson	ATL	DEV
CryoLife, Inc.	Kennesaw	ATL	BOB
D S M Nutritional Products Inc	Pendergrass	Pendergrass	PHARM
D Technology	Smyrna	ATL	BIOFUELS
Doctors Laboratory Inc	Valdosta	VALDOSTA	DIAG, SERV
Dornier MedTech America	Kennesaw	ATL	DEV
Dynamic Adsorbents Inc	Atlanta	ATL	CHEM
Eckert&Ziegler Analytics Inc	Atlanta	ATL	DEV
ECO Solutions, LLC	Chatsworth	DALTON	BIOFUELS
Effcon Laboratories, Inc.	Marietta	ATL	PHARM
EKA Chemicals Inc	Augusta	AUG	IND
Elan Holdings, Inc. (Elan drug delivery)	Gainesville	GAINSVILLE	PHARM
Elanco	Augusta	AUG	AGR
Elekta Holdings U S Inc	Norcross	ATL	DEV
EmTech Biotechnology Development, Inc.,	Atlanta	ATL	BIOTECH, SERV
EMThrax, LLC	Augusta	AUG	BIOL
Encompass Pharmaceutical Services, Inc.	Norcross	ATL	PHARM
Enviropac LLC	Peachtree City	ATL	DEV
Enzymatic Deinking Technologies, LLC (EDT)	Norcross	ATL	IND
EPD Pharma Solutions	Alpharetta	ATL	PHARM, SERV
Equinox Chemicals LLC	Albany	ALB	CHEM
ERBE USA, Inc.	Marietta	ATL	DEV
ERMI Inc	Decatur	ATL	DEV
Essential Consultants, Inc.	Chamblee	ATL	SERV
Essentics LLC	Marietta	ATL	PHARM
Ethicon	Cornelia	Cornelia	DEV
ExtRx Corporation	Roswell	ATL	SERV
Facet Technologies, LLC (Div. of Matria Healthcare)	Kennesaw	ATL	DEV
Femasys	Suwanee	ATL	DEV
First United Ethanol	Camilla	Camilla	BIOFUELS

Company	Location	MSA/Location	Product/Focus
Fisher Scientific Research	Suwanee	ATL	DIAG, R&D
FOB Synthesis, Inc.	Kennesaw	ATL	PHARM
Fortec Medical	Norcross	ATL	DEV
GE Healthcare	Atlanta	ATL	PHARM
Gene Probe, Inc.	Atlanta	ATL	BIOINFORMATICS,
GeneCure Biotechnologies	Norcross	ATL	BIOTECH
Genentech	Atlanta	ATL	PHARM
geneRx+	Atlanta	ATL	BIOTECH
Genesis Technologies International, Inc.	Lawrenceville	ATL	IND, AGR
Genzyme Corporation	Roswell	ATL	BIOTECH
Geoplasma Inc.	Atlanta	ATL	BIOFUELS
Georgia Alternate Fuels, LLC	Dublin	Dublin	BIOFUELS
Georgia Biofuels Corp	Loganville	ATL	BIOFUEL
GeoVax, Inc.	Atlanta	ATL	BIOTECH, PHARM
Given Imaging, Inc.	Norcross	ATL	DEV, DIAG
Glades Pharmaceuticals, LLC. (Div. of Stiefel Laboratories, Inc.)	Duluth	ATL	PHARM
GLASS HORSE PROJECT, LLC	Watkinsville	ATH	AGR
Grace Labs LLC	Decatur	ATL	PHARM, DIAG
Guided Therapeutics (formerly SpectRx, Inc.)	Norcross	ATL	DEV, DIAG
Health Discovery Corp.	Savannah	SAV	BIOTECH
HEIncorporated/AMMI Inc.	Martinez	AUG	DEV
Histology Services Co	Stone Mountain	ATL	SERV
HOWMEDICA OSTEONICS	Atlanta	ATL	DEV
ICON Interventional Systems®	Atlanta	ATL	DEV
IIIrd Millennium, Inc.	Alpharetta	ATL	SERV,
Imiren Pharmaceuticals Inc	Forest Park	ATL	PHARM, BIOL
Immucor, Inc.	Norcross	ATL	DIAG, BIOL
Inhibitex, Inc.	Alpharetta	ATL	PHARM, R&D
Innogenetics, Inc.	Alpharetta	ATL	DIAG
Innovation Factory	Atlanta	ATL	DEV
Insectigen	Athens	ATH	BIOTECH
Integrated Science Systems	Augusta	AUG	DEV
International Plant Nutrition	Norcross	ATL	AGR
Inviro Medical Devices	Duluth	ATL	DEV
Izenda	Atlanta	ATL	HI
KB Visions (Kaswan, Inc.)	Atlanta	ATL	PHARM
Kiel Laboratories, Inc.	Gainesville	GAINSVILLE	PHARM
KPS Technologies	Atlanta	ATL	R&D
Laboratory Corporation of America	Columbus	COL	DIAG
Lee Laboratories/BD	Grayson	ATL	DIAG

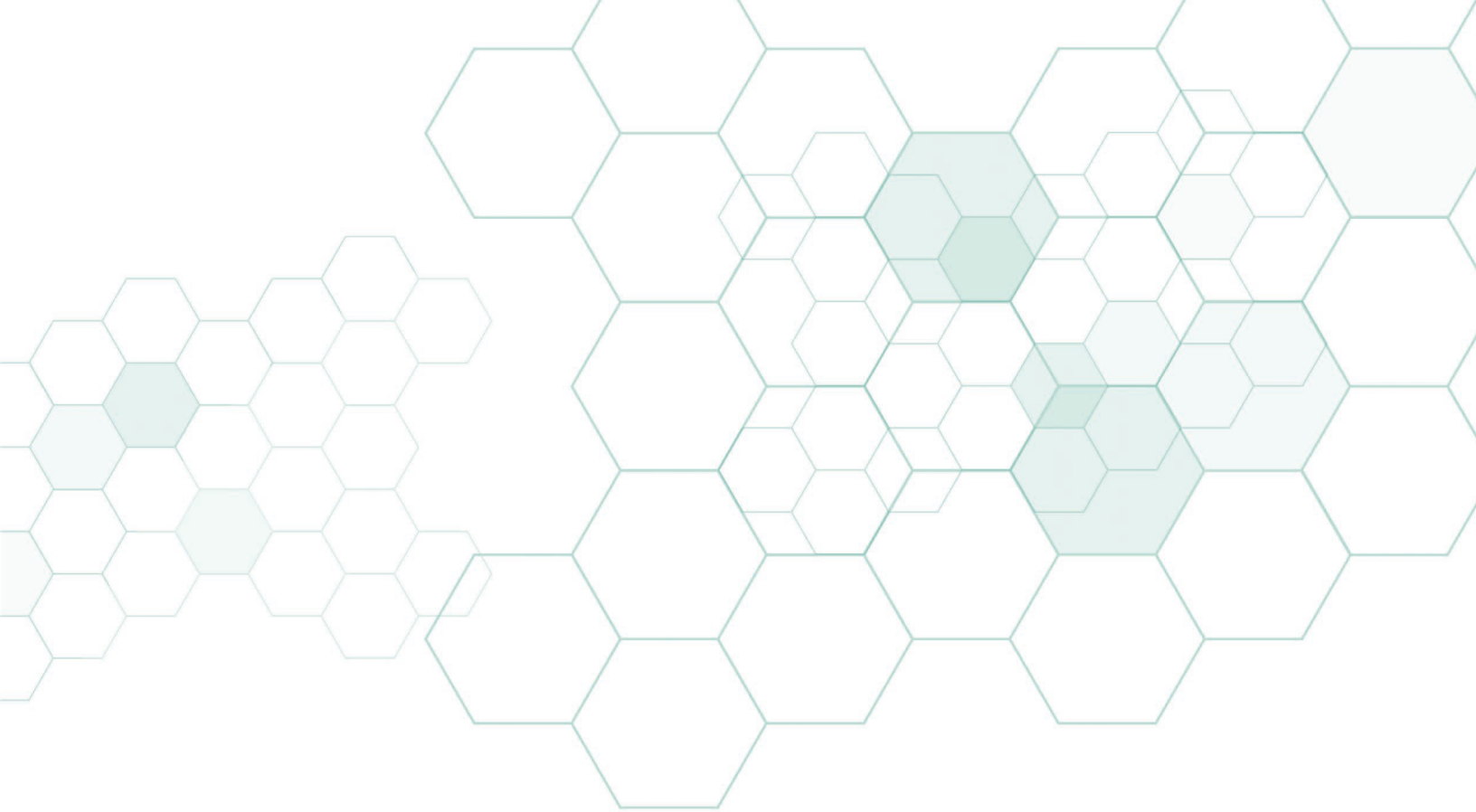
Company	Location	MSA/Location	Product/Focus
Lexicor Medical Technologies	Augusta	AUG	DEV
Life Alarm Inc	Augusta	AUG	DEV
Life Therapeutics	Clarkston	ATL	PHARM, BIOL
Lifescape Biosciences	Atlanta	ATL	PHARM
Lightyear Technology, Inc	Roswell	ATL	DEV
Marietta X-Ray Inc.	Marietta	ATL	DEV
McKesson Information Solutions LLC	Alpharetta	ATL	SERV, HI
Mddatacor Inc.	Alpharetta	ATL	HI
Mean Green Biofuels	Lakemont	Lakemont	BIOFUELS
Medical Device Development Group, LLC	Atlanta	ATL	DEV
Medical Device Marketing	Lawrenceville	ATL	DEV
Medical Edge Technologies Inc	Atlanta	ATL	DEV
Medical Molecular Therapeutics, LLC.	Lakemont	Lakemont	DEV
Medical Specialty Innovations	Alpharetta	ATL	DEV
Medtronic Inc	Atlanta	ATL	DEV
Merial Limited	Duluth	ATL	PHARM, BIOL
Merial Select	Gainesville	GAINSVILLE	BIOL
Metametrix Inc	Norcross	ATL	DIAG
Metastatix	Tucker	ATL	PHARM
Metro Vascular PC	Decatur	ATL	DIAG
Micro-Macro International Inc	Athens	ATH	AGR
Microtek Medical Holdings Inc	Alpharetta	ATL	DEV
Middle Georgia Biofuels Inc.	Dublin	Dublin	BIOFUELS
Mikart, Inc.	Atlanta	ATL	PHARM
Millenium Cryogenics, Inc.	Athens	ATH	BOB
Molecular Therapeutics, LLC	ATHENS	ATH	BIOTECH
Mölnlycke Health Care U.S.	Norcross	ATL	DEV
Monsanto Co	Augusta	AUG	AGR
Mq Associates Inc	Athens	ATH	DEV
Mullins Pathology & Cytology	Augusta	AUG	SERV, DIAG
Myelotec	Roswell	ATL	DEV
Nanli Laser Supply LLC	Atlanta	ATL	DEV
Nanomist systems, LLC	Warner Robins	WARNER ROBINS	R&D
National Diagnostics, Inc.	Atlanta	ATL	DIAG
NDC Health Corporation	Atlanta	ATL	SERV, HI
Neotonus, Inc.	Marietta	ATL	DEV
NeoVista, Inc.	Duluth	ATL	DEV
Neural Signals, Inc.	Atlanta	ATL	DEV
NeurOP	Atlanta	ATL	PHARM
NeuroTrials Research, Inc.	Atlanta	ATL	PHARM, DIAG
Newton Laboratories Inc	Conyers	ATL	PHARM
Noramco Inc	Athens	ATH	PHARM

Company	Location	MSA/Location	Product/Focus
North American Bioproducts	Duluth	ATL	BIOFUELS
North American Science Assocs	Atlanta	ATL	DIAG
Nova Biogenetics Inc	Atlanta	ATL	PHARM, IND
Novoste Corporation/Best Vascular	Norcross	ATL	DEV
Octogen Pharmacal Co Inc	Cumming	ATL	PHARM
Omega Bio-Tek, Inc.	Norcross	ATL	R&D, DEV
Omni International Inc	Marietta	ATL	R&D, DEV
Oncose, Inc.	Athens	ATH	DIAG
Opti Medical Systems	Roswell	ATL	DEV
OsteoLign	Duluth	ATL	DEV
P3 Laboratories	Winder	ATH	TESTING, R&D
Parexel	Lawrenceville	ATL	SERV, PHARM
Pathens Inc.	Athens	ATH	BIOTECH
Pathogen Control Associates	Norcross	ATL	DIAG, IND
Patient Care Technologies	Atlanta	ATL	HI
Peat Fuel Co	Claxton	Claxton	BIOFUELS
Pfeiffer Pharmaceuticals	Atlanta	ATL	PHARM
Pfizer Inc.	Atlanta	ATL	AGR
Pharm Data Inc/Premier Research	Marietta	ATL	PHARM, SERV
PhysioStream	Atlanta	ATL	DEV
Planteco Environmental Consultants	Athens	ATH	IND
Porex Porous Products Group	Fairburn	ATL	DEV
Porex Surgical, Inc.	Newnan	ATL	DEV
Poultry Specialties Inc	Marietta	ATL	AGR
Precision Medical, Inc.	Hoschton	Hoschton	DEV
Premier Research Atlanta, Inc.	Marietta	ATL	PHARM
Preventive Therapeutics Inc	Snellville	ATL	PHARM
Prime Behavior Testing Labs	Augusta	AUG	R&D
Prizm Medical, Inc.	Oakwood	ATL	DIAG
Proactive Labs Inc	Lithia Springs	ATL	PHARM
Proscien Inc	Atlanta	ATL	BIOL
Q Care International, LLC	Marietta	ATL	DEV
Quality Assurance Service Corp	Augusta	AUG	SERV
Quest Diagnostics	Tucker	ATL	DIAG
Quintiles Laboratories Limited	Smyrna	ATL	DIAG
Range Fuels Soperton Plant LLC	Soperton	Soperton	BIOFUEL
RayBiotech, Inc.	Norcross	ATL	PHARM
ReachMDconsult, Inc.	Augusta	AUG	HI
Recombinant Peptide Technologies, LLC (rPeptide)	Bogart	ATH	BIOTECH
Reddy US Therapeutics, Inc.	Norcross	ATL	PHARM, R&D
Relax-A-Cizor Products Inc	Atlanta	ATL	DEV

Company	Location	MSA/Location	Product/Focus
Research Think Tank, Inc.	Alpharetta	ATL	DIAG, R&D
Respiroics Inc	Kennesaw	ATL	DEV
RFS Pharma	Tucker	ATL	PHARM
Rhodia Inc	Winder	ATL	IND
RITA Medical Systems, Inc.	Manchester	ATL	DEV
Rx PHI Beta Group S A Inc	Marietta	ATL	PHARM
S S S Co	Atlanta	ATL	PHARM
SaluMedica, LLC	Smyrna	ATL	DEV
Sanofi-Aventis	Atlanta	ALT	PHARM, SALES
Sanuwave Services LLC	Alpharetta	ATL	DEV
ScheBo Biotech USA, Inc.	Marietta	ATL	BIOTECH
Schering-Plough	Suwanee	ATL	PHARM
SCI Tech Manufacturing Inc	Norcross	ATL	PHARM
Sciele Pharma Inc. (formerly First Horizon Pharmaceutical Corp.)	Atlanta	ATL	PHARM
Science Applications Intl	Marietta	ATL	DEV
Scientific Adsorbents (Div. of Apyron Technologies, Inc.)	Atlanta	ATL	DEV
Sebia Inc.	Norcross	ATL	DEV
Sector Electronics, LLC	Acworth	ATL	DEV
Sero-Immuno Diagnostics	Tucker	ATL	DIAG
Siemens Medical Solutions USA, Inc., Ultrasound Division	Atlanta	ATL	DIAG, HI
Sigvaris Inc	Peachtree City	ATL	DEV
Skalar	Norcross	ATL	DEV
Slainte Bioceuticals	Marietta	ATL	PHARM, BIOTECH
Sleepmed Inc	Kennesaw	ATL	DIAG, PHARM
Smisson Cartledge Biomedical	Macon	MAC	DEV
Smithkline Beecham Corp	Columbus	COL	DIAG
SMO-USA, Inc.	Canton	ATL	R&D, BIOL
Snowden Pencer, Inc.	Tucker	ATL	DEV
SoloHealth	Duluth	ATL	DEV
Solvay Pharmaceuticals, Inc. /Unimed Pharmaceuticals, Inc.	Marietta	ATL	PHARM
Southeast Laboratories, Inc.	Athens	ATH	DEV
Southern Neurophysiology LLC	Alpharetta	ATL	DIAG, SERV
Splash Medical Devices LLC	Atlanta	ATL	DEV
Sriya Innovations Inc	Marietta	ATL	BIOFUELS
SSL Americas Inc	Norcross	ATL	DEV
St Jude Medical Inc	Roswell	ATL	DEV
Starkey Laboratories, Inc	Norcross	ATL	DEV
Sterimed Inc	Cartersville	Cartersville	DEV

Company	Location	MSA/Location	Product/Focus
Stheno Corporation	Atlanta	ATL	DEV, R&D
Stiefel Laboratories Inc	Duluth	ATL	PHARM, DIAG
Stradis Medical LLC	Lawrenceville	ATL	DEV
Summit Industries, Inc.	Marietta	ATL	PHARM
Synageva Biopharma (formerly Avigenics)	Athens	ATH	BIOTECH, PHARM
Syntermed, Inc.	Atlanta	ATL	DIAG, HI
TAP Pharmaceuticals	Atlanta	ATL	PHARM
Technical Products, Inc. of Georgia, USA	Lawrenceville	ATL	DEV
Technology Resource International Corporation (TRI)	Alpharetta	ATL	DEV, R&D
The Nutrasweet Co	Augusta	AUG	AGR
Theragenics Corporation	Buford	ATL	PHARM, DEV
Thione International, Inc.	Atlanta	ATL	PHARM
Throwleigh Technologies LLC	Ball Ground	ATL	DEV
Trs Labs Inc	Athens	ATH	PHARM, DIAG
U.S. Biofuels Inc.	Rome	ROME	BIOFUELS
UCB	Smyrna	ATL	PHARM
Unimed Pharmaceuticals	Marietta	ATL	PHARM
Unisplint Corp	Norcross	ATL	DEV
UPPI-PET	Macon	MAC	PHARM, DIAG
Velocity Medical	Atlanta	ATL	DEV
VersaPharm, Inc.	Marietta	ATL	PHARM
Viro-Med Laboratories Inc	Marietta	ATL	DIAG, BIOL
Vitalabs Inc	Jonesboro	ATL	PHARM
Vitamin Derivatives Inc.	Winterville	ATH	AGR
Vivonetics, Inc.	Atlanta	ATL	R&D
Warner-Lambert Co LLC	Atlanta	ATL	PHARM
Waters Agricultural Labs	Camilla		AGR
Wellpharm LLC	Canton		PHARM
Wetland & Ecological Conslns	Woodstock	ATL	IND
Weylchem US	Augusta	AUG	CHEM
Wyeth	Snellville	ATL	PHARM, SALES
Wingo, Inc.	Cleveland	ATH	BIOL
Wynden Pharmaceuticals LLC	Marietta	ATL	PHARM
Xytex Corp.	Augusta	AUG	DIAG
Xytex Research	Augusta	AUG	BOB
Z Technologies LLC	Atlanta	ATL	DEV
Zenda Technologies	Atlanta	ATL	DEV
Zyrogen, LLC	Atlanta	ATL	R&D, BIOTECH

AGR	Agricultural, food, nutrition (human and animal)
BIOFUELS	Biofuels, bioenergy
BIOL	Biologics
BIOTECH	Biotechnology
BOB	Blood and Organ Banks
CHEM	Chemical
DEV	Medical devices and technology
DIAG	Diagnostics
HI	Health Informatics
IND	Industrial, Environmental
PHARM	Pharmaceutical, biopharmaceutical, therapeutics (including veterinary)
R&D	Research and development, platform technology, product discovery
SERV	Services



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