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INDUSTRIES OF THE MIND

High Technology in Atlanta

Lorena M. Akioka, editor

Compiled and edited from a special report produced by the Atlanta Chamber of Commerce. Used by permission.

The presence of more than 9,000 small, medium, and large high-technology firms presents Atlanta with an anomaly. In most cases, Atlantans pick an ambitious target (i.e., International City) and claim it as a trophy before ever doing anything about it. In this case, the local technology industry has quietly trumped Atlanta's boosterism.

Advanced technology companies employ more than 165,000 Atlantans, or just over 8 percent of the area's total employment. In addition, metro Atlanta's largest non-technology employers have high-tech talent of up to a quarter of their employees, none of which will surface in traditional employment-by-facility counts.

The bulky job numbers—displayed in Table 1—would normally signify critical mass of the high-tech industry in any U.S. metropolitan area, particularly those areas with employment numbers than Atlanta's. But the difference in perception of Atlanta's concentration of technology firms lies in the difference in the industry's development in the twenty-county metro area.

A ride down the major boulevards in Silicon Valley or Austin will show clusters of high-tech firms sharing parking lots, marquee rights, and more. In Atlanta, however, it takes considerable persistence to pick out the 9,000 or so high-tech firms from among the other 100,000-plus business facilities scattered around a 6,125-square-mile area. The metro area's high-tech firms form networks that run from downtown up the Peachtree Street spine and arch across the northern perimeter from Marietta to Norcross, with exceptions sprinkled around. These networks create self-generating economic activity with an impact great enough to put Atlanta on the map as the fastest-growing metro area in the nation.

THE MAJOR PLAYERS

Total revenue for Atlanta's 50 largest technology companies, the Fast Tech 50 as surveyed by Arthur Andersen, grew 17.5 percent in 1997 to $8.4 billion.

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TABLE 1

High-Technology Facilities and Employment in Metro Atlanta

Industry Description	Facilities	Employment
Biomedicine and Biotechnology	41	7,303
Computer Cabling	1,341	14,061
Computer Software, Programming and Services	3,893	49,699
Computers and Office Equipment Manufacturing	38	2,498
Electronic Equipment Manufacturing	169	13,833
Engineering, R&D and Related Services	2,778	25,952
Instruments & Apparatus Manufacturing	97	3,086
Telecommunications Services	842	49,748
TOTAL	**9,199**	**166,180**

Source: Georgia Department of Labor, 1998

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These firms showed evidence of an increase in venture capital and more public technology companies that are rising to the top. In addition, other Atlanta-based companies are recognized for the impact they make in specific industries. For example, Electronic Business lists HBO & Co. and Scientific-Atlanta in its rankings of the 200 largest U.S.-based electronics companies.

A quarter of the 29 Fortune 1,000 firms headquartered here (Tables 2 and 3) do their primary business in high-tech areas ranging from advanced information technology to Web content, including: Cox Communications, BellSouth, Equifax, HBO & Co., Scientific-Atlanta, and two with dual headquarters: First Data and Vanstar.

Mindspring is an Internet service provider with global recognition. Another little-known fact is that Atlanta is home to Lucent Technologies' second-largest operation outside of its headquarters. Others—such as SQL Financials—slip quietly into national recognition.

More recently, a dozen Atlanta technology companies cracked *Inc*. 500's rankings of the nation's fastest-growing private firms, including Tactics, Clarus, T/R Systems, Patient Care Technologies, Wakefield Pharmaceuticals, Management Decisions, Capricorn Systems, Network One, Matrix Resources, Ashford International, US Energy, and Witness Systems.

INVESTMENT BY INTERNATIONAL FIRMS

International high-tech firms have staked out a major presence in metro Atlanta and are more than a quarter of the 1,200 international businesses here. Major international manufacturers—Siemens, Philips, Mitsubishi—have opened new operations in the last year and are

TABLE 2

Atlanta's Largest Technology Headquarters by Revenues

Company	1997 Revenues (millions)	Companywide Employees
BellSouth Corp.	$20,561.0	81,000
First Data*	5,235.0	36,000
Turner Broadcasting System	3,437.4	6,000
Vanstar*	2,179.0	6,000
Philips Consumer Electronics	2,000.0	10,000
Equifax	1,706.0	10,000
Cox Communications	1,610.0	7,725
HBO & Co. (McKesson)	1,203.2	6,286
Scientific-Atlanta	1,170.0	5,800
Medaphis Corp.	572.6	9,800
National Data Corp.	433.8	2,900
LeyLink Dickens Data Systems	347.7	420
Nova Information Systems	336.0	600
Premiere Technologies	229.4	1,700
Hayes Corp.	199.6	600
CheckFree Corp.	176.4	1,444
Electromagnetic Sciences	171.2	1,200

* Dual Headquarters

Source: Arthur Andersen LLP; *Atlanta Business Chronicle*; *Fortune*, "The Fortune 1,000"

expanding their presence here. Robert Minkhorst, president and CEO of Philips Consumer Electronics North America's headquarters, said his company chose Atlanta because "the city offers a wealth of skilled labor, and has excellent engineering schools, in addition to a progressive and supportive business community."

In the first half of 1998, half of the 20 new international businesses that relocated to metro Atlanta were high-tech firms. Siemens relocated two divisions, Electromechanical Components and Electronics Assembly, and Mitsubishi brought in a fiber manufacturing division. Card Guard USA joined the more than dozen or so other high-tech firms from Israel that are building a major presence here.

TECHNOLOGY IN OTHER MAJOR COMPANIES

An examination of the largest Atlanta employers in industries outside the technology arena shows that most do employ some high-tech specialists, mainly in information systems management (see accompanying box on page 5). A quarter of these companies report that more than 20 percent of their employees are high-tech. The remaining companies report an average of 4 percent technical employment.

The Home Depot reported the highest percentage, counting two-thirds of its employees as technical specialists. The remaining firms with higher percentages included financial companies, utilities, the Coca-Cola Company, and Georgia-Pacific. On average, a quarter of the employees in each of these corporations are classified as high-tech specialists.

MOVING IN

Last year, the American Electronics Association cited Georgia as the national leader in high-tech job growth, and metro Atlanta supports more than three-quarters of this growth. Feeding it are Atlanta's well-educated workforce, a heavy in-migration of the nation's best talent, and state-of-the art educational and training programs that supply a steady stream of graduates.

By some recent measures, the 60,000 graduates who have flocked here make Atlanta the leading destination for college graduates. According to the U.S. Census Bureau, the metro area ranks second only to Boston in the percentage of its people aged 25 and over with a college degree. The area's more than 40 universities, colleges, and technical schools also feed this growth, sending 30,000 new degree-holders into the job market each year.

TABLE 3

Atlanta's Top 25 High-Tech Employers
(ranked by number of employees in Atlanta)

Company	Metro Atlanta Employees	1997 Companywide Revenues (millions)
BellSouth Corp.	17,080	$20,561
AT&T	11,200	53,261
Lockheed Martin	9,200	28,069
Lucent Technologies	7,300	26,000
IBM Corporation	6,235	78,500
Turner Broadcasting System	4,783	3,437
Cox Communications	4,198	1,610
MCI/Worldcom	4,000	19,653
Scientific-Atlanta	3,200	1,168
Equifax	2,780	1,400
First Data Corp.	2,090	5,200
Worldspan L.P.	1,800	575
Hewlett-Packard	1,700	42,900
Nortel Networks	1,700	15,500
Electronic Data Systems (EDS)	1,600	15,235
NCR Corp.	1,550	6,589
Alltel	1,200	3,264
Sprint	1,200	14,874
HBO & Co. (McKesson)	1,073	1,203
National Data Corp.	1,063	525
Compaq Computer Corp.	1,000	24,584
Electomagnetic Sciences	1,000	171
Federated Systems Group	850	NA
Scientific Games International	800	197
Lanier Worldwide	767	1,256

Source: *Atlanta Business Chronicle*; *Fortune*, "The Fortune 1,000"

RESOURCES

Essential to any region that considers itself a member of the National Silicon League is a concentration of R&D activity and centers, technology incubators, and the active participation of funding partners, or venture capital. Add to this list metro Atlanta's active, well-populated industry associations that support these efforts, and Atlanta's technology players are in the game.

R&D Research and development expenditures have risen steadily in Georgia in the last several years. The Georgia Research Alliance, a public/private partnership of major businesses with local research universities, is due much credit for helping to funnel national attention and funding support into the state's R&D institutions.

Joining the set of highly regarded research facilities affiliated with the area's major science and technical institutions, a number of new research facilities were announced in 1998. Lucent Technologies and Motorola unveiled plans to put a new chip design center in Atlanta as part of their alliance to develop digital signal processor technology. Intel spearheaded a group of semiconductor companies in talks with Georgia Tech (one of six chosen campuses), about founding a $10 million-a-year center to find ways for radically improving chip performance.

Georgia Tech also received $12.5 million from the National Science Foundation to establish a national research center for tissue engineering. Tech was one of only five institutions selected to receive a five-year NSF grant for engineering technology.

In August 1988, announcement was made about a new 42-acre, $31 million biotech center, to be built three miles from downtown Atlanta. This biomed-bioengineering research facility and incubator—a joint venture between Emory University and Georgia Tech—is expected to support 24 research companies and create 12,000 new jobs within the next ten years.

HIGH-TECH JOBS WITHIN SOME OF METRO ATLANTA'S LARGEST EMPLOYERS

Company	Estimated High-Tech Employment in Atlanta	Percent of Total Atlanta Employment
Atlanta Board of Education	125	1.6
Atlanta Gas Light	115	5.8
City of Atlanta	250	3.1
Clayton County Public Schools	38	0.7
Cobb County Government	75	2.1
Cobb County School District	120	1.3
Coca-Cola Co., The	1,050	21.0
Columbia HCA/Georgia Division	35	0.6
DeKalb County Govenrment	138	2.5
Delta Air Lines (Delta Technology)	2,220 (Nationwide)	8.7
Equifax (includes FBS Software)	700	23.0
Fulton County Board of Education	98	1.4
General Motors Corp.	70	1.3
Georgia Institute of Technology	Over 1,000	27.2
Georgia State University	491	18.2
Georgia-Pacific Corp.	850 - 900	20.5
Gwinnett Public Schools	60	0.6
Home Depot, The	800	66.6
NationsBank (Bank of America)	1,700	24.4
Rich's/Lazarus/GoldSmith's	10/300 - Federated	0.2
Southern Co., The	1,400	26.9
State of Georgia	140	1.8
U.S. Centers for Disease Control & Prevention	800	20.0
United Parcel Service	219	3.9

Source: Metro Atlanta Chamber of Commerce phone survey, 9/98

Technology Business Incubators The joint Emory-Georgia Tech biotech venutre will be the newest of more than a dozen business incubators in Georgia, more than half of them in metro Atlanta.

The grandfather of local technology incubators is the Advanced Technology Development Center, a state-funded enterprise which opened at Georgia Tech in 1980. By 1997, ATDC's 88 member and graduate companies had generated more than $300 million in revenues and employed nearly 2,500 people. Mindspring and Theragenics are two of its better-known graduates.

Two other local incubators help foster the growth of high-tech entrepreneurial businesses. The Intelligent Systems Shared Resource Technology Center, a private facility founded in 1990 in Norcross, nutures up to 22 companies at a time. ChemFree, Peachtree Software, and Digital Wireless are among its successes. The Fulton County Business Incubator is newer, founded in 1997 and funded by Fulton County. Its firms are in the telecommunications and information technology industries, and it is currently seeding the growth of a half-dozen companies.

Venture Capital Metro Atlanta is the clear favorite for venture capital investment in the Southeast (see Tables 4 and 5). More than $413 million in technology deals have happened here since 1995, according to Pricewaterhouse-Coopers. In that same time, Atlanta's share has grown faster than that of five other recognized technology corridors—Silicon Valley, Boston, Denver/Boulder, Austin, and the Research Triangle.

Communications and software/information firms attract the greatest amount of venture investments. From 1995 through the second quarter of 1998, they brought $140.7 million and $244.6 million, respectively, into Georgia. Some of the larger, more recent deals include:

- $30 million for iXL, a multimedia and Internet services firm.
- $23 million for Greenberg News Networks, an Internet information channel for physicians.
- $11.5 million for Microwave Instrumentation Technologies, LLC, a microwave applications design firm.
- $10 million for Lynk Systems, a provider of transaction processing.

INFRASTRUCTURE ADVANTAGES

Local companies in telecommunications services, equipment manufacturing, news and entertainment production, and software development are creating in metro Atlanta the world's leading telecommunications center.

METRO ATLANTA'S TOP VENTURE CAPITAL FIRMS

Firm	Capital under Management (millions)	Industry Preferences
Cravey, Green & Wahlen	$378	health care, manufacturing
Noro-Moseley Partners	214	technology, medical
Arete Ventures	155	telecom, software, info systems
Cordova Capital	133	telecom, info technology, health care
River Capital	54	light manufacturing
EGL Holdings	50	manufacturing, health care
Equity South Advisors LLC	41	software, manufacturing
Richards	30	light manufacturing

Source: *Atlanta Business Chronicle*, Jan. 30, 1998

TABLE 4

Venture Capital Investment Growth - Investment in Technology Companies ($ millions)

Metro Area	1995	1996	1997	1st Qtr. 1998
Atlanta, GA	97.2	44.7	180.3	52.9
Austin, TX	50.1	80.4	145.3	25.3
Research Triangle Park, NC	47.0	54.7	83.6	39.1
Denver-Boulder	31.2	161.1	160.9	64.6

Source: PricewaterhouseCoopers LLP, courtesy *The Atlanta Journal and Constitution*

Atlanta-based companies lead this industry's developments in service, R&D, and manufacturing.

For example, BellSouth provides here the world's largest toll-free calling area, at 7,164 square miles and more than two million access lines. The local dialing area also provides the latest in ISDN technologies. Nearly a half-million miles of fiber-optic cable criss-cross the state and Atlanta has the greatest number of videoconferencing sites in the world.

OTHER SUPPORT

Like any healthy technology community, metro Atlanta boasts a vibrant network of private technology associations and public groups whose sole aim is to foster the growth of local opportunities. Founded this year, The Technology Association of Georgia (TAG) is an alliance of three of the most influential local high-tech associations:

Business and Technology Alliance, which promotes and develops an infrastructure in Georgia that encourages and facilitates technology transfers;

Southeastern Software Association, which promotes the Southeast's software industry; and

Women in Technology, which allows women in the Atlanta technology community a forum for education, professional growth, interpersonal and business relationships, and community service.

TAG serves as an umbrella group for all technology associations, strengthening the associations and successes of all firms doing business throughout the state. Some other prominent associations include the Interactive Media

TABLE 5

Georgia Venture Capital Investments by Industry ($ thousands)

Industry	1995	1996	1997	1st Qtr. 1998	2nd Qtr. 1998
Software & Information	35,250	89,988	87,397	14,125	17,850
Medical Instruments & Devices	1,500	—	6,155	—	10,475
Computers & Peripherals	1,200	7,552	3,500	—	3,000
Biotechnology	—	9,500	725	1,350	—
Communications	34,666	17,177	60,866	28,000	—
Electronics & Instrumentation	—	—	13,000	—	—

Source: PricewaterhouseCoopers LLP Money Tree Survey, courtesy *Atlanta Business Chronicle*

Alliance, American Electronics Association, Association of Internet Professionals, Atlanta Venture Forum, Georgia Biomedical Partnership, and the Technology Executives Roundtable.

PUBLIC SUPPORT

The state itself has spearheaded the development of local high-tech industries with major investments and support. In the forefront of these efforts is the Georgia Research Alliance, which has brought the state together with private business to develop far-reaching initiatives. In less than a decade, the GRA has pumped up the R&D investments level in Georgia, opened a preeminent center for information and advanced telecommunications technology R&D, and is building a long-range industry advantage with its Eminent Scholars Program.

In 1990, the year the GRA was formed, Georgia universities were conducting $400 million in sponsored research annually. Since the GRA has been investing in the research infrastructure, the annual university R&D rose to over $700 million in 1997. The GRA's objective is to see this investment raised to $1.2 billion by the year 2000.

The Georgia Center for Advanced Telecommunications Technology is an academic-business-government partnership formed in 1991. It was designed to help increase research funding, to design advanced telecommunications networks for the state, and to serve small-to-midsized information companies with news of and applications for new technologies. Its flagship building opened in 1996 to house the program's eminent scholars, labs, classrooms and exhibit space.

GRA's Eminent Scholars program was developed to help expand the state's knowledge base. To date, 29 of the eminent research scholars from throughout the world have moved to Georgia's research universities to fill endowed chairs supplied with the latest, state-of-the-art equipment and new lab facilities. The most recent arrival is scientist Steven Stice, who, in addition to holding a new $1.5 million endowed chair at the University of Georgia, is developing a new company to clone cattle and pigs. ■

FOR MORE INFORMATION

This article describes only a part of metro Atlanta's decade-long transformation into a high-tech hub. For further information, and a more complete listing of the high-technology firms in the area, visit the Metro Atlanta Chamber of Commerce website at **www.metroatlantachamber.com** and look in the "Industries of the Mind" section.

CONNECTING WITH THE WORLD: GEORGIA ENTERS THE THIRD MILLENNIUM

Suzanne A. Lindsay

Editor's Note: In this exerpt from a forthcoming article, *Georgia Business and Economic Conditions* goes beyond its usual emphasis on economics and short-range forecasts for Georgia, the Southeast, and the nation. As the Third Millennium begins, what lies ahead for the state in an ever more interdependent world? Given where Georgia is now, the author speculates...

The arrival of the Third Millennium A.D. is a momentous turning point. When the Second Millennium began, bands of Native Americans lived along beaches or roamed great forests that swept north, south, and west. They depended on wild foods and primitive agriculture. They applied basic technology to wood, clay, stone, bone, leather, and natural fibers. Their small communities measured time by seasons, the movements of celestial bodies, oral tradition, and mythology.

Overseas, Europe was slowly recovering from the Dark Ages. The philosophy, science, and literature of the Greeks and early Romans, preserved by religious orders, would soon reach the world through theologically-oriented universities. Soon, too, the great scourge of Medieval and Renaissance Europe, bubonic plague, would virtually overcome a completely defenseless population.

In the East, civilizations long established in Persia, India, Japan, and China were creating art that lives on today, developing mathematics and philosophy, laying the foundations of medicine, and exploring technology as advanced for its day as computers are for ours. Around the world, however, there was little peace. Human conflict, natural disasters, illness, or accident, ended most lives early.

Today, as Georgians prepare for a new millennium, 7.6 million people live in the state. Laws, courts, prisons, and armed forces attempt to govern human conflict. Medicine fights illness and extends lives. Social institutions help many and a web of technical devices spreads knowledge. Manufacturing plants and firms that provide services line downtowns

or cluster in shopping malls, industrial complexes, and office parks.

A network of superhighways and secondary roads let people and products move rapidly between homes and businesses, across the state, and on to the nation and continent. Speed and convenience cost, of course: the roads have substantial environmental impacts, require large capital investments, and need more money and labor to maintain them. The gasoline-burning vehicles they bear are the single biggest source of man-made air pollution.

Above the highways, airplanes rule the skies. Great ships fill ports, but keeping channels open for ever-larger vessels means expensive and environmentally disruptive dredging. Railways criss-cross the land but abandon unprofitable local lines, which may be recycled as hiking trails.

Skies once hazed only by vegetation-produced ozone, wildfires, and the seasonal migrations of birds are also darkened by man-made and man-released pollutants. Artificially fertilized, guarded by herbicides and pesticides, and often mechanically irrigated, highly productive fields and farms send foodstuffs and raw materials to the nation and the world. Farmers use complex machinery, monitor crops by satellite, and precisely track costs and production by computers. Fire, flood, drought, frost, and biological hazards still threaten, however, while erosion and runoff of chemicals and animal wastes can endanger streams and rivers.

Forests survive, but are very different. Their third- and fourth-growth timber provides products, employment, and income, but most lack diversity. Few mature trees remain, so innovative methods of assembling small-diameter lumber into manufactured composites create new products and industries from scarcity. Owners actively manage timberlands for greater economic returns. Agricultural research develops faster-growing, more disease-resistant trees, but large, single-species forests suffer from infections and insect infestation, must be cleared of unwanted species, and have little room for plants and animals adapted to particular conditions.

Almost all of Georgia's free-flowing rivers are dammed to produce electric power, aid commerce, store water for human and industrial use, and provide inland seas for recreation. Much of the state's topsoil long ago washed into wetlands and to the sea. Deposits from natural and man-caused erosion slowly fill reservoirs and cover the traces of ancient encampments and modern settlements, unseen by recreation-bound Georgians. Meanwhile, offshore islands slowly lose ground, deprived of sand that once washed down the rivers.

The coast holds ports, towns, homes, and recreational areas. We locate ourselves and map the state through geographic information systems, rather than by oral landmarks. We communicate, watch for danger, guard against attack, and investigate the earth and oceans by continuously orbiting satellites. We measure time in tiny increments, keyed to a universal standard. Through advances in nutrition, sanitation, and medicine, we live longer, healthier lives. Paradoxically, many of us have less time for ourselves.

Georgians flock to what remains of the natural world. Parks and historic sites are so popular that some are almost "loved to death". Governments, private foundations, and individuals, often cooperating with local residents and businesses, try to save these resources, while keeping the social and material advances that centuries of human vision and toil have created. Simultaneously, an increasing population consumes more and more renewable and non-renewable resources, part of a standard of living and an economy that emphasizes consumption.

WHAT NEXT?

No one can forecast what Georgia will be when the Third Millennium ends, but we can examine the issues and trends that will influence its early years. Conversely, the decisions and actions of the state's residents are small links in the chains of events at all levels.

Today, citizens of all places stand at the intersection of global, national, state, and local influences and events. For example, economic collapse in Thailand spread the "Asian flu" to other nations as investors quickly depreciated currencies and withdrew capital. The chain reaction that followed still involves highly organized, productive economies in the region and the rest of the world.

The issues and trends that affect individuals spread through just such rippling, conflicting cross-currents in economic, social, and political life. Isolation and independence are myths that no person, state, or nation can afford to use to make real-life decisions and actions. In turn, these events are played out in an environmental setting that is slowly being recognized as a fundamental determinant of both short- and long-term change. ■

What issues and trends will affect Georgia as it enters the new millennium? Read more in the next issue of Georgia Business and Economic Conditions.

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