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Eight Regional Profiles

Silicon Valley

The name Silicon Valley was derived from a discovery approximately 30 years ago that silicon, the second most abundant element in nature, can be grown in crystalline form, sliced and polished, and then used as the basic medium into which semiconductor devices can be implanted. Today, nearly every high-technology company makes use of this basic scientific discovery.

Much of the credit for the Silicon Valley's existence must go to Stanford University and Dr. Fred Terman, its former dean of engineering. In the 1930s and 1940s, Dr. Terman was encouraging Stanford's engineering professors and students to get involved with local industry, not as consultants but as participants—entrepreneurs. Two of those students, Dave Packard and Bill Hewlett, heeded this advice and founded a company in 1938. Others followed suit. To encourage the process, Stanford

University opened an industrial park connected with its campus.

From its humble beginnings three decades ago, Silicon Valley has evolved into an industrial center possessing the qualities necessary to nurture and sustain high-technology companies of all types. These qualities include: universities, such as Stanford, which provide engineers and other professionals, research facilities, and other benefits of close academic-industrial relations; suppliers, which are nearby to meet the industry's specialized needs; professional advisors, such as bankers, who are comfortable with high-tech language and understand the needs of the valley's young companies; and venture capital, which is more accessible here than any other place in the world.

Because its high standard of living and housing costs have pushed wages to a higher level than elsewhere, the probability is that in the future other high-technology centers will attract manufacturing facilities faster than the Silicon Valley. On the other hand, companies probably will continue to locate their headquarters, research and development facilities, and manufacturing there. Why? Because the basic inducements are there. Because a valuable interchange

exists there among professionals and between companies. And, simply, because the executives like to live there.

—Jon Richards, San Jose

Central Florida

There is a saying in Orlando about the changes taking place in the high-tech industry: "California is where it was; Texas is where it is; and Florida is where it's gonna be."

Florida's ranking by a major financial services company as the number one state in which manufacturers would like to locate plants supports the idea that Florida has the potential to become a major center in the rapidly growing high-tech industry. In fact, development in the high-tech industry in Florida in the past several years has been significant, with Central Florida emerging as the state's hub of high-tech.

The development of high tech in Central Florida began in the late 1950s, when Martin Marietta opened its defense plant near Orlando. Within a few years, this company became one of the state's largest industrial employers, with more than 8,000 employees. Soon thereafter,

Brevard County experienced rapid growth for several years with the development of the space program at Cape Kennedy. In the 1970s, the area's base of high-tech industry began to broaden. In 1978, Harris Corporation, an electronics company, moved its headquarters from Cleveland to Central Florida, becoming the state's largest industrial employer with 10,500 employees.

There are several reasons why Florida's high-tech industry is undergoing rapid development. The state's cost of living is lower than that of other high-tech centers. Florida offers a quality of life matched by few areas. And real estate for plant development is more plentiful and less expensive than property in other high-tech areas.

Florida's educational system may not as yet be on the same level as California's or Massachusetts's, but it is making giant strides in the right direction. The University of Central Florida, for example, has established a professional chair in the high-technology field and endowed it with \$1 million. Earnings from the endowment fund will pay the salary and overhead of a professor with an international reputation in computer science. In addition, the state has allocated \$28 million to the university system to improve Florida's engineering schools.

In 1980 and 1981 several major announcements were made that high-tech companies were to locate plants in the area. While the recession has delayed some of those plans, the high-tech development currently underway is more significant than at any time in the area's history.

—Stephen Brown, Orlando

Orange County

The 1980s will be a prosperous decade for Orange County, with the area remaining at California's forefront of economic growth, according to Wells Fargo Bank's *Economic Forecast*. In fact, Orange County may surpass the Silicon Valley area and become

second only to Los Angeles in its concentration of manufacturing jobs, which will depend heavily on computers, electronic equipment, scientific instruments, and similar items.

The high-tech industry emerged in Orange County in the early 1970s with the aerospace industry. Over the past five years there has been approximately an 11 percent overall growth in Orange County's high-tech industry; in the computer and instruments areas, growth has been 19 percent and 14 percent, respectively. Currently, Orange County boasts approximately 500 companies and 74,000 employees in the industry. Total sales volume exceeds \$1 billion.

Due to rising business costs, especially travel, communications and telecommunications likely will be a significant growth area in the county during the 1980s. Emphasis on energy conservation also will create a strong demand for regulating, monitoring, and controlling devices. In addition, Orange County will continue to benefit significantly from military and space sector demands.

The educational facilities in the county, such as the University of California at Irvine and California State at Fullerton, are becoming an increasingly good source of skilled technical employees, as these schools expand their programs in computer science and engineering. Trade organizations, such as the American Electronics Association, are funding research and faculty assistance programs on local campuses to ensure the high quality of technical and professional education. Similarly, the Orange County Technology Exchange Center has been founded to act as a catalyst between industry and education, and to fill some of the job openings in specialized technological fields.

—Forrest Hunt, Orange County

Colorado

For a technologically oriented industry to prosper, the surrounding community must provide an educated work force, academically based research support, and investment capital. Colorado—the front range of the Rockies extending from Boulder south through Denver to Colorado Springs—historically has provided all three.

The so-called high-tech industry began in Colorado when the large computer companies opened branches in the state. IBM built a plant in Boulder; Hewlett-Packard established a number of operating divisions in Colorado Springs. At present, close to 700 high-tech companies employing 90,000 have located in the area. Most are small businesses in their embryonic stage of development, and most are devoted to the assembly of microprocessors, word processors, and data processing peripheral devices, and to the development of supporting software.

The limiting factor in the development of Colorado's high-tech industry has been a lack of venture capital. Nonetheless, Denver does have a unique source of funds which has helped to fuel the entrepreneurial drive. Compared with other areas where businesses began with venture capital and then graduated to public offerings, many Colorado ventures began with public offerings through the Denver "Penny" Stock Market. Most investments have been from middle-income people or from small venture-capital firms, which in their very early existence did moderate public offerings of between \$500,000 and \$2 million. Venture capital investments have followed during a firm's second round of financing.

The state leadership recognizes the potential for employment in this industry and is reviewing a number of proposals to support the industry. One such proposal, State Senate Bill No. 1, would authorize the co-funding by

government and private industry of a Colorado Advanced Technology Institute to promote communications about the industry's needs and to finance academic institutions supporting research.

The growth of existing firms combined with the area's attractive cost of living and agreeable climate should ensure that the high-tech industry in Colorado will prosper. In Colorado Springs the high-tech industry should be strengthened as the military space program and the North American Defense operations consolidate and expand their need for high-technology support. These operations could foster a "Silicon Mountain," as Coloradans like to think of it.

—Chris Peterson, Denver

Oregon

Oregon, a leading area of entrepreneurial growth, supports more than 300 high-technology companies, ranging from software engineers, working alone in their basements, to industry leaders, such as Tektronix and Floating Point Systems.

Venture capitalists recognize the importance of Oregon technology, having invested millions of dollars in new ventures. The recent Financial Symposium for Emerging Companies, held in Portland and sponsored by a group from Oregon's financial community, brought more than 80 venture capitalists from around the country to investigate the potential of 30 local start-up companies.

Early high-tech pioneers concentrated on specialty markets and reached international stature with products that were relatively unknown in Oregon but which made millions of dollars, both for themselves and their employees. Tektronix, for example, put the

first synchronized oscilloscope on the market in 1947, thus planting the seed for high-tech growth in the area.

High-technology-related industries added over \$4 billion to Oregon's economy in 1980 and provided more than 86,000 jobs. Oregon's labor department predicts that employment in this industry will increase 2,000 percent by 1990.

Government planners and private citizens have banded together to provide direction for this labor-intensive industry. The ultimate aim of the leaders who make up the newly formed Oregon Consortium for High Technology Education is to develop a Willamette Valley High Technology Corridor extending south from Portland to Eugene. For this effort, 30 Oregon firms had contributed over \$525,000, and the state of Oregon has agreed to appropriate \$500,000.

Oregon's geographical location on the Pacific Rim close to Japan and other Far East markets is a key factor in the nation's goal of balancing trade deficits with the countries in that region. In 1980, the value of Oregon's exports to Japan exceeded \$1.6 billion.

By the year 2,000, Bonneville Power Administration officials predict that high tech will be Oregon's largest industry. *Marple's Newsletter*, a respected Northwest business report, seconds this view and concludes, "The region has only begun to scratch the surface."

—Karen McMahon and Gary Burgher, Portland

Arizona

Arizona's rapidly growing high-tech manufacturing industry is on the leading edge of the state's economic expansion. Factors contributing to this growth have been a lower cost of living compared with other high-tech areas, a desirable climate, and an abundant supply of technically trained labor. The state's tax structure also has been particularly attractive: there are no taxes on corporate franchise or business inventory, and both federal and

state income taxes are deductible in determining taxable state income.

According to the Arizona Office of Economic Planning and Development (OEPD), which was formed by Governor Bruce Babbitt to attract more high-tech companies, 64,000 jobs presently exist in the state's high-tech industry, which in 1980 generated roughly \$3.6 billion in sales. In 1981, according to the OEPD, 40 percent of Arizona's manufacturing employment was in the high-tech industry, compared with 7.6 percent nationally. Among the high-tech giants with manufacturing facilities in Arizona are Motorola, Digital Equipment, Sperry Flight Systems, IBM, and Honeywell. The industry is expected to produce 70,000 new jobs by 1990, and the majority of these positions will be filled by graduates of Arizona's technical institutions. With over 300 such institutions, both public and private, the state is capable of meeting a wide variety of employer training needs.

Arizona's three major universities are gearing up for the increasing demand for professional labor. Arizona State University in Tempe has established a \$32 million Center of Excellence in Engineering. Scheduled for completion in October 1983, it will emphasize six engineering disciplines: solid-state electronics, computers and computer science, computer-aided processes, energy systems, thermosciences, and transportation.

Northern Arizona University in Flagstaff also is expanding its computer science and engineering departments, and the University of Arizona in Tucson is adding \$13 million in new facilities to its college of engineering. The OEPD ranks the state's work force as being younger and better educated than the national average, and more affordable than those of the other Sun Belt states.

The growth of Arizona's high-

tech industry has been a boon to the state's tax base. Further growth is being stimulated by the business and tax incentives promoted by the OEPD.

—Steve McCartney, *Phoenix*

Washington, D.C. Area

The Washington, D.C., high-technology community includes the District of Columbia, Montgomery and Prince George's counties (Maryland), Arlington and Fairfax counties (Virginia), the Dulles area in Loudoun County, the Baltimore-Washington corridor, and the I-270 corridor into Frederick County, Maryland.

Last year, at least 200 companies in this region each had sales greater than \$2 million. Total sales for area-based high-tech manufacturing and service companies approached \$6 billion, not including another \$500 million of work performed by nonresident companies.

The Washington market for high-technology goods and services has a solid anchor—the federal government. It supplies two-thirds of all research and development dollars in the United States. The federal government also is the world's largest user of computers. And overall, the region is considered the fourth largest computer installation in the nation.

In 1975 the Washington Standard Metropolitan Statistical Area (SMSA) had 17,651 doctoral scientists and engineers—more than any other area in the country. And according to 1978 census figures, the SMSA also has the highest per capita concentration of engineers and scientists—over 1,600 per 100,000 population. Of the total labor force, 27.8 percent are in the professional and technical fields. To assure an ample supply of future scientists, industry is forming relationships with the area's colleges and universities.

State and local governments, in turn, are working to create a

climate hospitable to industrial development. The Maryland Office of Business and Industrial Development, for example, is offering market research for businesses, matching up their requirements with locations and setting up meetings with county leaders.

State and local jurisdictions also are creating channels for investment or supporting those already in place. In Virginia, each local jurisdiction can permit companies to raise start-up or expansion capital through tax-free industrial revenue bonds.

With its ample tracts of undeveloped land, commitments to new highway construction, and enthusiastic local government support, the Washington area probably will see continued development in this industry.

—John Yerrick and
Anita Bradshaw,
Washington, D.C.

Massachusetts

America's nineteenth century industrial revolution began in Massachusetts. The state also claims to be where America's twentieth century industrial revolution—high technology—has begun.

Many Massachusetts-developed innovations have become the bases for new industries, such as interchangeable machine parts, the first American steam engine, the first analog and digital devices, important innovations in computer design, and, most recently, breakthroughs in robotics and biotechnology.

Massachusetts is economically dependent on its computer-related industry. The state has more than 700 such corporations that are based almost exclusively on technology transfer and brainpower. Most of these corporations are located along Routes 128 and 495, which loop Boston.

The state's advantage in high-tech manufacturing is derived

from its specialization in products with a large component of skilled labor. Filling this need are 120 academic institutions, at which, since 1965, 40 percent of all U.S. Nobel-Prize-winning scientists either have taught or been trained.

New companies have established themselves in Massachusetts primarily because of the expertise of the universities' faculties; approximately 15,000 academicians work in the Greater Boston area alone. A number of companies were, in fact, founded by research engineers, such as Kenneth Olsen of Digital Equipment, formerly with MIT's Lincoln Instrumentation Labs, or by scientists from Harvard, including Edwin Land of Polaroid.

According to a study by the Massachusetts Division of Employment Security in 1980, 35 percent of the state's manufacturing employees work in high tech. The actual number of high-tech jobs in Massachusetts is greater than in any other state except California, New York, and Illinois.

The Boston area has about 40 venture capital companies—more than any other state except California—and most specialize in high-technology investments. Financing programs also are in place within the state government. Largest of these is the Massachusetts Industrial Finance Agency, which has issued more than \$1 billion in industrial revenue bonds to 800 companies.

To facilitate cooperation within the industry and with the financial community, educational institutions, and government, more than 125 high-tech companies have joined to form the Massachusetts High Technology Council. Endorsing what it calls the "2% solution," the council is urging member companies to invest 2 percent of their research and development budget in higher education.

The future of high technology in Massachusetts looks bright. Although the industry's growth has slowed due to the recession, the expansion of Massachusetts's latest industrial revolution is expected to continue.

—Tara Dantzig, *Boston*