The Emergence of Silicon Valley

High-Tech Development and Ecocide, 1950–2001

The Military-Industrial-University Complex

The high-tech electronics industry is generally believed to be the solution to economic development, environmental protection, and social equity needs around the globe. Experience, however, indicates that this industry is linked to continued and rising rates of poverty and economic volatility, ecological devastation, and social inequality around the world.

International Business Machines (IBM) built its first West Coast plant, its Pacific headquarters, in San Jose in 1943. The Food Machinery and Chemical Corporation (FMC), a locally based manufacturer of equipment and chemical sprays and fertilizers for canneries and farms, expanded its operations in San Jose to include the building of armaments for the World War II effort in the early 1940s. The location and expansion of these and other major defense industry manufacturers signaled that San Jose was officially out of the Great Depression and beginning its transition into a new, post-agricultural economy. Predictably, Anglos—many of them Dust Bowl migrants—were the primary beneficiaries of these higher-skilled, higher-wage jobs in San Jose. This meant that European immigrants and Chicanos/Mexicanos continued to hold down jobs in the lower-wage cannery sector, which would soon be in decline. The electronics sector was emerging as the next economic stage in the Santa Clara Valley's evolution.

Before World War II, the electronics industry was concentrated in the Midwest and Northeast, producing mostly vacuum tubes and other products, generally for consumer radio markets. About 75 percent of all products were for consumer use. But by the end of the Korean War, the military accounted for 60 percent of the electronic products market.⁴

Facilitating this shift were the development of transistors (replacing the vacuum tube) and the virtual merger of the aerospace and electronics industries after the late 1950s. There was an ever-increasing demand for electronics products.

Stanford University was at the core of the transformation of Santa Clara Valley into Silicon Valley. Leland Stanford, the industrialist who endowed and founded the university, made a fortune supplying mining equipment during the Gold Rush, cofounded the Central Pacific Railroad, and advocated open Chinese immigration to the United States for railroad construction.⁵ Frederick Terman, a professor of radio engineering at Stanford and later dean of engineering and provost of the university, was intent on institutionalizing the relationship between the university and the government. He viewed such a relationship as the future of U.S. research universities, and perhaps the only way to ensure U.S. military security in the world. In his vision, university-government alliances for military research would bring "better health, better transportation, more leisure, and a higher standard of living" to his faculty and to the general citizenry of Palo Alto, California, where Stanford was based.⁶

When the cold war began in the late 1940s, the U.S. Department of Defense was making large grants to several firms and universities (like Stanford) in Santa Clara County to create a center for military and defense industry research around the transistor and microprocessor. Stanford University was a national leader in research and development in this field. The Stanford Research Institute (SRI) was founded in 1946 by several Bay Area financiers and University officials for the purpose of conducting applied research for California's industrial and defense sectors. The Stanford Industrial Park (SIP) was founded in 1951 when the university leased land to electronics firms, including future giants like Hewlett-Packard and Varian Associates, who were among its first tenants. At SIP and nearby, many firms located and/or expanded, including FMC, Lockheed, Philco, General Electric, Sylvania, Fairchild, Memorex, National Semiconductor, and dozens of others. In return for prime business locations at the SIP and lucrative federal contracts, firms would endow department chairs, provide needed buildings and equipment for university laboratories, and sponsor relevant projects. For their part, municipalities would provide tax relief and other subsidies and clear tracts of land for industrial development. Thus, Silicon Valley was the creation of the federal government, local municipalities, universities, industry, and the military. These stakeholders collaborated to produce an

Contractor	Defense Contracts (in millions of \$
Lockheed	1,910
Ford	295
Westinghouse	282
Autek Systems	126
Stanford Telecom	88
Unisys Corporation	87
Varian Associates	51
TRW	35
Honeywell	29
Applied Technology	27
Teledyne	24
Hewlett Packard	21

TABLE 4.1 Tot Turalia Defence Contractors in Santa Clara County 1988*

economic engine that would lead the nation—and indeed the world—in the production of electronics and computer chips for commercial, military, and consumer use.

The cold war economy provided Santa Clara County's defense/electronics industry with an opportunity to reap a windfall of government contracts. Since 1940, the infusion of federal money—hundreds of billions of dollars—has underwritten the expansion of high-technology industry.8 By the late 1970s, Santa Clara County was receiving \$2 billion annually in federal defense contracts, and the trend continues today (see Table 4.1). Given this enormous volume of federal contracts pouring into the Valley, the claims that this industry started "from scratch" or that "brainpower is the most important factor in the semiconductor industry" defy reality. 10 Federal dollars went toward the development and production of "electronic warfare technology": the Trident missile, military lasers, rocket booster motors for the Air Force Titan 3C, spy satellites, and armored personnel carriers. 11 By 1979, two hundred thousand persons in the county were directly or indirectly employed in the electronics industry. 12 Thus, military demands shaped technological and economic developments in Santa Clara County from the beginning of the electronics industry. 13

In 1955, William Shockley, co-inventor of the transistor, arrived in Palo Alto to found a company that would produce semiconductors. Shockley would in many ways spur the development of Silicon Valley, through the growth of a family tree of name-brand firms over the next

^{*}Smith and Woodward 1992, 4.

several decades. Shockley Transistor Corporation quickly picked up several federal military contracts. But in 1957, all eight of Shockley's engineers defected and went to work for the newly founded semiconductor division of Fairchild Camera and Instrument Corporation (the Fairchild family was a cofounder and one of the principal stockholders of IBM). In 1961, Fairchild struck gold when it developed the ability to mass-produce integrated circuitry on fingernail-sized silicon chips. This process led directly to the production of the second generation of Minuteman intercontinental ballistic missiles (ICBMs) for the U.S. Air Force.¹⁴ Charles Sporck, general manager at Fairchild, left to work at National Semiconductor in 1967, and Robert Novce, one of the original "traitorous eight" engineers who defected from Shockley, resigned as head of Fairchild to cofound Intel, the largest producer of semiconductor components in Santa Clara County. Fairchild, National, and Intel became known as "The Big Three" in the industry. The development of large-scale integrated circuitry (leading to the boom in hand-held calculators) and the microprocessor—a programmable minicomputer on a chip, which led to the explosion of consumer use of computers—solidified Santa Clara County's position as the electronics industry leader during the 1960s and afterward. The result was an explosion in the number of firms-800 electronics businesses sprang up between 1950 and 1974. As hundreds of firms located, expanded, or were created in Santa Clara County, thousands of job seekers, many of them immigrants and people of color, came looking for work.

Immigrants and People of Color Seek Opportunities in the Valley of Dreams

Long an elite and exclusive private institution, Stanford University had no less stringent expectations of the firms it was allowing to locate in its industrial park. The university sought to ensure that the companies and their personnel would "blend in" with the suburban environment. They sought

"light industry of a non-nuisance type . . . which will create a demand for technical employees of a high salary class that will be in a financial position to live in this area." The well-paid, well-educated worker in the industrial park made a "very desirable kind of resident" for the community, according to the president of the Stanford Board of Trustees; employers should expect the suburban environs of the park to "attract a better class of workers,"15

The terms "desirable" and "better class" are classic code words that denote Stanford's wish to attract white, middle-class workers and to repel undesirables, the multiracial blue-collar "riffraff" generally associated with manufacturing industries. 16 This was a textbook pitch reminiscent of the turn-of-the-century "city beautiful" efforts by Frederick Law Olmstead and others, who were openly classist and racist in their consultations with cities regarding what a desirable citizen population might be.17 The San Jose News did its part to promote Santa Clara County's clean and lily-white image when it boasted that political and business leaders were able to attract entrepreneurs to the area who used "[i]mproved production techniques and new types of industries which eliminated or reduced industrial nuisances." In 1968, while the Black Panther Party, the Brown Berets, La Raza Unida, and the San Francisco State University strike were in full force, the San Jose News proudly proclaimed that Santa Clara "is a white collar county . . . and 93.6 per cent of the county population [is] white."19 Little did the Stanford University administrators, newspaper editors, and urban planners in the county realize that the region would soon be transformed into one of the most environmentally polluted and racially and ethnically diverse in the nation.

Chicanos

The 1960s and 1970s saw the emergence of public protests in San Jose's Chicano community when activists and residents put the spotlight on police brutality, economic discrimination, and the lack of services in their neighborhoods. Punctuating some of these concerns, one Chicano activist, Sal Alvarez, told an audience at a West Valley College symposium in 1969 that "Mexicans in San Jose got cheated out of land under urban renewal . . . [and] the killing of Mexican Americans by police in California is a very serious problem and a worry in San Jose."²⁰ Community-based and national organizations like United People Arriba, the Council on Latin American Affairs, and La Raza Unida were active in San Jose and Santa Clara County. Apartment complexes, construction companies, schools, and police departments charged with discrimination against Chicanos were the primary targets of the protest movement.²¹

A 1973 Rand Corporation study reported that while much of San Jose was experiencing prosperity, "poor [largely Latino] neighborhoods [had] deteriorated relative to better-off neighborhoods and segregation had increased."22 Housing quickly became a social and environmental justice issue as activists linked poor housing quality and poor health with racism. The fate that befell so many African American neighborhoods around the nation during the 1950s due to urban renewal efforts also came to pass in the barrio of Sal si Puedes in east San Jose.²³ Urban renewal was the federal effort to improve municipalities by razing degraded and blighted housing and by connecting cities and states through the interstate highway system. These changes devastated and destroyed many communities, earning urban renewal the nicknames "Negro removal" and "Mexican removal." For example, most of the houses of Sal si Puedes were razed as part of an urban renewal program that included the construction of a new freeway.²⁴ In the 1980s, other neighborhoods populated by people of color in San Jose would fall prey to urban renewal—ironically, for the construction of the Tech Museum, the city's monument to the electronics and computer industries, and its own physical proclamation of its status as the "Capitol of Silicon Valley."25

The Chicano community of Alviso, in North San Jose, was also the site of many conflicts over environmental and social justice concerns. In March 1973, activists set up a tollbooth on the Gold Street Bridge, charging twenty-five cents for cars to pass—a symbolic protest to call attention to the lack of paved streets in Alviso. The streets were not paved until 1980, twelve years after Alviso was annexed by San Jose.²⁶

Asian/Pacific Islander Americans and Immigrants

According to the 1980 census, an estimated 11,700 Vietnamese immigrants were living in San Jose. By 1987 that number had jumped to around 75,000.²⁷ During the 1980s, there was a marked rise in white resentment and hate crimes directed at the Vietnamese population in particular, and at Asian/Pacific Islander Americans and immigrants in Silicon Valley in general.²⁸ During this period, many manufacturing workers were being laid off in the United States and there was increased

tension over the heightened competition with Japan in the auto and electronics industries. Much of this tension was channeled into scapegoating any and all Asians, regardless of their specific ancestry.²⁹

At the same time, some Asian immigrants were doing well in the hightechnology sector, as white-collar workers. Chinese software engineers set up many businesses by networking with firms and entrepreneurs overseas and, by 1992, Asians made up a third of the engineering workforce in Silicon Valley.³⁰ Very few of these upwardly mobile Asian workers broke through the glass ceiling into the ranks of management. David Lam, founder of Lam Research, a company that makes equipment used in chip making, explained, "Many Asian engineers are not being looked at as having management talent. They are looked upon as good work horses, and not race horses."31

As financially stable as some Asians appeared to be, most were working-class and many of them experienced plenty of setbacks. In 1983, Atari Corporation, the video game maker, announced that it was closing its Silicon Valley plant and shifting production overseas to Hong Kong and Taiwan. Most of those production employees thrown out of work were Latino, Chinese, and Vietnamese. One of these workers was Hoa Ly. In 1978, Ly escaped Saigon in a fishing boat jammed with fifty-five other refugees. He spent half a year in a Malaysian refugee camp and later moved to Silicon Valley, where he got a job in printed circuit board assembly at Atari for which he was paid \$7 per hour. Since his mother and father both worked by his side at Atari, when the company closed down his whole family was suddenly out of work. The Atari case was also quite significant because it was a high-profile example of the empty "no layoff pledge" many Silicon Valley companies made during the 1970s, when business and political leaders were claiming that this industry was immune to recession.³²

Since the 1980s, the popular sentiment regarding immigrants took at least two, perhaps contradictory, directions. The first was a continuation of the traditional nativist approach to immigration, and this anti-immigrant movement gained sanction at the highest levels, as the efforts to pass Proposition 187 (denying undocumented residents access to public services) and the implementation of the Welfare and Immigration Reform Acts of 1996 moved forward. Television commercials depicted gangs of "illegals" crossing the Rio Grande under cover of night, and presidential hopeful Pat Buchanan warned of a "foreign invasion" from Mexico. In Silicon Valley, as elsewhere, this backlash took the form of

Immigration and Naturalization Service (INS) raids of workplaces. In April 1984, when the INS opened a new office in Silicon Valley, they conducted raids on two electronics firms in San Jose and the city of Santa Clara on the same day. Using classic nativist rhetoric, Harold Ezell, the INS's Western regional commissioner, stated, "Probably 25 percent of the working population in this area is here illegally, particularly in the Silicon Valley area. We intend to make our presence known. Our officers will be freeing up jobs for U.S. citizens and people who are here legally."33 Neither the newspaper article nor the INS acknowledged that, without the abundance of undocumented immigrant labor, many Silicon Valley industries would relocate overseas or south of the U.S./Mexico border. The second direction in popular sentiment was the general consensus among labor, business, and politicians that the Immigration bill of 1990 and the H1-B visa expansion in 2000 (allowing white-collar high tech workers to immigrate to work at a particular firm for a limited period) were good for the U.S. economy, because of the alleged "shortage" of skilled workers.34 The AFL-CIO called for an amnesty for the nation's estimated 5 million undocumented immigrants and Federal Reserve Board Chairman Alan Greenspan warned that, without a new wave of skilled immigrant workers, the integrity of the U.S. economy would be threatened.³⁵ Soon the national and California state legislation and policy making around these questions lumped documented and undocumented immigrants together for punitive measures. This indiscriminate grouping of these populations rendered the distinctions moot in many cases and revealed the deep similarities between the racist nature of immigration policy at the turn of the twentieth century and the twenty-first.³⁶ One of the major differences for Silicon Valley and the state of California, however, was that, for the first time since indigenous peoples occupied the land, people of color were now the majority. Of the 1.6 million people in Santa Clara County in the year 2000, 49 percent were white, 24 percent were Latino, 23 percent were Asian, and 4 percent were African American.³⁷

Immigrants, People of Color, and Inequalities in the New Economy

The level of social inequality in Silicon Valley is a byproduct of an unregulated quest for wealth. In a 1979 special report on the state of Silicon

TABLE 4.2
High-Technology Employment by Race, Ethnicity and Gender in Santa Clara County, 1970*

	Male	Female	White	Latino	Asian
Managers	85%	15%	88%	4%	5%
Professionals Craft Workers	82% 56%	19% 44%	83% 63%	3% 17%	12% 14%
Operatives	31%	69%	49%	23%	19%
Laborers	38%	61%	41%	34%	17%

^{*}Adapted from Equal Employment Opportunity Commission 1980.

Valley, the San Jose Mercury News noted that "[t]he economic gap between the white majority and the minorities and poor is widening, and inflation will add to the inequities, putting greater strain on the social system." That same report stated that, although most of the new immigrants in the area have either a college or a trade school education, the majority are working at jobs "generally below their skill level . . . [and] more than half of them are employed in the valley's electronics industry."

By 1995, the situation had not improved. On the one hand, racial diversity was increasing: the total Latino population constituted 23 percent of the county's residents, Asian/Pacific Islanders were 20 percent, and the white population was less than 53 percent.³⁸ However, Silicon Valley was experiencing ever-increasing wage inequality across race, class, and gender, at rates much greater than in the United States as a whole.³⁹ Perhaps more disturbing than this growing inequality was an absolute and relative decline in wages for many workers.⁴⁰

Carrying on the historical tradition of gender and racial segregation in the Santa Clara County workplace, Silicon Valley electronics firms surpassed the national economy in their ability to divide employees by social categories (see Tables 4.2, 4.3, and 4.4). As one study reported, "The workforce is sharply divided along ethnic, sexual, and educational lines. In general, white males hold the positions with the highest incomes and greatest power. Non-white men (including Hispanics) and white women fall in the middle of the high tech hierarchy. And minority women stand at the bottom of the occupational structure."41

Table 4.2 reveals that, in 1970, women and people of color constituted an exceedingly small fraction of professional and managerial positions in the Valley; these same groups were concentrated in the

TABLE 4.3 High-Technology Employment by Race and Ethnicity in Santa Clara County, 1980*

	White	Latino	Asian
Population	58%	20%	17%
Managers	80%	4%	10%
Professionals	70%	3%	20%
Craft Workers	45%	20%	30%
Operatives	25%	23%	47%
Laborers	19%	36%	42%

^{*}Adapted from Siegel 1994. The above percentages are rough approximations based on a reading of bar graphs.

lower-paid, higher-risk occupations of craft worker, operative, and laborer. Ten years later, these patterns remained virtually unchanged, except for the class bifurcation among the Asian populations, as many skilled Chinese immigrants moved into higher-paid positions, while the Vietnamese population was concentrated in the lowest-paid positions (see Table 4.3). Thus race, class, and gender operated in ways that generally disadvantaged people of color and women in Silicon Valley. The problem of racial and gender discrimination in the industry was so serious that the U.S. Commission on Civil Rights held a hearing on the topic in San Jose in 1982.42

In addition to a racial and gendered division of labor in Silicon Valley,⁴³ residential segregation was rampant in the region. Wealthy, educated whites tended to cluster in the Palo Alto area and the foothills, while less affluent residents, including most people of color in the Valley, concentrated in the "flatlands" of East Palo Alto, Mountain View, and San Jose. 44 This spatial segregation by race and class also produced and reinforced school segregation.⁴⁵

The Underside of Silicon Valley: Land Grabs, Toxics, and Ecocide

Land Annexation and Sewage Troubles

Paralleling the Spanish Conquest, the Gold Rush, and the cannery and orchard economies in the Valley, San Jose's industrial and political leaders in the post-World War II era sought to expand their profits and their

influence. As two political scientists flatly put it, "Their policy was growth,"46 and pollution was one of the many negative byproducts of this approach to development. Under City Manager Dutch Hamman, San Jose allowed "developers [to] do what they wanted wherever they wanted to do it."⁴⁷ The city was intent on achieving growth, attracting industry, and increasing the tax base at almost any price:

Simply put, growth meant prosperity, and bigger was better. Few people identified growth as anything but beneficial for a community, and the thought of the contrary was virtually unthinkable. Growth meant progress, and progress was the road to prosperity. In this atmosphere it is not difficult to understand why proposals for slower and more coordinated growth were neglected.48

Soon San Jose was caught up in what became known as the "annexation wars." The city coerced and cheated farmers, residents, and others out of large tracts of land all over the county. 49 This was a contemporary extension of the "land grabs" that had been ongoing in the area for nearly two centuries.

The annexation wars took on an interesting environmental twist during the 1940s and 1950s. At this time, surrounding towns needed sewage treatment facilities, and San Jose, in a much despised political move, gave them a choice: annexation as the price for sewage service or no sewage service at all. San Jose had built an extensive "outfall" sewage drainage system into the San Francisco Bay in the 1880s. This was the first and largest sewage system in the South Bay and was built to accommodate the significant effluent produced by the canneries and any waste from future (projected) population growth. So other cities either had to

TABLE 4.4 High-Technology Employment by Race, Ethnicity, and Gender in Santa Clara County, 1990*

	Male	Female	White	Latino	Asian
Officials/Mgrs	78%	22%	80%	4%	12%
Professionals	72%	28%	70%	4%	21%
Technicians	76%	24%	53%	10%	31%
Office Workers	21%	79%	65%	13%	15%
Blue-Collar	61%	39%	43%	20%	31%
Laborers	51%	49%	18%	38%	42%

^{*}Siegel 1994.

build their own systems or become a part of this growing giant in order to handle their own waste and comply with state and federal laws. This was San Jose's way of using its monopoly on sewage toward its goal of growth at all costs. As Dutch Hamman bluntly stated, "We're in this fight to the finish, and if we have to use sewage disposal to bring Santa Clara [County municipalities] to some point of reasoning, we'll do it." The annexations continued; between 1950 and 1960 the city added 491 lots, and it added at least 900 more between 1960 and 1970—for a total annexation of 132 square miles of land. This pattern continues through the present day, underscoring that the most basic natural resources—land and water—remain critical for the survival of the high-technology industry, as was the case for each major system of production that preceded it. S2

During the 1970s, San Jose's sewage treatment plant was operating near, at, or over peak capacity and was increasingly toxic. A sewage spill from the plant in 1979 killed off a great deal of marine life in the southern part of the San Francisco Bay. Another spill just one year later exacerbated the situation. This sewage plant was located in the Latino community of Alviso. By this time, the sewage problem was attributable less to cannery pollution than to electronics industry pollution. Industry representatives from National Semiconductor complained that, by paying sewage fees and taxes, the electronics sector was being forced to "subsidize the canneries"53; in actual fact, however, National Semiconductor was one of the biggest polluters in the Valley and has since been sued for allowing its workers to be poisoned and afflicted with cancer. More generally, the high-tech industry is responsible for dumping sewage laced with heavy metals like nickel, cyanide, lead, and cadmium into the Bay, contaminating the oyster and shellfish population to the point that they are unsafe for human consumption today.⁵⁴ A 1988 study by the environmental group Communities for a Better Environment found that nine of the top twelve releasers of toxic heavy metals into the local ecosystem were high-tech firms. An investigation by the San Francisco Bay Guardian newspaper found that tech companies were regularly dumping toxics into the public sewer system, violating local and federal clean water laws, and contaminating the Bay waters just as the canneries and gold miners had done in previous generations.⁵⁵

Pushing against the dominant political grain, a number of growth control advocates were operating in the area, although they wielded sig-

nificantly less power than the pro-growth forces. They included farmers, certain school districts, and conservationists who sought to achieve a balance between the aesthetic agricultural side of the Valley and the growing industrial areas. Farmers understandably felt threatened by San Jose's unchecked growth, so many of them fought the annexations. In 1953, a task force of agricultural leaders pressured the county to develop a new zoning classification called "exclusive agricultural" areas, also known as the "green belt" or "green zones." 56 In 1955, farmers succeeded in obtaining passage of the Agricultural Exclusion Act as well. This act mandated that land zoned for agriculture could not be annexed to a municipality without each property owner's consent. The 1957 Agricultural Assessment Law and the more recent Williamson Act both allowed for voluntary contracts between landowners and the city and county governments to maintain land for agricultural use while taxing properties based on their agricultural—not real estate market—value.⁵⁷ By 1958, 40,000 acres fell into this zoning category, and by 1960 that number had increased to 70,000 acres.⁵⁸

From "Clean Industry" to the Valley of Toxic Fright

As others have noted, the new economy, based on the emerging electronics industry and its defense and warfare orientation, was ushered in with a fanfare that promised new jobs in a "clean industry." 59 Stanford University's Industrial Park also bought into (and propagated) this myth:

Stanford Industrial Park represented a new variation on several traditions, and observers initially were unsure how to describe it. Some likened the district to a garden, others to a park, still others to a country club—all provocative comparisons for what was at bottom an industrial workplace. One booster simply listed the amenities—"broad lawns, employee patios, trees, flowers and shrubs, walls of glass, recreational club"—that made it such a "pleasant place" in contrast to "smokestacks, noise, coal, cars, soot, and other things" associated with industry in the East and Midwest. All these features defined the park as a western hybrid of the two mid-twentieth century strains of suburb and campus. . . . Stanford consequently limited buildings in the park to no more than two stories, forbade smokestacks, and prohibited any noises, odors, or emissions that might offend homeowners.60

This postindustrial, post-smokestack, campus-like suburban planning made it easy for developers and industry owners to claim that the electronics sector was "clean" and "pollution free." The clean image of the electronics industry was touted by executives, politicians, and newspapers everywhere. Harold Singer, an official of the San Francisco Bay Regional Water Quality Control Board, once stated, "the horizon above San Jose is unmarred by smokestacks, and people here are proud of that. They have worked hard at making the valley a base of the computer-electronics industry and an unpolluted place to live." 62

As recently as the year 2000, the *Smithsonian Magazine* described the "clean rooms" where microchips are made as "the most fanatically clean, most thoroughly sanitized places on the planet," where "one could eat one's oatmeal off the floor." The highly toxic wafers from which microchips are cut are viewed by industry promoters as "pristine," and the chemical-laden water that washes semiconductor components in the electronics "fab" plants is described as "pure." Even former U.S. President Bill Clinton rubbed shoulders with CEOs in Silicon Valley in the 1990s, publicly proclaiming that the high-tech industry "will move America forward to a stronger economy, a cleaner environment and technological leadership." These accounts leave the uninformed reader with the impression that high-tech firms are the paragon of hygiene and safety, sanitation and environmental responsibility.

The history behind this image—and more importantly, the need and desire to create this image—seems to be lost on most observers of Silicon Valley's environmental problems. In the 1940s, as large defense industries such as General Electric, IBM, and Westinghouse Electric were locating and/or expanding in the Valley, the agricultural interests were quite concerned about the environmental impacts of this new form of development. In 1950, the San Jose Chamber of Commerce wrote:

there were some sincere and intelligent people who looked askance at this industrial development. They had genuine fears that smokestacks would "encircle the city"; that "blighted areas" would spring up in industrial sections; that orchards would be torn up "by the hundreds"; and that by past standards, this accelerated trend in the establishment of a new industry might result in an unbalanced, top-heavy economy destined to collapse at some undetermined time in the future.⁶⁷

The author of a study of the Bay Area conducted during the 1950s described the level of accuracy of these dire predictions:

The fears that orchards would be torn up by the hundreds were indeed well founded; and smokestacks, though they by no means encircled the city, did undeniably contribute to the development of a new problem. The Chamber [of Commerce] sought to assure the skeptical that industrial growth was not incompatible with desirable living conditions. Yet it was not long before the Santa Clara County Board of Supervisors found it necessary to designate the entire county an air pollution control district; the skies over the Santa Clara Valley were becoming a dirty gray. In March, 1950, the county health officer, declared that "smog," the murky atmospheric condition familiar to Los Angeles, was not only a Santa Clara County problem but also a "Bay Area problem." The new factories in San Jose and Santa Clara were producing air pollutants. 68

Thus the very beginnings of the electronics and defense industries were marred by environmental problems, the greatest irony of all being that they involved "smokestacks." So it seems that in the 1950s and 1960s, when Palo Alto and other cities in the Valley demanded that new industries be smokestack-less, these concerns were rooted in the real experience of having observed this sector befoul the local environment. Whether or not the municipalities were aware of it, these expectations and claims of nonpollution were either naïve promises or lies, while the production processes internal to these corporations actually became even more toxic than before. This heavily polluted past also challenges earlier claims by Silicon Valley boosters that the region was "pollution free" prior to the electronics boom of the 1960s.69

The End of Innocence

In the 1960s and 1970s, a sort of amnesia fell over the Valley's residents and policy makers; they all seemed to arrive at a consensus that the new industry was somehow pristine. This image was shattered in December 1981, when it was discovered that the drinking water well that supplied 16,500 homes in the Los Paseos neighborhood of South San Jose was contaminated with the deadly chemical trichloroethane (TCA), a solvent used to remove grease from microchips and printed circuit boards after they are manufactured. Officials estimated that 14,000 gallons of TCA and another 44,000 gallons of various toxic waste materials had been leaking from an underground storage tank for at least a year and a half.⁷⁰ The responsible party was the Fairchild Semiconductor corporation.

Lorraine Ross, a resident of the neighborhood (and a mother), was catapulted into the role of environmental activist. She and her neighbors mapped out a disturbing and pervasive cluster of cancers, miscarriages, birth defects, infant heart problems, and fatalities in the neighborhood that public health authorities and the industry were forced to take seriously. Two health studies were carried out immediately, both of which confirmed the presence of higher than expected frequencies of congenital birth defects (three times the normal rate), spontaneous abortions, and heart defects. However, neither study would take the bold step of pinpointing industrial chemicals as the cause.⁷¹ One reason for the delayed discovery of the presence of chemicals was that at the time, state and federal regulations did not require testing for industrial chemicals. Tests were only required for viruses, bacteria, pesticides, and herbicides.⁷² A painful irony here is that TCA was commonly used as a substitute cleaner for TCE (trichloroethylene). TCE is a suspected carcinogen that was nearly phased out of the industry in the late 1970s—the result of the Campaign to Ban TCE, led by occupational health advocates in San Jose. 73 This community organizing success was reversed when the industry phased out the targeted chemical and substituted a comparably hazardous one.

Back in the Los Paseos community of San Jose, Lorraine Ross was organizing against Fairchild, berating the city council that year with the question, "Fairchild or my child?": "It takes a lot of nerve for them to invade a pre-existing residential neighborhood, pour dangerous chemicals into a leaking tank, poison the surrounding environment and hide the fact from the people affected by their negligence."

Ross was not alone. She was a leader of a burgeoning antitoxics/environmental justice and occupational health movement taking shape in Silicon Valley. Organizations like the Santa Clara Center for Occupational Safety and Health (SCCOSH) had prior to the contamination of Los Paseos been involved in leading community workshops on chemical solvents such as those spilled at Fairchild.⁷⁵ The Silicon Valley Toxics Coalition (SVTC), an environmental justice group that had formed in response to the Fairchild spill, was also at the forefront of the campaign to bring that company to justice. In 1983, Fairchild closed down its plant

in South San Jose, a victory for Ross and the environmental justice movement. Since then, the company has spent more than \$40 million on the cleanup. Similar chemical accidents and resulting toxic illness and death tolls have occurred in the communities near the IBM and Teledyne Semiconductor plants; the IBM spill is one of the largest in the county, having leaked toxics since 1956.76 IBM had to install a more extensive chemical detection system for ground water monitoring as a result of efforts by the Silicon Valley Toxics Coalition, Communities for a Better Environment (a San Francisco-based group), the Santa Clara Valley Water District, and the County Board of Supervisors.⁷⁷ This result actually set two new precedents. The first was that the so-called "clean industry" could no longer be viewed as pristine. The second was that this industry was not trustworthy and that only the presence of a strong local environmental justice movement could ensure that necessary reforms would materialize.

Challenges to the "clean industry" image in the Valley abound. The USEPA has estimated that a large area of land, contaminated by eleven electronics plants in the Mountain View area alone (a community with a large population of immigrants, people of color, and working-class persons) will take \$60 million and 300 years to clean up. As we mentioned in chapter 2, that site is located at Moffett Field, the old Naval base that sat on the land owned by one of the few remaining Ohlones in the area, Lope Inigo. As for the once pure water and fertile land of the Valley, 57 private and 47 public drinking wells were contaminated as of 1992, and 66 plots of land have been declared too toxic for human beings to walk on.⁷⁸

Soon after the Fairchild spill made news headlines, various arms of the federal government also took on the charge of addressing this problem. In 1985, the Congressional Committee on Public Works and Transportation held a hearing on toxic concerns in the electronics industry in San Jose.⁷⁹ The USEPA also undertook its own study of the human health risks associated with industrial pollution in Santa Clara County. The agency released a preliminary draft of this "Integrated Environmental Management Project" in 1985, which concluded that pollution-related health risks in the area were "comparatively low."80 Clearly elated, a spokesman for the Semiconductor Industry Association (SIA) informed the media that, based on the EPA's findings, industrial chemicals in Silicon Valley "do not pose a significant threat to human life." 81 Environmentalists and journalists immediately became suspicious and discovered that a scandal was afoot. According to one report, long before the study was released, the SIA had hired a high-ranking official of the Republican Party who lobbied the EPA into lowering risk estimates and excluding tests from the study that would indicate whether solvents caused chronic diseases, birth defects, and miscarriages. This effort seems to have paid off, as it appears to have shaped the "findings" in the EPA's study. But it was a major source of embarrassment for the EPA when high-profile environmental groups and political leaders denounced the report as flawed and biased in favor of industry. The true significance of this event was that environmentalists learned that they had to remain vigilant and be wary of "scientific studies," because the USEPA and any other agency could be bought and paid for by industry to silence or "disprove" dissenting perspectives concerning the true costs of the Silicon Valley "miracle."

After testing other companies for toxins, county authorities found that sixty-five of seventy-nine (or 82 percent) had hazardous chemicals in the ground beneath their plants. Some of these included IBM, Intel, Hewlett-Packard, DEC, Tandem, Raytheon, NEC, AMD, Signetics, TRW, and many others. Today Santa Clara County is home to twenty-nine Superfund sites, more than any other county in the nation, and twenty-four of those sites are the result of pollution by electronics firms.

The earlier claims that computer/electronics was a "clean industry" rang painfully hollow, because, as the Silicon Valley Toxics Coalition's Ted Smith put it, this industry had "buried its smokestacks underground."⁸³ Other leaders stated similar concerns:

Voicing the shock shared by cities that had assumed the electronics industry was nonpolluting, San Jose's mayor, Janet Gray Hayes, said, "I remember thinking about smokestacks in other industries. I didn't expect this problem in my own backyard." She continued, "When I first became Mayor and we embarked on an economic development program, there was no doubt in my mind that this was a clean industry. We now know that we are definitely in the midst of a chemical revolution." So

Why Is High Tech Toxic?

Mayor Hayes got it right: we *are* in the midst of a chemical revolution, with more chemicals in use today than ever before, and with very little knowledge of their toxicological effects. In 1999, on average, the production of an eight-inch silicon wafer required the following resources:

4,267 cubic feet of bulk gases, 3,787 gallons of waste water, 27 pounds of chemicals, 29 cubic feet of hazardous gases, 9 pounds of hazardous waste, and 3,023 gallons of deionized water.86

Why was so much toxic waste being produced? First, the semiconductor chips themselves had toxics built into them. This was because silicon, a natural conductor of electricity, would increase its conductivity exponentially when certain chemicals were applied to it.⁸⁷ Second, it is now well known that the U.S. military is the largest producer of toxic waste in the nation. So the fact that Silicon Valley was hardwired for military production is a major reason for the presence of an inordinate amount of toxins in these industries. Specifically, the use of toxics is required in many contracts with the military. As one report details:

Many products made by electronics firms are destined for use by the military. Military production specifications are the driving force behind product design. Yet, these specifications are unrelated to social needs or public costs. For instance, military specifications for many electronics devices demand the use of CFC-113 as a solvent of choice. CFC-113 is one of the main destroyers of the Earth's protective ozone layer. The military's need for faster, radiation resistant semiconductors has also prompted the development of gallium arsenide-based chips, and this demand has placed an extra burden for safety on the electronics manufacturers, since gallium arsenide production techniques require far greater amounts of carcinogenic arsenic.88

Third, the electronics industry was taking advantage of breakthroughs in research and development in the petrochemical industry:

the microelectronics industry is developing in a new age of synthetic chemicals. Since World War II, major technical innovations in the petrochemical industry have produced a wide range of synthetic chemicals for industrial production. Early work by the National Bureau of Standards and the American Petroleum Institute during the 1930s shifted the focus of hydrocarbon production from coal to petroleum. Combined with the heavy defense investments in chemical research during the war, this led to an explosion of new chemicals on the market following 1945. The U.S. production of synthetic chemicals increased from about 1 billion pounds in 1940 to 30 billion in 1950 and 300 billion in 1976. The rapid increase in the quantity and variety of new chemicals paralleled the development of the microelectronics industry. Unlike older industries that developed when resources were more limited and naturally occurring, the high-tech industry capitalized on new solvents such as ethylene, benzene, and styrene, complex halogenated hydrocarbons like trichloroethylene and methylene chloride, and various new ketones and resins.⁸⁹

Finally, much of the water pollution associated with the high-tech industry in Silicon Valley stems from historical practices within the agricultural sector:

It is estimated that there are about ten thousand well pipes in the Valley which extend from the surface to a depth of 30 to 150 feet into the ground. These were well pipes for agricultural uses on the farms. When the factories were built throughout Silicon Valley, most of these well pipes were simply buried. No one knows any longer where the majority of these well pipes are located. After careful searches through the records of the water authorities and other governmental agencies, about three thousand old well pipes were located. The unidentified pipes which remain puncture the clay strata and permit chemically contaminated ground water to seep into the underground water supplies, whereby toxic substances are distributed far and wide.⁹⁰

Thus, the use of toxics in this industry (and their resultant ecological impacts) emerged from "advances" (and past mistakes) made in the military, chemical, and agricultural industries.

Aside from toxics spewing out of the drainpipes of Silicon Valley's industries, the layout of the region and the growth of the population presented other environmental challenges. Traffic congestion on the interstates in Santa Clara County is legendary, and the resultant air pollution produces a haze that covers the sky and obscures the view of the nearby hills at just a few miles range. In 1965, Frederick Terman of Stanford University argued that the traffic and air pollution were "really a pretty small price to pay" for the wealth generated in the Valley. One opinionated observer who analyzed this situation called Santa Clara County hideous, smog-covered, amoeboid sprawl of housing tracts, freeways and shopping centers . . . [created] needlessly and mindlessly." Skyrocketing housing costs made this area even less desirable for many workers pursuing a high quality of life, and less attainable for most

lower-middle- and working-class families.94 Hence, Silicon Valley was rapidly turning into a metropolis with all the problems of other major urban areas rearing their heads, thus substantially lessening the region's unique appeal. If the social, economic, and environmental ills of Silicon Valley were a burden for the general population, they were even more acute for immigrant communities and communities of color.

Environmental Inequalities

When the nature and extent of high tech's toxicity became public knowledge, a decline in the location of such industries in white communities was complemented by a shift to lower-income communities and communities of color. 95 For example, after the discovery of toxic waste in the water tables in Palo Alto, residents organized and supported new regulations so strict that some companies moved out or decided against locating there, and shifted their toxic production to less restrictive communities (with higher percentages of working-class people and persons of color) such as Mountain View. 96 Similarly, during the early 1980s in Sonoma County (north of San Francisco), citizens opposed all high-tech development because of the newly discovered associated pollution threats. And in 1984, a Fremont-based group, Sensible Citizens Reacting Against Hazardous Materials (SCRAM), organized to block CTS Printex's attempts to locate a plant in that town.⁹⁷ This dynamic was a stark departure from the fights and bidding wars among municipalities in their efforts to attract the "clean industry" in previous decades. But this is also a pattern we see in myriad other "environmental protection" practices that impact communities of color across the United States and around the world. In other words, immigrants and people of color bear the cost of both environmental destruction (when industry extracts or pollutes natural resources) and environmental protection (when white, affluent communities discover that an industry is toxic and protect themselves by shifting the burden onto lower-income neighborhoods and communities of color).98

However, some polluting businesses that originally located in marginal neighborhoods were forced to reform because communities of color were also organizing. For example, Lorenz Barrel and Drum was located in a working-class and Latino neighborhood in south San Jose. For forty years this company treated the electronics industry's hazardous

waste. The site was located a half block away from Mi Tierra, one of San Jose's first community gardens. A local neighborhood group, Students and Community Against Lorenz Pollution (SCALP), formed and pressured authorities to take action.⁹⁹ In 1986, federal authorities shut the company down, citing criminal violations. The soil and ground water on site were found to be contaminated with at least fourteen toxic chemical compounds. 100 The site was "remediated" for a \$5.2 million price tag, but was covered with an asphalt cap—the "cleanup" method of choice in low-income communities and communities of color—rather than subjected to a true abatement and restoration operation as preferred under law. 101 Even so, more than 25,000 drums containing hazardous waste and 3,000 cubic yards of contaminated soil were removed. A year later, the company's owner was sentenced to two years in jail, assessed fines of \$2.04 million, and ordered to spend up to \$100,000 on health monitoring for current and former neighbors and employees. So while environmental racism placed these residents and workers at risk, they were able to achieve some modicum of justice through collective action.

While residents and the general public may not have been knowledgeable concerning the hazards associated with electronics production before the 1980s, ample evidence suggests that the industry was aware of the facts early on. As we mentioned in the beginning of this section, industry and government were cognizant of the air pollution associated with the electronics/defense industries as early as 1950. Years later, in 1976 (five years before the Fairchild spill was made public), a study submitted to the Santa Clara County Board of Supervisors disclosed that tons of "poisonous and explosive chemicals" were being illegally dumped in communities and into the sewer system throughout the region. These hazardous materials were from electronics firms and many of these dumps were located in communities of color and low-income neighborhoods inside the county and beyond. 102 So communities of color were being polluted well before the public outrage against the electronics industry made headlines in the early 1980s, and the industry was well aware of it.

After communities began demanding that toxic sites be placed on the EPA's Superfund list, evidence of another pattern of environmental inequality emerged. Table 4.5 reveals that many of these federally designated toxic Superfund sites are in communities of color and workingclass neighborhoods. For example, Mountain View (where a high per-

City	Number of Sites	
Mountain View	10	
Sunnyvale	6	
Alviso	1 (entire community North of Hwy)	237)
Santa Clara	5	
San Jose	5	
Palo Alto	2	
Cupertino	2	

TABLE 4.5 Superfund Sites in Santa Clara Country California*

centage of immigrants and people of color live) has the most Superfund sites in the county (ten); the increasingly multi-ethnic Sunnyvale municipality has the second highest number (with at least four of these sites in extremely close proximity to two mobile home communities and the San Miguel Child Development Center). The working-class Chicano community of Alviso, with just one such site, seems to have gotten off easy. However, that one site covers the entire Alviso community north of Highway 237. Much of this community is contaminated by asbestos; it is home to six garbage landfills; and now high-tech companies that build "servers" for computer and Internet networks are seeking to construct these large electrical and fuel-based facilities there as well. This project will lead to the addition of 82 diesel generators and an estimated 1.2 million gallons of fuel stored on site in the community. 103 In contrast, the two most affluent cities (with the highest percentage of white residents) in the Valley—Palo Alto and Cupertino—host only two Superfund sites each and now have the most restrictive industrial and residential zoning requirements in the county. 104

In addition to soil and water pollution, the air pollution from area industries was considerable and was also distributed unevenly by race and class:

Census figures and TRI [Toxic Release Inventory] air emissions data show clear evidence of environmental inequality in Santa Clara County as of 1990. . . . TRI facilities are concentrated in [census] tracts where households have low to moderate incomes . . . some tracts that have higher-than-average Hispanic populations contain some of the greatest concentrations of TRI facilities. 105

^{*}Working Partnerships USA 1998, 52.

TABLE 4.6
Relationship between the Latino Population and the Presence of TRI Emissions in Santa Clara County Census Tracts, 1990*

% Latino	All Tracts	Tracts with TRI Emissions (expected frequency)
23.5-82.0	75	17 (10.25)
13.2-23.5	75	12 (10.25)
7.0-13.2	75	8 (10.25)
0-7.0	75	4 (10.25)

^{*} Szasz and Meuser 2000, 609.

Table 4.6 divides Santa Clara County's census tracts into four equal groups, according to the percentage of their population that is Latino. These data reveal that those tracts with the highest percentage of Latinos are more than four times as likely to host a TRI facility as are tracts with the smallest percentage Latino residents. Conversely, the greater the percentage of white residents, the smaller the pollution burden. This body of evidence reveals a "clustering of low-income, mainly rental house-holds, and of certain communities of color and children in neighbor-hoods in close proximity to the valley's toxic industrial belt, along Highway 101." The future of environmental inequalities looks no better, considering the results of the San Jose City Council's proposed solution to the "energy crisis" in California: constructing sixteen new power plants, fifteen of which are to be located in communities in which people of color make up 67 percent or more of the population. 107

Finally, most persons working to produce computers and semiconductor chips *inside* Silicon Valley's electronics firms are women, immigrants, and people of color. Compounding the pollution in their neighborhoods, these workers hold jobs that are more toxic than those found in any other basic industry (see chapters 5, 6, and 7).

A Sustainable and Just Future for Santa Clara County?

As with Santa Clara County's previous historical eras, opportunities to opt for less resource-intensive practices in the semiconductor industry were often available. For example, after the Vietnam War, many activists promoted the "Peace Dividend" and the idea of "military conversion," whereby these industries and government funds would be redirected toward the public interest in some way. The Mid-Peninsula Conversion

Project in Santa Clara County was a leading proponent of reorienting electronics production toward nonmilitary purposes. Unfortunately, these arguments were lost in the cold-war race to build up military and nuclear arsenals in the effort to maintain the United States's position as the world's dominant superpower. The continued focus on military production was a betrayal for many activists, and was arguably a slap in the public's face because so many taxpayer dollars had been allocated to fund this industry, the social benefits of which were questionable.

A second example of an opportunity to engage in sustainable planning occurred at the dawn of the electronics industry's growth spurt, beginning in 1953. That year the County of Santa Clara distinguished itself as a pioneer in the establishment of "exclusive agricultural zones" for the purpose of protecting some of the richest farmlands in the area. 109 Within a few years, however, the benefits of this project were lost, as these lands were polluted or developed during San Jose's annexation wars and the subsequent boom in the land-hungry electronics industry.

A third missed opportunity was the promise of pollution prevention, promoted by environmentalists and the USEPA and publicly endorsed by most large computer and electronics firms. 110 To be fair, the electronics industry has been successful at reducing many pollutants, if we measure those improvements in per unit production. However, progressive environmental initiatives in electronics have generally only occurred when grassroots activists or regulators demanded them, and as the volume of production has increased with the growth of markets, the total pollution burden has also increased, rendering any per unit pollution reductions moot.

Like El Pueblo de San Jose's unsustainable increases in crop production in the 1770s, the introduction of unnecessarily destructive mining technologies during the Gold Rush, and the continuous bouts with overproduction and water depletion in the canneries and orchards of Santa Clara County, Silicon Valley industries followed the time-honored practice of pushing past any reasonable limits on human and ecological sustainability, placing profits before people and the environment. In Santa Clara County there has always been a pervasive set of ideological and cultural tenets that view economic growth as unconditionally positive an ideology foisted on the county's less influential majority by the most powerful classes. Just like the city planners' policy during the 1940–1970 period, Silicon Valley's prime directive today is "growth at any cost," despite the fundamental unsustainability of the approach. 111

Whether from depletion or pollution, Santa Clara County industries seem always to have been intent on maintaining a dependence upon and a lack of respect for—water, land, immigrants, and people of color. Environmental racism in the Valley meant not only that people of color were being exposed to toxics and pollutants at home and work, but also that this process was part and parcel of a broader context of general ecological degradation in the region. European contact, the missions, mining, farming and canning, and computer/electronics production each brought the promise of economic prosperity and new social liberties springing forth from the bountiful wealth of natural resources that only California could offer. But in each case, economic gains were concentrated among a few while poverty and immiseration were shared among the many; racial and ethnic cleavages reemerged and deepened; and the integrity of the natural environment suffered as yet untold assaults. Nothing is new about the latest proclamation of salvation in Silicon Valley; it is old wine in new bottles and represents only the most recent manifestation of a long history of environmental injustice, California style.