

The Core

Work and the Struggle to Make a Living without Dying

You discover that all those nice things they told you about how they were protecting you were just bullshit. They got rid of me because I was vocal. I couldn't be intimidated. That bothered them. You have to speak up. No job is worth my health. I cared more about my safety than about the wafer [the microchip]. And that's a basic conflict.

—Nancy Hawkes, former Advanced Micro Devices (AMD) employee and cancer survivor

Core Occupations in Silicon Valley: Semiconductor Chip Production and Clean Room Work

Semiconductor chips are the brains of electronics components and a host of consumer goods today. Without them, our radios, cars, watches, computers, airplanes, refrigerators, clocks, and cell phones would not operate properly. Semiconductor chips are central to the functioning of the global economy. For this reason we refer to chip production and related occupations as the core of Silicon Valley's high-tech economy. These chips come at a dear price for the people who manufacture them.

Although infinite variations exist in the way they are made, it is possible to offer a general description of how semiconductors are manufactured in the "fabs" (fabrication plants):

The manufacture of semiconductor components starts by growing long cylindrical crystals from molten silicon, the basic raw material, and sawing them into thin slices called wafers. They are then baked in "diffusion furnaces," and the heated wafers are treated with a variety of gases to

improve their conductivity. Next, a photochemical process is used to create complex circuitry on hundreds of tiny squares, or "chips," on the wafers. After testing and sorting for defective wafers, the final product is typically shipped overseas for the more labor-intensive assembly processes. The wafers are split into individual chips, each with the identical integrated circuit pattern on its surface, bonded to microscopic wire leads, and encapsulated in protective casings. The assembled integrated circuits are then returned to the United States for testing and finishing. The semiconductors and other components are next soldered into printed circuit boards, which are assembled into every kind of electronic device, from computers to elevators.¹

The areas inside electronics firms where computer chips are manufactured are generally referred to as "clean rooms." These rooms are "clean" because they are kept meticulously free of small particulate matter—which can damage chips—by means of air filtration systems. But the people who perform these tasks are placed at a level of risk that no individual with means to do otherwise would willingly accept. Here we examine the working lives of electronics employees in the core and consider the impacts on their health. These stories are derived from personal interviews, extensive legal depositions from ill and dying workers, and archival and newspaper sources.

People's Stories: Work, Toxics, and Health

Sarah Carpelli has worked in the semiconductor industry since the 1960s.² In an interview with the authors she takes note of the importance of historical context, in that during the 1960s, there was no widespread public knowledge of the high-tech industry's myriad hazards:

I had a neighbor introduce me into the world of technology. This was in the beginning, when the technology first started out. We started in warehouses that were dark and dreary and smelled of chemicals. This was in the late 1960s, early 1970s. I didn't pay a lot of attention to the smells and the chemicals or think much about what it was doing to me personally, health-wise. As the years progressed and I saw some of the things, I thought, we shouldn't be smelling these fumes, ingesting these fumes. We shouldn't see the tires rotting off of the cars when there was

a chemical spill in the parking lot. I had numerous jobs in the industry. I ran wafers through chemicals. I did chemical testing. I worked on the computers. A lot of it, though, was in the chemical area, in what they called a "clean room." We still had many, many chemicals to work with, sulfate, sulfur, acid, to clean the wafers at the many different stages in the process.³

Armanda Esperanza, a Chicana worker at a major electronics firm, had an experience similar to Carpell's regarding the general lack of knowledge of hazards. Like many elderly Chicanas in Santa Clara County today, Esperanza began her career working in the canneries: "I worked in a cannery for like three months. Right out of high school, around 1965. I would sort peaches."⁴ She had no idea if any chemicals were used in those operations (in fact many toxins were in use—see chapter 3). After the cannery closed down in 1968, Esperanza began work at a large electronics firm "in the clean room, and we were measuring parts." She would regularly be exposed to epoxy, a hazardous material. "We didn't think it was dangerous, so we didn't really rush to the bathroom every time we got it on our skin to wash it off, you know." This historical ignorance of hazards may have cost Armanda her health. She now suffers from cancer and is a party to a class action lawsuit against her former employer.

Esperanza and other workers wore "finger cots" as protective clothing. These cots were coverings that only protected the tips of a worker's fingers, despite the hazardous nature of the job. She would use chemicals like methylene chloride, epoxy, and solder every day. Often she wore latex gloves, which would "start to disintegrate" from contact with the methylene chloride and "we would take our gloves off because it was much easier to work with your hands than it was with the gloves, and we would just pull out the parts with our hands."⁵ This type of risky behavior in hazardous workplaces is not uncommon.⁶ It often stems from inadequate health and safety training, a lack of regulation of the workplace by management and state agencies, and the extreme discomfort and lack of productivity (and consequent impairment of one's ability to feed one's family) associated with wearing certain protective equipment. Like many women in the industry, Esperanza was also directly exposed to glycol ethers (a hazardous solvent): "we used glycol. It was like a lubricant, it was a liquid. It was a little abrasive."⁷

A combination of corporate and worker misconduct at Esperanza's firm created further problems, as certain chemicals that had been officially phased out were still unofficially available for use: "I don't recall when they stopped using methylene chloride. It worked great on cleaning heads—so once in a while it was snuck in to clean this and that, but I know they took it off the line completely."⁸ She was later diagnosed with breast cancer and underwent a lumpectomy, chemotherapy, and radiation therapy.

Sarah Carpell recalled the gendered division of labor at her firm:

Most of the workers were single moms. A lot of single moms. I do remember one woman who had been married and had a child under two years of age. She became pregnant again and continued to work, but had a stillbirth. I wondered at the time, I still wonder if her work had anything to do with that. She worked while she was pregnant. How sad to have to work while you were pregnant.⁹

When she became ill, it was clear that Carpell's cancer was probably not hereditary:

After I retired, I was diagnosed with cancer. There was not a drop of cancer in my family in any way, shape, or form, so this was definitely out of the ordinary. My mom lived to be 75, and she passed away due to diabetes. My dad lived to be 99, and he passed away of old age.¹⁰

Flora Chu is a legal advocate for Asian workers in Silicon Valley. She places the story of one worker, Erlinda Carreon, in a broader political context:

More than one hundred years ago, they lowered Asian men in baskets to insert and light the dynamite so that mountains could be blasted away and the Sierra railroads built. A hundred years later, Asian immigrants are still asked to put their health and life on the line so that California can prosper. Only now, the job hazards are sugar-coated so that workers do not know the hazards that they are facing until it is too late. Erlinda Carreon was a teacher in the Philippines until she emigrated here so that her daughter could have a better education. Like so many immigrants, she came to the Silicon Valley and worked in the electronics

industry assembling discs that go into our computers. She put up with headaches, nausea and discomfort for the sake of a paycheck. What she did not realize was that it was the chemicals in her job that prevented her from having another child that she so desperately wanted. What she did not realize was that the chemicals that she worked with were building a cancer inside her. She died of a thymoma, a rare cancer that she realized too late was caused by her work. Erlinda's story is not unique for Asian immigrants. Many Asians form an underclass that works in the low-paying high-hazard jobs under constant threat that they might lose their meager paycheck. They are constantly exposed to chemicals that can permanently disable them. Employers hire Asians into these jobs because they perceive that Asians are a docile workforce willing to perform monotonous repetitive duties without complaints.¹¹

Echoing Flora Chu's lament about the treatment of Asians in the Valley, Romi Manan, a Filipino immigrant, discussed the chemical-intensive nature of the work he and other immigrants performed at National Semiconductor Corporation in San Jose. Many of his coworkers made the supreme sacrifice for our high-tech economy:

There was too much exposure to chemicals. I handled all kinds of chemicals used in the wafer production. At National there were so many issues in regards to health and safety. We tried to address them. Just by looking at the National Safety Papers for every chemical that was used in the plant, you see all the symptoms in other workers. We had so many cases of miscarriage. Glyco-ether is heavily used in the production of wafer materials. We had workers who contracted cancer. It's not easy to pinpoint the cause, but we had a good number of workers who worked around those chemicals who contracted that kind of disease. You would think twice why that would happen. One of the workers who I used to work with died of cancer just some months ago.¹²

Sadly, when workers suffer from occupational illnesses, it affects their whole lives, on and off the job. Furthermore, the impact is felt by coworkers, friends, family, and loved ones. Therefore, we must consider the broader social effects of an individual's struggle to survive work-related health problems.

Disruption of Daily Life and the Family Impacts of Occupational Illness

Paulina Bustamante became so sensitive to chemicals after working for years at a chip plant that it interfered with her daily life outside the job site:

I'm still experiencing the effects from my xylene [a hazardous solvent] inhalation. I'm real sensitive to certain smells such as chocolate, nail polish, shampoos, and highway fumes. Sometimes in the grocery store when I pass the soap and detergent aisles, I start to feel sick and dizzy again and have to go out to my car and put my head down before I can finish shopping and drive home.¹³

Bustamante's experience was not out of the ordinary. A report on another chip worker stated, "One worker who now reacts to everything from laundry detergent to copying machines as a result of chronic exposure to chemicals on the job, says the job has made her 'allergic to the twentieth century.'"¹⁴

But the ripple effects of toxic work stretched beyond these survivors' bodies and touched their families in a number of ways. In the most basic manner, these multiple impacts often occur when entire families and social networks are employed in the same firm or industry. Lydia Johnson, a cancer survivor, had deep familial connections to her plant. Similar to many of the older, basic manufacturing industries like iron, steel, and auto, entire neighborhoods, friends, and families often migrated together into workplaces. Silicon Valley at the turn of the twenty-first century is no different for Lydia Johnson, who stated, "My sister, brother-in-law, my brother-in-law's brother, and many close friends from school and the neighborhood I grew up in [worked at the same firm]."¹⁵ Her sister later developed cancer.

As with all basic industries, in electronics these familial connections were advantageous to the industry, serving as a form of social control over potential troublemakers. As labor union activist Michael Eisenschner explained:

When there was a worker shortage, they relied upon family members [to recruit new workers]. But they also relied upon family members to maintain discipline. If I get my job through you, my cousin, and I am a

troublemaker, the boss goes to you and you say, "I got you this job, don't screw it up. Keep your mouth shut and do your work." There was a kind of family network of people obligated to one another. You also had the issue of multiple wage earners from one household working for the same firm. You had great family dependency. People all relied on a single employer for their paycheck. The implication was your whole family income could be wiped out if you got in trouble. They'd not only fire you, they'd fire your wife.¹⁵

This type of family-mediated social control was a major barrier to Jessica Arvada, a clean room worker who told of her family's lack of support for her and their disbelief in her claim that she suffered from multiple chemical sensitivity:

My aunt also worked at the company, as the secretary for the vice president. She was like a mother to me. I lived with her and my uncle through high school, and my own aunt warned me that I could be blackballed from the company [if I kept complaining about work-related health problems], and she also didn't believe me and stopped talking to me. I still can't believe the whole thing could encompass and come out and hit the home as much, and destroy as much as it has. Not only is there physical damage, but the emotional is so much. . . . I will probably be divorcing my husband as soon as I'm able to go to work. My husband does not believe that anyone can be allergic to anything. The lack of support throughout all of this has been really hard.¹⁷

Jessica had been exposed to xylene continuously while working at her firm. Her supervisor told her that xylene was entirely harmless, despite its documented negative human health effects.¹⁸

Other ill electronics workers were caught in a bind because their own children were also working in electronics or perhaps anticipating entering the industry some day. Alida Hernandez worked at IBM from 1977 to 1991 and was always proud to be a part of the Big Blue family. She washed discs used for computer hard drives and was "exposed to water with the chemicals." She said the fumes were so strong that her head would spin whenever she would enter the plant. Like many clean room workers, Hernandez's sense of taste was dulled: "When you went to eat, you didn't taste nothing." Hernandez was diagnosed with breast cancer in 1993 and underwent a mastectomy. She feels a deep shame about her

illness and has not yet told her children, who also work in Silicon Valley. Her granddaughter is unaware of her grandmother's condition, and she graduated from San Jose State University with a degree in computer engineering and is considering job offers from Intel, IBM, and Cisco Systems.¹⁹

Jose Carbon emigrated from the Philippines in 1975. He has worked in high tech ever since then and has seen a lot of illness and death among his coworkers and friends in the industry. He says, "Not only the person [the ill worker], but the family as a whole is disrupted. The wife, the daughter or son. Economically, also, not only the physical well-being of the person."²⁰

Daily routines and special occasions become traumatic experiences for many ill workers and their families. Selena Gonzales suffers from

problems with my menstrual cycle . . . I always have problems with my arms when I'm cooking, carrying things. I burned my arms recently. I'm always starting a fire or something. Nobody trusts me with knives at home. I can't ride a bike no more. I can hardly cook because I always end up burning myself. I don't do hardly any cooking anymore. I can't run. I have a hard time writing. Sometimes I think of things that are way back when, over 20 years ago. Some days I can't remember what I did the day before. This happens all the time. I can't go to activities like I'm supposed to with my kids because I'm always too darn tired. When I have to go to their meetings for the schools, they call them teacher conferences—sometimes I can't even make those. Sometimes I can't even change my own Kotex [sanitary feminine napkin] by myself. Somebody has to help me.²¹

Like many ill survivors of the toxic workplace, Selena's condition altered her ability to care for herself, to contribute to household work, and to do the routine activities her family engages in—yet another illustration that the concentration of women in the electronics production labor force has negative impacts on the ability of those workers who succumb to illness to perform other forms of gendered labor (e.g., in the home).

Another chip worker, Monica, told of how special family events became nightmares. On one Easter Sunday, she had a severe reaction to the cellophane on her children's Easter baskets. She felt suffocated by the fumes. On another occasion, while on a trip to the Santa Cruz Mountains with her family, Jessica had to jump out of the moving car

suddenly—a reaction to the vinyl seating and the car exhaust. She recalled, “I felt I had to be totally insane or had flipped. There’s no way smells can kill you. It is impossible!”²²

As a majority of core production workers in Silicon Valley are women, the question of children’s health is often at the forefront of their concerns and illness experiences. Lydia Johnson was a senior assembler at a major chip plant and worked in that position for two years. She was forced by the firm to leave work and take medical disability because of her illness. She now suffers from allergic rhinitis, early menopause, and sterility. “I remember doctors telling me that I was sterile. I ‘couldn’t have children’ is how they put it. The Ob-Gyn mentioned since no one else in my family had become sterile or had an early menopause, it was very unusual. I was crying and shocked.”²³ As with many other clean room employees in the Valley, Johnson regularly had chemicals splash onto her skin, including her face. And it happened “pretty often. Daily.”²⁴

In addition to being poisoned at work, another worker, Ronni Martino, like many women of childbearing age, carried another burden, more terrible than the others: “My son had two tumors removed from his brain. He was born with them . . . and to this day, I have thought many, many times of that, thinking that I have done this to my child.”²⁵ Blaming oneself for toxic exposure children suffer is a common way of coping with such a life-shattering event, particularly given that parents, especially mothers, are socially entrusted with the protection of their children. Debra Dodd, a former AMD (Advanced Micro Devices) employee, suffered from asthma after years on the job. She said she constantly smelled xylene when she worked, during her pregnancy, and that her breast milk turned orange as a result.²⁶

For those women who had given birth to healthy children, the prospect of dying before their sons and daughters grew up was terrifying. After years of working at a chip plant, Ronni Martino was diagnosed with a rare cancer that had spread to her lungs, bladder, lymph nodes, bowel, and uterus. She remains strong for herself and her family: “I went through hell. . . . My goal is to get well, to stay well and to stay alive as long as I can for my children’s sake.”²⁷

Many women were also economically vulnerable and afraid to speak up about toxics for fear that they would lose their jobs and jeopardize their family’s economic stability. A Chicana electronics worker stated, “When I was at work, I couldn’t close my hands because they had blis-

ters and they crack and break open and bleed and swell. Of course I couldn’t take off from work or quit because I’m a single mother and I had kids to support.”²⁸

According to one study, many managers in the chip industry referred to the chips as “babies” and the workers as “mothers” whose job was to tend to them. “Workers’ identities defined outside the workplace were brought into the production process by this characterization, and became a mechanism of control over workers. By using the language of mother and infant to describe the relationship between female chip worker and her product, the industry implicitly asked workers to make sacrifices for the welfare of the product, even if this meant jeopardizing their own health for the production of flawless chips.”²⁹

Electronics workers were caught in many binds. They were compelled to choose between their health or their job, but no matter which choice they made, their personal and family lives would be deeply affected. Clean room workers, particularly women workers, found themselves in complicated scenarios where their own health was tied to the health and well-being of their children and family. The physical and psychological stress these women endured interacted to produce and exacerbate illnesses they developed as a result of high-tech work.

Management Control over Work and Well-Being: Power and Denial

Studies of hazardous workplaces indicate that when the balance of power between management and labor is changed even slightly in favor of the latter, when a union or labor advocacy organization is present, the occupational environment often becomes safer for employees.³⁰ When workers gain some measure of *autonomy*, they have a greater capacity to secure a safer and healthier job. Worker autonomy has been a central feature of sociological and anthropological studies of work during the last three decades. Several studies have highlighted the enduring conflict between workers and managers over autonomy within the labor process.³¹ Throughout the nineteenth and twentieth centuries, this issue manifested itself in the form of struggles over craft versus unskilled production, job design, and production quotas, for example. When worker autonomy declines, we observe both an imbalance in power relations and increases in physical and psychosocial occupational hazards.³² So,

from a health and safety or environmental justice orientation, autonomy and power matter a great deal.

One measure of worker autonomy is the degree of participation employees enjoy in decision making on the job. Data from depositions and our interviews with semiconductor and clean room workers indicate that they enjoyed very little participation on the job and that this antidemocratic structure of decision making produced measurable negative health effects.

One sociological study of the electronics industry concluded that management's control over labor is nothing short of "authoritarian."³³ The obsession among chip makers with spotless clean rooms is legendary. David Raric, a cancer survivor, worked as a clean room operator:

They [the firm] were very big on cleanliness and contamination, putting the safety shoes in the shoe cleaner when you came in or walking on the little, the sticky mats, wearing your gloves, covering your nose with the little face mask part of the smock; a lot of things towards lessening contamination and particles in the clean room.³⁴

Ronni Martino was a female employee of a firm that is being sued for allegedly causing her cancer. Her view of the clean room is highly critical:

I always thought the bunny suit was to protect the employee. I didn't know they were using chemicals. I know that they were making a product, but I thought it was to protect the employee. The floor [in the clean room] was raised with holes in it, because of the airflow going through. They were very concerned over the product, extremely concerned over the product, how you handled it, don't shake it, don't move it, you know, everything had to be the right temperature. They cared more about the product than anything else.³⁵

The clean room hygiene policies and the economic necessity that workers keep up their productivity was a deadly combination. The drive to stay on the line and keep "protective" clothing on prevented Lydia Johnson and others from washing off after chemical splashes and other forms of exposure:

We couldn't wash off much in there. To get to water, you couldn't do that [for fear of contaminating the chips]. We couldn't take our smocks

off because of the skin flakes and hair. We had to keep our smocks on in that area. [In order to wipe chemicals off her body after a splash, she would] usually use my smock. No rags were allowed in the clean room because of dust and fibers.³⁶

Johnson was later diagnosed with cancer.

To their credit, some firms provided workers with information on toxics, at least occasionally. For example, Hannah Anderson worked at a chip plant during the 1980s and remembered that Material Safety Data Sheets "were readily available to everybody" (an MSDS provides information on work hazards that is required, by law, to be posted in all workplaces). Anderson regularly worked with TCE and used freon and solder—substances that are known poisons. Indeed, it is frightening to learn how careful some of these clean room practices were and yet how deadly the health outcomes continued to be. It would appear that, whether companies are careful or careless or whether they provide "information" to workers does not address the more basic problem of the intense prevalence of toxics in the Silicon Valley workplace.

Management and supervisors in the electronics industry have held considerable and virtually unchallenged power over workers. One example of this power—illuminating a theme in most of our interviews with workers and in most of the depositions we analyzed—was management's claim that, no matter how toxic the workplace might be, it was still very safe. David Raric remembers one such example. And like many other workers, Raric's interaction with management also involved subtle coercion:

I smelled strong odors at least five or six times a day. I mentioned it to the manager and the department techs. . . . But we were told that it was within acceptable limit levels by what the company had set forth and by their testing, and that it was just literally part of the job as working in the chemical process area. It was your job that had to be done.³⁷

During the 1980s, workers at the Advanced Micro Devices (AMD) plant in Sunnyvale, California, reported that there were xylene spills two to three times per week, but that their manager would claim "I don't smell nothing" and refuse to allow workers to leave the fab.³⁸ These examples reveal management's power to deny that there is a problem at all—thereby defining the situation as safe because they hold authority over

workers in the corporate hierarchy. Managers therefore place their employees in extremely dangerous situations from which workers can protect themselves only by leaving their jobs.

Management's response to women workers who raised concerns about toxics in the workplace was gendered and patronizing. In 1983, SCCOSH activists interviewed a woman who worked at an electronics plant. She explained how management used the "mass hysteria" argument to defuse any claims of workplace hazards:

They called it "mass hysteria" when everybody got sick. I'm not talking about just Fab 6; [Fab] 6 and 7 were adjoining, so whatever happened in 6 happened in 7 also, and whatever happened in 7 happened in 6. "Adjoining" means that the clean air ventilation ran through both Fab areas. Okay? So that the original 25 people that went to the industrial clinic [as a result of a chemical spill] that day came from BOTH Fabs. The incident was classified as "mass hysteria." It was like, "You haven't smelled nothing, there's nothing wrong with you, you just smelled a little something and went off the deep end."³⁹

The use of the "mass hysteria" charge has an extensive historical lineage. It is at least as old as the charge that women who dared to leave their husbands or those women who claimed they were raped by a man (particularly if it was her husband) were "hysterical" or "schizophrenic."⁴⁰ We find the "mass hysteria" and related "mass psychogenic illness" labels employed by medical authorities at state agencies and by electronics firms and governments in other nations as well.⁴¹ In other words, it is a form of patriarchal control, the use of power exercised by men and male-dominated institutions over women to maintain the status quo.

This type of gendered power has measurable consequences for the health and livelihood of many electronics workers. Nancy Hawkes, a former AMD employee, told reporters about her long years of tribulations on the job:

Sometimes sitting around [at AMD] with other women at break or lunchtime, the conversation would take odd turns. "A lot of women were having menstrual problems. It amazed me how often the subject came up. Some were going through eight, nine, 10 [feminine] napkins a day—and really soaking them."⁴²

When Hawkes pulled the employees out of a clean room after finding a puddle of xylene on the floor, her supervisor told her she had imagined the whole thing and that if she continued to talk about the spill "he'd have my job in two days." She surreptitiously got hold of AMD's Chemical Handling Guide and read about the toxic and lethal effects of the materials she had been working with. "It was like reading that someone had put a contract out on your life," she recalled. Her supervisor (the man who had threatened to "have her job" if she persisted with her efforts) told reporters his feelings about Nancy Hawkes: "She's very emotional. She may be somewhat disturbed. [She has a] Chicken Little, sky-is-falling mentality." Hawkes and many other (former) employees battled life-threatening illnesses during and after working at AMD.

When electronics workers go beyond raising the question of toxics and actually request assistance in determining the level of contamination on the shop floor—thus asserting that a problem exists in the first place—management's response is often swift and harsh. Retaliation by management against workers seeking protection from toxics is very common in high-tech manufacturing. Sadly, as sleek and shiny as the Valley's corporate campuses may be on the outside, the level of fear among workers concerning management retaliation in this industry is not fundamentally different from that observed in basic manufacturing such as auto or steel industries, or in the sweatshops of the garment industry. One male worker recalled:

I used to be a chemical handler at Signetics. I was 19 years old. Most of my job was pouring chemicals. I used to pour them, load them, clean them up and dump them. My work made me dizzy and nauseated. I couldn't sleep at night. These symptoms were getting worse and worse every day I worked there. The second I walked into the Fab area I'd smell a weird odor and get sick from it. I asked for an exposure check [an air quality check] and I was terminated on the spot.⁴³

Paulina Bustamante tells a similar story that may provide insight into why accidents and illness may be underreported in the industry. After experiencing an illness, she was

placed in a new diffusion area. I was there five days when I was put on warning for absences and tardies. I checked into these warnings. It turns

out they were pinning me down for reporting my illness to the nurse during working hours. They said I should have deducted those times from my card. They used time card discrepancy as an excuse to fire me.⁴⁴

Management harassed and fired Bustamante for seeking medical assistance for health problems that were very likely caused by toxics in the firm. Under this type of pressure and coercion, many workers would likely choose to work while ill rather than seek medical assistance on the job.

Fear of retaliation, firing, and “blacklisting” were common among chip workers. However, workers also engaged in acts of resistance against management. A Filipina woman who worked under a particularly brutal system at a firm remembered:

I told the supervisor, “I am not going back to work because there is something wrong with the machine, and I am not standing there and making myself sick over whatever is leaking from it.” But it was very few people who refused work because a majority of the people who worked in there were scared to death of losing their jobs. They wouldn’t complain, and a lot of them wouldn’t like what was going on and they would come to me, complain to me, thinking I could fix it all. But there are so many of them that are scared. There is a lot of Filipinos working there, and they figure their job is everything and they will take just about anything. They don’t get up and leave.⁴⁵

With no unions, most workers subsisted day to day at the mercy of their supervisors and management, who could and did punish them at will.

On the surface, many companies protect their image by practicing public relations with their own workers, in the form of trendy concepts like employee “speak out” programs and “total quality management” (TQM). One firm that is believed to have poisoned many workers had an “Employee Speak Out” Program that officially encouraged workers to communicate any concerns about the job to management. Time and time again workers did this, but management never responded to them in any way. TQM was an equally manipulative management strategy. One worker who experienced TQM deconstructed this model of control:

The company always makes the decisions. Sometimes they got workers involved, like in total quality management. That program would say

that it would empower you. It’s like you were being seen by management as their co-equal. If you don’t have a union, you sit down with the management and talk about things like a quality job. In such manner you bring up your suggestions and work on problem-solving issues. You would have the feeling that you are important in the company. You call them by first name. You sit side by side with these managers. It works really well. But it corrupts your mind as a worker. You don’t discuss your wages, childcare, affordable housing. You just talk about how to improve production. This means that you are being speeded up to do your job. An article came out in the *San Jose Mercury News* [about toxic conditions in the industry]. Management responded by getting involved in asking you what kind of pizza topping you would like. In some meetings they give out pizzas, picnics. They know how to play the game, manipulating you.⁴⁶

The TQM promise of “equality” is generally a farce, considering the highly secretive decision-making practices at most large chip making corporations.

Corporate Secrecy

Secrecy is a way of life at many electronics firms. Managers and executives claim that secrecy is necessary for protecting trade secrets (i.e., “proprietary information” or “intellectual property”) from competitors. Other reasons include the fact that many companies are manufacturing products for the military, and some of the technology is classified by the government. Secrecy presents many problems for workers, however, because (1) employees frequently have no idea what chemicals they are working with because the chemicals are labeled with company-specific code names, not their actual contents; and (2) workers labor in departments that are kept physically and socially isolated from their coworkers, thus making it extremely difficult to organize for expressing basic grievances or for collective bargaining. Under such a scheme, not only are workers divided, but if an employee ever claims that health problems are the result of exposure to chemicals, they will have a difficult time even determining what compounds they worked with in the first place. Secrecy, therefore, benefits the industry owners, shareholders, management, and clients, while acting to the detriment of workers.⁴⁷

Armanda Esperanza spoke of the secrecy at her firm and how it fragmented the labor force:

At the firm, all your operations, I mean you only knew about what *you* were doing. They didn't give you a whole lot—you didn't get a whole lot of information about what was going on with somebody else's stuff. Everything was so confidential that you only knew about what you were doing. How it related to somebody else's operation, you just could never connect it, because it was a lot of things going on. Everything was so confidential and they would constantly be changing, so if anything got out it would confuse the public or whoever's trying to get the information.⁴⁸

This sort of corporate secrecy allowed management to maintain a greater degree of control over the labor process and any potential organizing efforts on the part of workers. After all, how can you organize if you do not even know who your coworkers are and what they do for a living? Workers at Armada's firm did have access to a Chemical-Right-to-Know class: "You would get on the computer, they would give you information on how to deal with chemicals, and then at the end they would ask you to take a short quiz, after reading the material." However, she added, "*We never had the real name of the chemical.* Like MC was never called by the real name methylene chloride . . . so some of these . . . I can't really recognize as what type of chemical it really was." Other clean room workers reported using chemicals with names like "Blue no. 5" and "Yellow no. 2" but had no knowledge regarding the standard scientific names for these substances. We see this pattern of secrecy across the board in our interview and deposition data from Silicon Valley workers. The profit motive and secrecy conflict with and violate the workers' federally protected right to know about the chemicals they are handling. And when Esperanza brought a suit against the company for allegedly contributing to her cancer condition, at the legal deposition hearing the corporation's lawyer challenged her lack of knowledge regarding specific chemicals she worked with. The attorney also read statements from physicians implying that the plaintiff was deranged, delusional, and suicidal.

When Lydia Johnson would express concerns about toxics and health issues to management and supervisors at her firm, they often responded, "you're safer here than you are at home. So don't worry about it."⁴⁹ "I

believed them," she recalled. "The firm would not hurt anybody." Moreover, any request to be reassigned to a safer area would be quashed with the reasoning that "what job you're trained on is where they need you, and that's your job, and that's that." She stated that one of her managers lied about the claim that her workplace was cleaner and safer than the average home because she overheard him privately telling another manager that he "didn't like to go in there [the clean room] where the chemicals were, to be exposed and breathe that stuff."

The secrecy surrounding production at Johnson's firm was also a problem during emergencies and industrial accidents. For example, after a chemical spill at the plant, the workers were evacuated. However, Johnson "wasn't told where it occurred, in my area or not. I never heard about what chemicals had leaked or how much had leaked." In 1998, when a class action suit was filed against IBM in San Jose, California, the principal attorney for the plaintiffs, Amanda Hawes, stated, "It is disturbing that some of these materials are closely guarded trade secrets, which is more important than getting to the bottom of their potential for human harm."⁵⁰

The Medical Community's Responses

Few medical doctors can competently diagnose the condition of chemically sensitive, ill, and dying electronics workers. Medical schools still largely reject even the existence of multiple chemical sensitivity; equally disturbing, few doctors have any training whatsoever in occupational and environmental health.⁵¹ The dominant orientation of the medical profession, and the science supporting it, is that "health behaviors" (diet, exercise, etc.) and genetics are the driving causes of most illnesses.⁵²

The reasons for these gross oversights are many, but they are largely rooted in the political economy of medicine, which is characterized by corporate funding, some of which comes from companies largely responsible for (and profiting from) environmental and occupational pollution.⁵³ Not only do many of the companies that fund medical research profit from the pollution of human bodies and the ecosystem, but many of these same firms also profit from the production and consumption of pharmaceutical treatments (medicines, etc.) for the resultant illnesses. For example, W. R. Grace was a company that produced both

toxic chemicals *and* medicines for pharmaceutical use. W. R. Grace was also the company widely believed to be responsible for creating a cancer cluster in Woburn, Massachusetts (as a result of TCA dumping).⁵⁴ Likewise, General Electric, an electronics company with a history of producing nuclear power—which has generally been linked to a range of illnesses, including cancer—also profits from its medical information systems business.⁵⁵

The genetic fixation with cancer within the medical community is partly the result of pressure by corporations to shift the blame for this disease from polluters onto individual bodies. For example, Ronni Martino, a worker at a chip plant in San Jose, was diagnosed with a rare cancer after putting in several years on the job. Her company doctor asked her if she would like to participate in “some sort of female study. He told me that they would check to see if you had the gene for breast cancer.”⁵⁶ With the blinders that are typical of the medical profession, in the face of the scores of cancer patients working in (or retired from) the electronics industry, these doctors are funded largely to find the “genetic causes” of these diseases, and are, in a real sense, blaming the victims for their conditions, while allowing the chemical companies and the Valley industries to continue completely unscathed. Some private or independent physicians claim that their industry counterparts do not or cannot publish or communicate the truth about the electronics industry because management places “velvet handcuffs” on them by pressuring them to maintain the industry’s sanitized image. The historical basis for such a charge is clear; there are many documented instances of company doctors routinely ignoring or even lying about occupational illness among a plant’s workers because of pressure from management.⁵⁷ This “suppression of information makes determining which exposure causes which illness a mission impossible.”⁵⁸

Generally, workers can choose from two categories of medical authorities: (1) company doctors, and (2) independent, or private, doctors. A company doctor is a medical official, either on site (i.e., at the plant) or at an off-site office, who has a contract with the firm. These individuals’ roles as medical healers whose first charge is to “do no harm” are inherently compromised because they are paid by the very firms that may be making workers ill and they therefore have a financial incentive to underreport such illnesses. Independent or private doctors, while not necessarily employed by a firm, are also hampered by the general lack of occupational and environmental medicinal knowledge that plagues the

medical community in the United States. Today, with the rapid spread of managed care and health maintenance organizations (HMOs), *all* physicians in these institutions are pressured to withhold treatment and care unless such treatment is viewed as absolutely necessary. This means that the options for ill workers have decreased dramatically in recent years.

Company Doctors

Ronni Martino spoke of the cryptic, guinea-pig-like experimentation she underwent with her firm’s medical testing, and her resistance to it:

I do remember that they called me into medical at one time and they were checking me for something. And after I left, it did bother me for a long, long time because I thought “how stupid of me to even allow it.” But they were giving me a physical and they said it was more routine, and the nurse did a breast exam on me and I just felt so odd afterwards because I thought this is like a really strange thing and I was so stupid to ever allow it to happen. So I just thought that was very strange. And from that point on, when they would call you over to medical saying it’s time for your physical or whatever, I would come out and tell them I don’t want a breast exam, you know, I will go to my own doctor. I didn’t know these people from Adam. I didn’t feel comfortable letting this woman—I wouldn’t feel comfortable letting their doctor do it—this was not a doctor’s facility to me. I could kick myself a dozen times when I think how foolish I was.⁵⁹

When asked, “Were you told what the purpose of that exam was?” Martino replied, “No.” When asked, “Did you ever learn what the results of that physical exam were?” she also replied, “No, I did not.”⁶⁰ It was later revealed that this particular firm was keeping secret records of its employees’ health status, including what one workers compensation attorney calls a “corporate mortality file”—a thirty-year-old database of those workers who succumbed to various illnesses such as cancer. The cancer rate among this particular firm’s employees was found to be much higher than the rate among the general U.S. population, indicating a high probability that the workplace might be killing the workers.

Dorina Hermosa remembered a similar “guinea-pig” type experience when she was working in the clean room of a Silicon Valley chip maker.

this is almost never the case with electronics workers' illness. As one Cambodian immigrant woman worker told us, "I went to my doctor and he said that since he doesn't work at my job he can't say whether my job caused my illness."⁶⁵ The dozens of workers' cases we examined via interviews or legal depositions revealed that in the majority of instances, doctors never asked workers anything about their jobs, and therefore never hypothesized any links between their health condition and occupational hazards, even when the workers had developed cancer or any of a number of other illnesses that can be caused by chemical exposure.

One female worker suffering from cancer stated, "And the doctor—I had to pull information out of him to get him to volunteer anything [about the cause of her cancer]."⁶⁶ Fortunately, some doctors were persuaded or concerned enough to write letters to employers suggesting that workers be reassigned to areas that might not cause "allergic reactions" and other health problems. However, other physicians were adamant in their belief that nothing in the workplace could be at fault. For example, after Lydia Johnson visited a doctor for her allergies, the physician wrote to her employer, "The allergic disease is not caused by the workplace." In another letter, a doctor wrote to the firm that she was a "37-year-old divorced woman who is being referred for evaluation of her psychological problem."⁶⁷ This of course is alarmingly similar to the traditional "mass hysteria" charge against women claiming occupational illness. Another worker dealt with "quack" doctors who told her that multiple chemical sensitivity "does not exist"; she diagnosed the problem herself when "I started to feel better when I would be away from work. I would go back, I would get worse. That's the way it was."⁶⁸

In addition to misdiagnosis and ignorance, physicians regularly prescribed useless and/or harmful treatments for patients from electronics firms. Anita Zimmerman was "exposed to chlorine gas every day for a month" at her job at AMD in Sunnyvale. After one incident at the plant forced an evacuation, a doctor at an industrial health clinic told Zimmerman to "gargle with sugar water and take cough syrup." Zimmerman now suffers from a form of bronchial asthma that leaves her chronically short of breath.⁶⁹

Doris Santiago spent her entire career in the electronics industry and has always worked with microchips. She worked in the clean rooms of Raytheon, National Semiconductor, and IBM. She suffers from multiple sclerosis, a relapse of cerebral palsy, lupus, and a stroke. She was given a

range of medications for her conditions. Lydia Johnson also worked at Santiago's firm: "I had a respiratory disease, chronic bronchitis, chronic fatigue."⁷⁰ Doctors also prescribed a witch's brew of medicines for her allergies, depression, and asthma. Thus, after one industry poisoned these women and made them sick, another industry produced medication for these symptoms, few of which the workers felt improved their condition.

Ill and dying electronics workers suffer from the daily horrors of toxic exposure, only to later confront a medical system that is stubbornly ignorant of, and resistant to, any suggestion that the workplace could be a cause of these health problems. The result: pharmaceutical companies continue to reap handsome profits; workers are misdiagnosed and mistreated, stay sick and die; medical research remains mired in antiquity; and the captains of Silicon Valley industry—the original perpetrators of the systemic poisoning in question—go free.

Conclusion

Core workers in Silicon Valley's electronic industry are a dying breed—literally and figuratively. As we demonstrated with the data above, many of these workers' lives are being snuffed out slowly, as a result of years of chemical exposure in the clean rooms. The number of core workers is also declining because all but a handful of chip making plants have left the Valley and moved offshore to Asia, the Caribbean, Europe, or other states in the United States. Some industry officials have argued that this highly toxic work is less of a problem today because so few chip plants remain. But, of course, that process only shifts the toxic burden onto other communities, rather than reducing the pollution.

Semiconductor companies form only one part of the electronics industry. After they are manufactured, the chips must then be placed into printed circuit (PC) boards that ultimately make up the nervous system of the end product. Many of those end products also require a variety of cables. For example, on a typical desktop computer with a monitor, modem, printer, and zip drive, there might be at seven or eight different cables snaking in and out of each component and into the wall socket. The production of cables, PC boards, and printers goes hand in hand. No computer will operate without its cables and computers are consid-

ered incomplete without a printer. The workers in these jobs occupy what we call the “periphery” because they constitute the next major stages in the production of electronics. These jobs are also much lower-paid and lower status. We now consider the trials of workers located on the periphery of the high-tech economy and offer a special look into the world of temporary workers.

7 The Periphery *Expendable People, Dangerous Work*

Printed Circuit Board, Cable, and Printer Assembly: Revelations and Resistance

PC boards are the foundation of virtually all electronics devices. They are the platform upon which integrated circuits (chips) and capacitors are mounted, and they create the electrical interconnection between components. PC board and cable assembly companies are notorious for being the “smallest, shoddiest, least accountable and most likely to go out of business.”¹ They compete with thousands of other assembly outfits (many of them in people’s garages and homes) by cutting costs and pushing workers to produce more and more rapidly, often with exacting brutality. Many workers in the periphery earn lower wages than employees in any other occupation in Silicon Valley, with the exception of food preparation and laundry workers.² According to the California Employment Development Department, like semiconductor chip making, circuit board manufacturing jobs at the major firms in Silicon Valley such as Apple, Hewlett-Packard, and Sun Microsystems have been stagnant or declining. The reason for this apparent lack of growth at these original equipment manufacturers (OEMs) is that they have outsourced the production of PC boards and other components to contract manufacturers (CMs). Traditional computer equipment jobs at the OEMs declined from 72,080 to 71,383 between 1992 and 1996, while jobs at the CMs increased from 22,858 to 31,321 during the same period.³ The earnings of employees at the CMs are 30 percent less than that of OEM workers.

On any given day dozens of job advertisements for electronics positions appear in the “Classifieds” section of the *San Jose Mercury News* and the many newspapers in the Bay Area. In the February 1, 1982, and August 26, 1984, editions of the *Mercury News*, for example, numerous

100. Begley and Carey 1984, 85.
101. Markoff 1992a.
102. Alonso-Zaldívar 1998a.
103. ~~*San Jose Mercury News*, February 23, 1998.~~
104. ~~Hawes Depositions 2000, 326-330.~~
105. ~~Alonso-Zaldívar 1998b. This refusal to cooperate with health officials has happened in numerous cases in the United States and Japan (see earlier in this chapter and in chapter 8).~~
106. Welles 1984.
107. Hawes Depositions 2000, 287.
108. ~~*Daily Camera*, July 4, 2001.~~

NOTES TO CHAPTER 6

1. Baker and Woodrow 1984, 24.
2. This worker's name is a pseudonym, as are all others unless they come from a previously published source.
3. Interview with Sarah Carpell, June 2000, San Jose, California.
4. The Esperanza quotations in this paragraph are found in Hawes 2000, 12, 28, and 45.
5. *Ibid.*, 59.
6. Roberts 1996.
7. Hawes 2000, 92.
8. *Ibid.*, 134.
9. Interview with Sarah Carpell, June 2000, San Jose, California.
10. *Ibid.*
11. Chu 1998.
12. Interview with Romi Manan, June 2000, Milpitas, California.
13. Interviews with Pat Lamborn of SCCOSH, February and November 1983.
14. Baker and Woodrow 1984, 25.
15. *Ibid.*, 376.
16. Interview with Michael Eissenscher, Berkeley, California, June 2000.
17. Lamborn 1983.
18. Cone 1986.
19. Lazarus 2000.
20. Interview with Jose Carbon, October 10, 1999, San Francisco, California.
21. Hawes 2000, 127, 220.
22. Lamborn 1983.
23. *Ibid.*, 218, 219.
24. *Ibid.*, 355.
25. *Ibid.*, pp. 99, 230-231.

26. Welles 1984.
27. Hawes 2000, 293, 300.
28. Lamborn 1983.
29. Gurtunya 1992, 149. Aside from this study, we have found no other evidence of this phenomenon, so it cannot be assumed that this practice was necessarily widespread.
30. Roberts 1996; Robinson 1991.
31. Burawoy 1979; Clawson 1980; Edwards 1979; Pauls 1993.
32. Karasek and Theorell 1990; Roberts 1993; Robinson 1991.
33. Robinson and McIlwee 1989, 132.
34. Hawes 2000, 51.
35. *Ibid.*, 64, 168, 206.
36. *Ibid.*, 512-513.
37. *Ibid.*, 108, 112.
38. Welles 1984.
39. Lamborn 1983.
40. Warren 1991.
41. See chapter 8 for a discussion of this phenomenon in Asia.
42. This quotation and the quotations in the following paragraph concerning Nancy Hawkes are from Malone and Yoachim 1980.
43. Lamborn 1983.
44. *Ibid.*
45. *Ibid.*
46. Interview with Romi Manan, June 2000, Milpitas, California.
47. In 1997, the USEPA concluded in its Design for Environment report on printed circuit/wire board toxics that "the most frustrating element in this study was its inability to fully evaluate all the chemicals in use by the industry or associated with new process technologies. This occurred because some companies that produce formulations used refused to reveal their chemical ingredients, claiming 'trade secrets.' The Project lacked authority to require them to divulge this information, having to rely on their voluntary good faith participation. Consequently, it is not possible to discount the possibility that some of the new process technologies may create hidden environmental or worker health hazards. . . . *Chemical companies should not be allowed to claim 'trade secrets' when worker and community health is at stake, especially in an EPA-sponsored study*" (Campaign for Responsible Technology 1997, 8, emphasis added).
48. This quotation and the material from Esperanza in the next paragraph are from Hawes Depositions 2000, 76, 98, 195, 208, 604-605.
49. The material from Lydia Johnson is from Hawes Depositions 2000, 303, 308, 438-441, 527.
50. *San Jose Mercury News*, February 23, 1998.
51. Institute of Medicine 1999b.

52. During a broadcast of National Public Radio in early May 2001, an internationally renowned cancer researcher stated, "it is now the consensus among the scientific community that cancer is fundamentally a genetic disease." This genetic orientation on cancer is a political, economically driven shift away from blaming corporate power and instead places the fault on the individual's genetic makeup.

53. See *Lancet* 1973; Epstein 1979, 77-79. Contributors who gave \$100,000 or more to the American Cancer Society include carcinogen polluters General Electric and Dupont, and pharmaceutical companies Bristol-Myers Squibb, Novartis, and Smith-Kline Beecham.

54. The W. R. Grace/Woburn case was featured in the book and movie *A Civil Action*. See also Brown and Mikkelsen (1990) for a strong sociological account of this tragedy.

55. *New York Times*, May 18, 2001. Examples of these conflicts of interest abound. American Cancer Society Board member David R. Bethune is president of Lederle Laboratories, a multinational pharmaceutical company and a division of American Cyanamid Company. Bethune is also vice president of American Cyanamid, which makes chemical fertilizers and pesticides—known carcinogens—while transforming itself into a full-fledged pharmaceutical company. In 1988, American Cyanamid introduced Novatrone, an anticancer drug. And in 1992, it announced that it would buy a majority of shares of Immunex, a cancer drug maker. The ACS is a large organization that provides research grants, public outreach, and expert advice on matters of public health relating to cancer.

56. Hawes 2000, 303-304.

57. Berman 1978; Kazis and Grossman 1982.

58. Begley and Carey 1984.

59. Hawes 2000, 199-200. Martino's main concerns were that the company was taking health information from her body without disclosing it to her and without telling her how it was to be used.

60. Hawes 2000, 202.

61. *Ibid.*, 36.

62. Fisher 1998, emphasis added.

63. Johnson 1996, 7.

64. Mr. Prokopio 1996, 5.

65. Anonymous worker at Welap! Graduation, December 6, 2000, San Jose, California.

66. Hawes 2000, 88.

67. Hawes 2000. Actual memo from the employee's physician to her employer.

68. Lamborn 1983.

69. Begley and Carey 1984.

70. Hawes 2000, 5.

NOTES TO CHAPTER 7

1. Kadetsky 1993, 517.

2. *Ibid.*

3. Working Partnerships USA 1998.

4. See chapters 4 and 5; Campaign for Responsible Technology 1997.

5. AIWA actually developed similar classes for women perhaps before SC-COSH, focusing on workplace literacy, leadership development, and health and safety education (see Kim and Kim 1996).

6. Raquel Sancho, SCCOSH Retreat, October 10, 2000.

7. Celia Chavez, Welap! Workers' Stories Process, 1999.

8. Anonymous Worker, Workers' Stories Process at the SCCOSH Welap! Graduation, December 6, 2000, San Jose, California.

9. Interview with Jung Sun Park, Cupertino, California, June 2000.

10. *Ibid.*

11. Raquel Sancho, SCCOSH Retreat, October 10, 2000.

12. In addition to winning his case with the California Labor Commissioner, Jayadev was featured in a documentary titled "The Secrets of Silicon Valley," released in 2001.

13. Jayadev 2001a.

14. *Ibid.*

15. Jayadev 2001a.

16. Excerpt from field notes, E-Tech, 1999.

17. *Ibid.*

18. Smith and Woodward 1992.

19. Karasek and Theorell 1990.

20. Gonos 1997.

21. Excerpt from field notes, E-Tech, 1999. In fact, San Jose's living wage ordinance, passed in 1995, required city contractors to pay employees at least \$10 per hour.

22. From a video produced for a temporary help firm in the San Francisco Bay Area, the particulars of which we are not at liberty to disclose.

23. Roberts 1996.

24. Excerpt from field notes, E-Tech, 1999.

25. Fox's excellent study of GTE Lenkurt's plant in Albuquerque revealed this pattern too (Fox 1991, 12).

26. Excerpt from field notes, E-Tech, 1999.

27. See Rollins 1985 and Salzingier 1997 for discussions of gendered deference rituals in several labor markets.

28. *Ibid.*

29. Excerpt from field notes, E-Tech, 1999.

30. See Rollins (1985) for a stunning account of her undercover fieldwork as