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# GLOBAL ELECTRONICS

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## SILICON VALLEY SURVIVES QUAKE



In the recent James Bond movie, "Live and Let Die," the fictional British agent saves Silicon Valley from villains who attempt to destroy the area's high-tech industry by triggering a massive earthquake along the nearby San Andreas fault. On October 17, a quake measured 7.1 on the Richter scale centered in the mountains near Santa Cruz caused massive damage in the San Francisco and Monterey Bay areas, but Silicon Valley survived without much injury or destruction.

The temblor caused minor damage throughout the area, and some sections experienced long power outages, but for most of Silicon Valley the major problem is the medium-term damage to the roadways that serve the entire region.

The San Andreas fault, the break in the Earth's crust that follows much of the California coast, does not actually dip into Silicon Valley. Instead, it rises near the ridge line of the Santa Cruz mountains to the west, and seismologists have placed the quake's epicenter further south, near the town of Aptos, in Santa Cruz County. The only city in Santa Clara County that experienced severe quake damage, Los Gatos, is located in the hills between the Valley and Santa Cruz.

Largely because most of the area's power grid was knocked out by the quake, most Valley high-tech firms were closed for a day or two. A few major employers, however, such as Lockheed, kept its doors open the next day. Some firms, such as Apple and the San Jose Mercury News kept their main computer systems going on emergency power, while other companies had to restart their machines and restore data from back-up tapes after the electricity was turned on. Many companies with national or international networks shifted key operations outside the area.

Communication lines—primarily the common carrier phone lines—functioned throughout the period, though service was limited by the huge demand. (Since the quake occurred live on national TV—millions were awaiting the start of baseball's World Series game three in San Francisco—the long distance networks serving north central California were flooded with calls from the worried relatives of area residents.) In the days after the

quake, executives at Seagate Technology, the disk-drive maker nestled in the Santa Cruz mountains in Scotts Valley, not far from the epicenter, managed the company by phone from their homes. (San Jose Mercury News, October 20, 1989)

High-tech companies were not merely saved by quirks of geology. Large firms, in particular, had emergency plans in place. And most of high-tech plants are new, built to modern earthquake-resistant building standards. The only large Valley employers suffering major, permanent damage were FMC and Stanford University.

FMC, originally known as Food, Machinery, and Chemical, primarily makes armored personnel carriers. Though it is one of Silicon Valley's largest Pentagon contractors, most of its operation is decidedly low tech, and many of its buildings predate the area's high-tech boom. The quake disabled an FMC shop where a large number of critical parts are machined. Since the firm uses "just-in-time" component inventory techniques, the machine shop shutdown stopped its two main assembly lines, idling 500 hourly workers.

Stanford, which contains many of the oldest large structures in the area, suffered an estimated \$160 million in destruction to unreinforced student housing and non-high tech academic facilities. However, most of the relatively new science, engineering, and medicine buildings held. In fact,

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## PSC SURVIVES, TOO BUT WE NEED HELP!

During the October 17 quake, ten of PSC's free-standing bookshelves fell over, spilling their books and other contents around the office. We cleaned up the mess quickly the next morning, reshelving materials in random order. Volunteers are already bracing the shelves, but *we need volunteers to help re-sort the publications*. Please call us at 415/969-1545 if you can offer some time.

Those readers who are amateur geologists may be interested to know that only shelves facing north fell.

Stanford's Linear Accelerator Center, where a six-mile long "electron gun" actually traverses the fault line above the main campus, experienced no serious damage. Stanford's long-term rebuilding effort could slow the university's ongoing contribution to Silicon Valley technology, however, if funds that have been raised for the construction of new research labs are diverted, as they should be, to reconstruct and replace existing facilities.

The products of Silicon Valley proved particularly valuable in the period after the quake. TV field crews beamed on-the-spot coverage from their van-mounted satellite transmitters. News media and relief officials used cellular telephone systems to stay in contact. Electronic mail services provided a link to relatives outside the area who were unable to phone in directly. And the two San Francisco daily papers, the **Chronicle** and **Examiner**, used their art departments' Macintosh computers to publish abbreviated emergency editions while their main computers were down.

Though most of the Valley is now back in business, many employees are handicapped by the damage to major commute routes, including the Bay Bridge, the Cypress Structure in Oakland, and the partially reopened Highway 17 to Santa Cruz. Relatively few Silicon Valley workers are directly affected, but commuters headed to San Francisco's financial district from the East Bay have been channeled onto roads that are already normally clogged by Valley commuters.

Furthermore, commuting has taken on new meaning to Bay Area employees who found themselves separated from their homes and family members are the time of the big quake. Over the past several years, many Bay Area employees have confounded urban planning experts by commuting increasingly longer distances daily to live in relatively low-priced housing while holding down jobs in the high-priced employment centers, such as Silicon Valley and San Francisco. Now that may change.

Public transit, less damaged than the roadways, may benefit from the quake, but more significantly, there are like to be new pressures brought upon employers and planning agencies to locate housing and employment in the same general areas.

## HOW TANDEM WORKS

Tandem, the Silicon Valley-based leader in the market for fault-tolerant transaction-processing computers, has been in the news a lot lately. First, it successfully orchestrated the announcement of its

first mainframe computer products, designed to take on IBM in an area where many other competitors have failed. Second, Tandem operates one of the few high-tech plants in Watsonville, California, one of the communities hardest hit by the October 17 earthquake. Though shut down by power outages, Tandem's Watsonville factory apparently suffered little permanent damage.

But James J. Mitchell, Business Editor of the **San Jose Mercury News** (October 24, 1989) chose to focus his column on Tandem for another reason, its organization of work. Tandem has a reputation for the innovative and respectful treatment of its professional employees, but its printed circuit board plant in largely Mexican-American Watsonville is a good distance from corporate headquarters in Silicon Valley.

Still, Mitchell reports, Tandem is equally innovative in the organization of its manufacturing plant, and that the company's approach has paid off. He writes, "It's an example of how high technology and planning can produce a highly efficient and flexible manufacturing system that benefits employer and employees." (We have no source among Tandem production employees to judge the accuracy and relevance of Mitchell's findings.)

Tandem employs about 230 people in Watsonville year-round, even though production schedules vary periodically. Turnover is low for the industry, at about 4 percent per year.

Tandem's factory workers, like many professionals in Silicon Valley, may "set their own starting times and take breaks almost whenever and

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Mountain View, California

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however long they want, without advance notice, as long as they work an eight-hour day."

Each Tandem worker is cross-trained to carry out at least half the jobs in the plant. "In a week, at least half the plant's employees do more than one job." In addition to training workers to operate a variety of machines, it also teaches them how to suggest improvements in the manufacturing process.

Tandem says it would take 600 to 1,000 workers in a typical plant to produce the boards it makes. This year the plant makes 260 products, primarily printed circuit boards, compared to 25 when it was opened in 1983. Now it takes only three days to produce a typical board, compared to 95 days in 1983.

## U.S. MEMORIES REJECTS CALIFORNIA

U.S. Memories, the proposed memory chip production joint venture, has narrowed its list of prospective sites to four areas: Phoenix, Arizona; Colorado Springs, Colorado; Middletown, New York; and Austin, Texas. Already state and local officials in California are seeking scapegoats for California's continuing difficulty attracting such investment "plums."

In fact, California and San Jose in particular had put together an attractive incentive package for U.S. Memories. [In the previous issue of *Global Electronics* (No. 96), we criticized this approach to high-tech development.]

Sanford Kane, the former IBM executive now responsible for organizing U.S. Memories, explained why San Jose lost the bidding war: "It turns out, as a place to run a large manufacturing business, California is expensive." He cited "taxes, labor costs, and construction costs." (*San Francisco Examiner*, October 23, 1989.)

Silicon Valley is in essence a victim of its own success. Though manufacturing labor statistics for Santa Clara County alone do not show the full magnitude of the Valley's growth, Silicon Valley is still a boom town. The Valley is probably the best place in the world to locate a new high-tech firm, and it is the best U.S. site for foreign-owned firms to buy into U.S. technology. The Valley is home to a wide range of specialized support services for high-tech firms as well as a huge pool of high-tech professionals, including computer scientists and integrated circuit designers. Small firms and large foreign firms come here to draw upon those resources.

As a boom town, Silicon Valley suffers from high housing costs, high land costs, and congested roads. Those factors reduce the supply of labor—professional, skilled, and semi-skilled as well—and drive up production costs.

Consequently, established U.S.-based firms—who already have technology and can supply support services in house wherever they locate—avoid placing major new production facilities in the Valley. U.S. Memories, as a consortium of established U.S.-owned firms, plans to utilize the skills and services of its member firms—especially the largest, IBM. So it can locate wherever production costs are lowest or subsidies are highest.

One smaller, younger high-tech firm that wants to take on U.S. Memories is San Jose-based Cypress Semiconductor. Cypress is headed by T.J. Rodgers, an outspoken critic of both U.S. Memories and Sematech, the Pentagon-funded semiconductor manufacturing technology consortium. In opposing special Federal legislation or subsidies for U.S. Memories, Rodgers challenged IBM to make available to Cypress the same memory chip design technology that it plans to license to U.S. Memories.

Rodgers promised to produce state-of-the-art DRAM's (dynamic random access memory circuits) a year earlier and at a lower cost than U.S. Memories. Though it is unlikely that Cypress can match U.S. Memories' intended volume, industry observers don't doubt Rodgers' ability to manufacture chips. Now even IBM, the parent of U.S. Memories, has asked Rodgers to present a business plan. (*San Jose Mercury News*, October 27, 1989) If a deal is worked out, it is even possible that Cypress would fabricate memory chips in Silicon Valley—without millions of dollars in subsidies.

This contrast in corporate behavior fits in well with Anno Saxenian's latest research. Anno, now an Assistant Professor at UC Berkeley's Department of City and Regional Planning, argues that a new wave of specialist firms is leading a resurgence of Silicon Valley's semiconductor industry. She summarizes, "The case of Silicon Valley suggests that geographic proximity fosters the trust and reciprocity which characterize networked production." Saxenian concludes that high-tech firms from a variety of subsectors "collaborate with local customers and suppliers... creating inter-industry production networks which foster joint problem-solving. These relationships are proving to be as important as the individual

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firm to sustaining the technological dynamism of the region." ("Local Area Networks: Industrial Adaptation in Silicon Valley," August, 1989)

### ENGINEERING TURNOVER

To no one's surprise, the latest American Electronics Association (AEA) survey of engineers salaries' and tenure at AEA member companies found high mobility. In fact, reporting firms experienced a 12.7% turnover rate in 1988, up from 10% the previous year. Software engineers, 17% of whom changed jobs, proved more footloose than their hardware counterparts.

Northern California had a 14.5% engineering turnover rate, compared to a regional high of 19.8% in New England and a low 3.3% in Arizona. (San Jose Business Journal, September 18, 1989)

As always, the AEA makes public only a small fraction of its survey results, and it offers no information as to whether "turnover" is voluntary or not.

### SOFTWARE BOTTLENECK

As time passes, computer software becomes more complex. Not only are computer users demanding more powerful application software, but each time a new piece of hardware or system software is developed, software developers need to

revise software or at least to check its compatibility with the new system. And if new features are added to an open-market program, developers need to make sure that not only the new features but the old program code work with a large variety of supposedly compatible computer systems.

Fortune magazine (September 25, 1989) is not the first institution to discover the bottleneck, but its coverage gives added profile to a problem that has long stymied the Pentagon and which is creating growing problems in the civilian sector as well. Fortune concludes, "For all the technical problems, the biggest obstacles to effective, economical software development are managerial. In case after case, the cause of delayed or botched software invariably boils down to bad planning, organizational rivalries, unrealistic scheduling, or the inability of techies to grasp the business problems they are trying to solve."

To illustrate the growing cost of software development, Fortune profiles the software aspect of several well-known products:

Product	Lines of Code (1,000's)	Programming (human-years)	Software Cost (US\$ millions)
Lotus 1-2-3 version 3	400	263	22
Space Shuttle	25,600	22,096	1,200
'89 Lincoln Continental	83.5	35	2
Citibank Teller	780	150	13
IBM Checkout Scanner	90	58	3

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