111 First Avenue South, Suite 600
Seattle (/places/united-states-and-canada/us-political-geography/seattle),
Washington 98104-2860
U.S.A.
Telephone: (206) 701-2000
Fax: (206) 701-2500
Web site: http://www.cray.com

Public Company
Incorporated: 1972 as Cray Research
Employees: 889
Sales: $149.2 million (2004)
Stock Exchanges: NASDAQ
Ticker Symbol: CRAY
NAIC: 334111 Electronic Computer Manufacturing

Cray Inc. is one of the world's premier producers of super-computers, a term rather loosely used to denote the fastest computers at any give time. The company's high-performance supercomputers, which are capable of performing billions of operations per second, are used by governmental agencies for classified and nonclassified applications, by governmental and academic research laboratories for scientific research, by weather centers for forecasting, and in the automotive and aerospace industries for vehicle design. Its product line includes both vector and massively parallel supercomputers. Now based in Seattle, Cray has its main manufacturing operations in Chippewa Falls, Wisconsin (/places/united-states-and-canada/us-political-geography/wisconsin), and also maintains offices in Mendota Heights, Minnesota (/places/united-states-and-canada/us-political-geography/minnesota), and Burnaby, British Columbia (/places/united-states-and-canada/canadian-political-geography/british-columbia), for software and hardware development, sales, and marketing operations. Although as a legal entity, the Cray of the early 21st century was founded in 1987 as Tera

Early History

Cray Research was formed through the efforts of Seymour Cray, a recognized genius in the design of supercomputers. Cray was born in 1925 in Chippewa Falls, Wisconsin, and spent a boyhood devoted to tinkering with electronic gear. After service in World War II (/history/modern-europe/wars-and-battles/world-war-ii) working as a radio operator and then functioning as a specialist in breaking Japanese codes, he attended the University of Minnesota, earning a bachelor of science degree in electrical engineering (/science-and-technology/technology/technology-terms-and-concepts/electrical-engineering) and another in applied mathematics, both in 1950. He decided to enter the computer industry and took a job with Engineering Research Associates, founded by William C. Norris. Through a series of mergers, Engineering Research Associates was brought under the control of Sperry Rand Corporation. Norris left Engineering Research Associates and established Control Data Corporation in 1957. Cray soon followed him to the new company. Among his early projects at Control Data, Cray developed the 1604, one of the first computers to use transistors in place of vacuum tubes.

Control Data shared in the booming computer industry of the 1960s, experiencing a period of rapid growth. Cray became disenchanted with the bureaucracy that this growth created and insisted that the company build him a separate research facility in his home town of Chippewa Falls. In this new

Cray's success at Control Data eventually hit a stumbling block. In 1972 top management at the corporation halted his plans for a new computer, telling him he could continue working on it only after another computer project was completed.

Instead of waiting, Cray and a group of followers left Control Data to set up Cray Research. Their purpose in starting the new company was to design the first supercomputer, which they ultimately named the CRAY-1. Cray Research situated its research and development and manufacturing operations in Cray's laboratory in Chippewa Falls while establishing a headquarters in Minneapolis (/places/united-states-and-canada/us-political-geography/minneapolis), Minnesota. After several years of work on the supercomputer project, the company delivered its first computer to the Los Alamos (/places/united-states-and-canada/us-political-geography/los-alamos) National Laboratory in 1976 for a six-month trial. Cray Research's first official customer, how-ever, was the National Center for Atmospheric Research, which took delivery of a CRAY-1 in July 1977. This sale, totaling $8.86 million, enabled Cray Research to earn back its original investment.

The CRAY-1 was the fastest computer then available. It used the technique of vector processing, which employs a system wherein a series of operations are manipulated at once as opposed to scalar processing where operations take place one at a time. The CRAY-1 could execute 32 operations simultaneously,

During its early years of operation, Cray Research sold its supercomputers to government laboratories and agencies. The main application of supercomputers was in physical simulation, wherein computer models were used to analyze and forecast the response pattern likely to take place in a system composed of physical variables. Early applications of these models were in gauging the effects of nuclear weapons (/social-sciences-and-law/political-science-and-government/military-affairs-nonnaval/nuclear-weapons) and in meteorology. Because these types of applications were performed under the aegis of the government, it was felt that the market for supercomputers would be very limited. In 1978, however, Cray Research was given its first order from a commercial organization.

Second Generation Systems: Early 1980s

The CRAY-1 system became the CRAY-1/S and the CRAY-1/M systems. As the 1980s began, the company decided to begin development of the next generation of supercomputers. To concentrate his efforts on that development, Seymour Cray resigned as CEO in 1980, and in 1981 he stepped down as chairman. John Rollwagen became CEO in 1980 and chairman in 1981. Cray retained his ties with the company as an independent contractor and as a member of the board of directors. The new project called for the design and development of the CRAY-2, intended to be the first computer on the market that used chips made of gallium arsenide. When the

Because the CRAY-2 project contained an element of risk due to its innovative technology, Rollwagen had the company initiate a second project based on a further upgrade of the CRAY-1 technology. Under the direction of Steve S. Chen, the CRAY X-MP system was devised. This system marked the first use of multiprocessors, where a number of microprocessors are linked together to take on bigger jobs. Introduced in 1982, the CRAY X-MP was originally a dual processor, with a speed three times that of the CRAY-1.

As had been done with the CRAY-1, both the CRAY-2 and the CRAY X-MP supercomputers evolved into more sophisticated systems. The CRAY X-MP served as the basis for a series that consisted of 11 models. The more

Third Generation Systems: Late 1980s

By the mid-1980s Cray Research embarked on producing another generation of supercomputers, again following several paths. In 1986, Chen began working on a new system of highly innovative design, relying on significant technological advances in five different areas. After spending nearly $50 million on the project, the company decided to discontinue it. Chen left the company in 1987, taking 45 engineers from Cray Research, to form Supercomputer Systems, Inc., with plans to build a supercomputer using as many as 256 microprocessors.

Seymour Cray completed design work on the CRAY-3 supercomputer system in 1987. The CRAY-3 marked another effort to use gallium arsenide chips, a prospect made more feasible by the production of the first of the new type of chips suitable for computer production in the 1980s. While awaiting the CRAY-3, the company developed and introduced the CRAY Y-MP system, which combined the power of eight central processing units to give it 30 times the power of the original CRAY-1. The CRAY Y-MP was the first supercomputer to sustain a speed of more than one gigaflops (that is, one billion floating-point operations per second) on many applications.

nation's largest companies, listed in the *Fortune* 500. During this period, the company was able to market its supercomputer systems to commercial corporations engaged in petroleum exploration, automobile production, and the aerospace industry.

Company Perspectives:

Cray Inc.'s mission is to be the premier provider of supercomputing solutions for its customers' most challenging scientific and engineering problems. Cray systems are used to design safer vehicles, create new materials, discover life-saving drugs, predict severe weather and climate change, analyze complex data structures, safeguard national security, and a host of other applications that benefit humanity by advancing the frontiers of science and engineering.

Cray Research underwent a major restructuring in 1989. Delays in the development of the CRAY-3 system were creating very high research costs, and the scheduled date for completing the project was reportedly postponed. In addition, the company had embarked on another project, the C-90, as a new stage in the CRAY Y-MP product line. Rather than discontinue one of the projects, Rollwagen decided to create a new company, Cray Com-puter Corporation, to be headed by Seymour Cray. Located in Colorado Springs (/places/united-states-and-canada/us-political-geography/colorado-springs), Colorado (/places/united-states-and-canada/us-political-geography/colorado), Cray Computer would continue the development of the CRAY-3 supercomputer. On November 15, 1989, Cray Research issued shares of Cray Computer to its stockholders, retaining a 10 percent ownership

company in the production of supercomputers, with about two-thirds of the world market. In 1989, it phased out the CRAY-2 and CRAY X-MP as new models of the CRAY Y-MP were coming on line. There were continuing plans for development of the C-90 project, which was renamed the CRAY Y-MP/16. The company also began development of enhanced systems for supercomputer networking to facilitate scientists' access to Cray supercomputers from a variety of other types and brands of computers. In addition, there were plans to bring to the market an entry-level supercomputer, which would use the technology of the CRAY Y-MP, but would have a much lower price with reduced installation and operating costs.

As the market for supercomputers expanded, Cray Research diversified its sales efforts both in terms of type of customers and geographic region. In 1989 governments remained the largest customers, buying 31 percent of Cray Research's output; other important purchasers of Cray machines included universities; aerospace, petroleum, and automotive companies; energy producers; and weather and environment analysts. Sales in North America (/places/oceans-continents-and-polar-regions/oceans-and-continents/north-america) that year were 61 percent of the total. Approximately 75 percent of revenue between 1987 and 1989 was derived from sales of computer systems, with remaining income from leased systems and service fees.

independent firms in the United States (/places/united-states-and-canada/us-political-geography/united-states), and for a time Cray itself seemed very vulnerable. Increasing competition from Japanese computer giants Fujitsu Limited (/social-sciences-and-law/economics-business-and-labor/businesses-and-occupations/fujitsu-limited), Hitachi, Ltd., and NEC Corporation, and from U.S. giant Intel Corporation, had by 1990 already cut Cray's market share to about 65 percent; this compared to the 80 percent level for the number of installed supercomputers that were Cray models. Looming on the horizon were several upstart companies seeking to build less expensive but still very powerful models—such companies as Alliant, Convex Computer, Kendall Square Research, nCube, Supercomputer Systems, and Thinking Machines—or create high-end models such as Seymour Cray's Cray Computer. At the same time, with the end of the Cold War (/history/united-states-and-canada/us-history/cold-war) and cutbacks or slowdowns in government spending worldwide, Cray Research faced the decline of its core market, government agencies and laboratories, the military, and government-supported entities such as universities and research centers.

Facing these threats, Rollwagen reportedly realized in 1990 that he had put the wrong man in charge in the person of Gumucio. Just when Cray needed more than ever to tap into its engineers' expertise, Gumucio's formal management style stifled their creativity and dampened morale. The more inspiring figure of Rollwagen resumed operating responsibilities.

Key Dates:

1972:

Seymour Cray forms Cray Research, headquartered in Minneapolis with research and development and manufacturing operations in Chippewa Falls, Wisconsin.

1976:

Cray delivers its first computer, the CRAY-1 model, to the Los Alamos (/places/united-states-and-canada/us-political-geography/los-alamos) National Laboratory.

1977:

The National Center for Atmospheric Research takes delivery of a CRAY-1, becoming the company's first commercial customer.

1985:

The second-generation CRAY-2 is introduced.

1987:

Tera Computer Company is founded in Washington, D.C., by James Rottsolk and Burton Smith; the firm soon relocates to Seattle, Washington.

1988:

The CRAY Y-MP makes its debut.

1989:

Company spins off the CRAY-3 supercomputer project into a separate company, Cray Computer Corporation, headed by Seymour Cray (who would die in an auto accident in 1996).

1993:

Cray Research introduces its first massively parallel processing (/science-and-technology/computers-and-electrical-engineering/computers-and-computing/parallel) (MPP) system, the T3D supercomputer.

1996:

Silicon Graphics, Inc. (SGI) acquires Cray Research for $745 million.

minisupercomputers, general-purpose scientific computers that are not as powerful as standard supercomputers. Since minisupercomputers sold for as little as $250,000, Cray viewed them in part as an entry level for new customers who might later be tempted to invest in a multimilliondollar supercomputer. Also on the low end was the 1991 purchase of the superserver (high-end servers within a client-server environment) assets of the bankrupt Floating Point Systems, which became Cray Research Superservers, Inc. The following year this new subsidiary introduced its first product, the Cray S-MP, which was designed for the widely used Sun Microsystems, Inc.'s SPARC processor client-server environment.

Meanwhile, Cray's newly energized product development program produced results on both the low and high end. Within one month in late 1991, Cray introduced an entry-level system priced at about $340,000 called the Y-MP EL and its fastest vector supercomputer to date, the C90, with operational speed four times that of its previous fastest model. Cray had also begun work on a new type of supercomputer (at least for Cray), a massively parallel processing (/science-and-technology/computers-and-electrical-engineering/computers-and-computing/parallel) (MPP) system. Long touted by some analysts as the inevitable successor to the vector systems pioneered by Cray, MPP systems linked a number of standard microprocessors to create a virtual supercomputer at a potentially much lower cost than vector systems. MPP systems were the type that the upstart supercomputer companies were developing.

closed one plant and eliminated 330 jobs, or one-eighth of the workforce.

Early in 1993, Rollwagen resigned after President Bill Clinton (/people/history/us-history-biographies/bill-clinton) nominated him for the position of deputy secretary of commerce (a position for which he was never confirmed). Rollwagen was replaced by John F. Carlson, a 16-year Cray veteran. Later that year, Cray's first MPP system was rolled out, the T3D. Although scoffed at by rivals because it had to be linked to a standard Cray vector system, the T3D outperformed other MPP systems and helped put a number of the upstart firms out of business (such as Thinking Machines and Kendall Square Research) or into the arms of larger firms (such as Convex Computer which was acquired by Hewlett-Packard Company in 1995).

Although Cray returned to profitability in 1993, additional restructuring was needed to improve the company's operations. In 1994, which saw the resignation of Carlson, an $8.3 million charge was incurred, while in 1995, when J. Phillip Samper, former vice-chairman of Eastman Kodak and former president of Sun Microsystems, became chairman, $187.7 million in charges were booked. The 1995 charges contributed to a full-year loss of $226.4 million, but were incurred within a critical year in which three major new products were introduced: a new low-end J90 series; a new high-end vector system, the T90 series (touted as the first wireless supercomputer and five times faster than its predecessor, the C90 series); and Cray's second-generation MPP system, the T3E. The last of these, unlike its predecessor, did not need to be connected to a traditional vector supercomputer and had a top

1996–99: The Silicon Graphics Interregnum

By early 1996, Cray Research was the only independent supercomputing firm left. Among the victims was Cray Computer, which declared bankruptcy early in 1995. (In September 1996 Seymour Cray died at age 71 as the result of an automobile accident in Colorado Springs (/places/united-states-and-canada/us-political-geography/colorado-springs).) Cray Research had survived and now had a range of products to offer from lower-end superservers and minisupercomputers to entry-level supercomputers to high-end vector and MPP supercomputer systems. But it now competed directly with several firms with much deeper pockets, the Japanese computer giants and Intel on the high end and Hewlett-Packard, IBM, Sun Microsystems, and Silicon Graphics, Inc. (SGI) on the lower workstation end. Thus when SGI, a leader in high-powered workstations with a particular emphasis on graphics-oriented systems, made a friendly takeover offer early in 1996, Samper and other Cray executives decided to accept the offer rather than attempt to continue to compete against such giants. The $745 million deal, completed in June 1996, bolstered SGI's position in the technical-computing arena and simultaneously ended the era of independent supercomputer companies, at least for a time.

Although no longer independent, Cray Research had survived the early 1990s and counted on tapping into SGI's deep pockets to develop future systems. It had to do so, however, without Samper, who resigned shortly after the

Ironically, at the time of SGI's purchase of Cray, this unit was one of few thriving areas at Cray. The company's core vector supercomputer operations were already beginning to slump, and that sector of the market continued to decline over the next few years. Rather than investing in Cray, SGI instead pulled the plug on successors to both the T90 and T3E and allowed Cray to develop only one new supercomputer, the SV1, which debuted in 1998 and was about twice as fast as previous Cray models. Cray was at the same time expending much energy fighting legal battles against its Japanese rivals, particularly NEC, accusing the firm of "dumping," selling its supercomputers below cost in the U.S. market. In September 1997 the U.S. Commerce Department ruled in favor of Cray, imposing dumping duties of 454 percent on NEC supercomputers, effectively barring the firm from the U.S. market. Cray and NEC continued to battle over this dispute in various venues, but in the meantime SGI, attempting to turn around its now struggling operations, was in near continuous restructuring mode, including overhauls that slashed Cray's workforce from more than 4,500 to around 800 employees. About the only positive development of this dark period in Cray's history, which some Cray staffers later derisively dubbed "the occupation," was a deal that the company struck in 1998 with the (/social-sciences-and-law/political-science-and-government/us-government/national-security-agency)National Security (/social-sciences-and-law/political-science-and-government/military-affairs-nonnaval/national-0) Agency and other federal agencies to develop a new

Tera Computer

The SGI "occupation" ended in rather surprising fashion in April 2000. That month a much smaller, upstart supercomputer firm, Tera Computer Company, acquired Cray Research for less than $100 million ($50.3 million in cash plus one million shares of Tera's common stock). Tera was founded in 1987 in Washington, D.C., by James Rottsolk and Burton Smith, the former taking the operational lead and the latter serving as chief scientist. One year later, the founders moved the operation to Seattle, Washington, in order to be near the University of Washington and its first-rate computer science department and because they thought a location in the trendy Pacific Northwest would make it easier to attract top computing talent. Tera was established to develop a new kind of supercomputer, an MPP machine, but one with "shared memory." This type of computer was designed to split a problem into many smaller pieces, which are sent to many processors at once for simultaneous computation, an approach that was often compared to the way a secretarial pool works. The Tera design held out the promise of greater speed because the processors would be used more efficiently.

As it worked to develop its first model, Tera stayed afloat through a variety of funding sources, including a contract from the Defense Advanced Research Project Agency (DARPA), an arm of the U.S. Department of Defense; a public offering of stock in 1995, after which Tera was listed on the NASDAQ; and a number of private placements of stock and warrants. In early 1998 Tera finally delivered its first computer, called the MTA, to the San Diego (/places/united-

the X1, Cray resolved its longstanding dispute with NEC in early 2001. NEC invested $25 million in Cray in exchange for Cray becoming a distributor of the NEC SX series of supercomputers, with exclusive North American rights and nonexclusive rights elsewhere. This deal lasted just two years: in 2003 NEC sold its investment in Cray and canceled the company's exclusive distribution rights, although Cray continued as a nonexclusive distributor of NEC supercomputers worldwide.

In the meantime, Cray hired an IBM executive, Michael Haydock, as president and CEO in October 2001, with Rottsolk remaining chairman. Just five months later, however, Haydock resigned after clashing with the board of directors on the company's direction. Rottsolk reassumed Haydock's former positions. Late in 2002 Cray released the long-awaited X1, which enabled the company to eke out a profit of $5.4 million on revenues of $155.1 million following years of losses. The first version of the X1 had a top speed of 51 teraflops, 25,000 times faster than a Pentium 4 personal computer (/science-and-technology/computers-and-electrical-engineering/computers-and-computing/personal-0), achieved via an architecture that was vector-based but that enabled the processors to share each other's memory. Early in 2003 Cray received $62 million in orders for the X1 from the U.S. government, one of the largest contracts in company history. Concurrently, Cray in October 2002 had entered into a $90 million contract with Sandia National Laboratories (/social-sciences-and-law/economics-business-and-labor/businesses-and-occupations/sandia-national) of Albuquerque (/places/united-states-and-

of $63.2 million on revenues of $237 million.

The Red Storm project came to fruition in 2004 as Cray began shipping the computer hardware to Sandia in installments, with the final shipment coming in the first quarter of 2005. In October 2004 Cray introduced a commercial version of Red Storm, which it dubbed the XT3, positioning it as the company's third-generation MPP system, following the T3D and T3E. The XT3 combined Cray's traditional high-bandwidth connections on the chips and circuit boards and between the cabinets that comprise the supercomputer with a number of inexpensive, off-the-shelf processing units, particularly the 64-bit Opteron processor from Advanced Micro Devices, Inc., using a Linux-based operating system.

In April 2004 Cray went down market when it acquired OctigaBay Systems Corporation for about $115 million in stock and cash. Based in Burnaby, British Columbia (/places/united-states-and-canada/canadian-political-geography/british-columbia), OctigaBay was in the process of developing a supercomputer comparable in design, but not power, to other Cray products but at a much lower price. Cray subsequently renamed the acquired firm Cray Canada Inc. and in October 2004 released the firm's product as the Cray XD1 system. Another important development came in May 2004 when Cray was selected by the U.S. Department of Energy to provide most of the hardware for a new supercomputer at Oak Ridge National Laboratory that planners hoped would be the fastest civilian research computer in the world. The goal was to create a machine with a sustained speed of 50 teraflops, which would

hard at work in 2004 developing a major upgrade to the X1, the X1E, sales of which began in March 2005. The new model boasted a top speed of 147 teraflops. Cray's transition from just the one model, the X1, to its three-supercomputer lineup was unfortunately a rough one. The firm missed several of its delivery dates, cutting 2004 revenues to just $149.2 million. Cray was forced to restructure, announcing in July that about 100 employees (out of a workforce of 925) would be laid off. Various charges totaling more than $62 million, coupled with the revenue shortfall, led to a net loss for the year of $204 million.

Cray's difficulties continued in 2005, when customer delays for several large supercomputer orders adversely affected cash flow. In June the company announced the layoff of an additional 90 employees and temporary pay cuts for the remaining U.S. employees making more than $50,000 per year. By this time a leadership transition was also well underway. In March 2005 Peter J. Ungaro was promoted to president, having joined Cray in August 2003 as senior vice-president of sales, marketing, and service; he came to Cray from IBM, where he had been vice-president of worldwide deep computing sales. Ungaro was named CEO in August 2005, when Rottsolk announced his retirement. Taking over as nonexecutive chairman was Stephen C. Kiely, a company director since 1999 and a tech executive serving simultaneously as chairman of Stratus Technologies Inc. The other cofounder of Tera Computer, Burton Smith, remained Cray's chief scientist. Cray's new leaders seemed confident that a return to profitability was in the offing, once production of the new product lineup had been fully ramped up.

Cray Canada Inc.; Cray Canada (Washington), Inc.; Cray Canada Corp./Societe Cray Canada; Cray China Limited; Cray Computer Finland Oy; Cray Computer SAS (France (/places/britain-ireland-france-and-low-countries/french-political-geography/france)); Cray Computer Deutschland GmbH (Germany (/places/germany-scandinavia-and-central-europe/german-political-geography/germany)); Cray Supercomputers (Israel) Ltd.; Cray Italy S.r.l.; Cray Japan, Inc.; Cray Korea, Inc.; Cray Netherlands B.V.; Cray Computer South Africa (/places/africa/south-african-political-geography/south-africa) (Proprietary) Limited; Cray Computer Spain, S.L.; Cray-Tera Sweden AB; Cray Computer GmbH; Cray Taiwan, Inc.; Cray U.K. Limited.

Principal Competitors

International Business (/social-sciences-and-law/economics-business-and-labor/businesses-and-occupations/international-2) Machines Corporation; NEC Corporation; Hewlett-Packard Company; Silicon Graphics, Inc.; Dell Inc.; Sun Microsystems, Inc.; Intel Corporation; Advanced Micro Devices, Inc.

Further Reading

Alexander, Steve, "Cray Says Oregon Business Unit Is No Longer Needed," *Minneapolis Star Tribune*, May 8, 1996, p. 1D.

————, "Seymour Cray Dies of Injuries from Accident," *Minneapolis Star Tribune*, October 6, 1996, p. 1A.

Churbuck, David, "Cray Versus Japan Inc.," *Forbes*, September 4, 1989, pp. 118-19.

Clark, Don, "Cray to Unveil Systems Based on New Chip Line from AMD," *Wall Street Journal (/literature-and-arts/journalism-and-publishing/journalism-and-publishing/wall-street-journal)*, October 27, 2003, p. B6.

———, "Tera Computer to Acquire Cray in Surprise Bid," *Wall Street Journal (/literature-and-arts/journalism-and-publishing/journalism-and-publishing/wall-street-journal)*, March 2, 2000, p. B8.

Cook, James, "War Games," *Forbes*, September 12, 1983, p. 108.

Corr, O. Casey, "The Need for Speed: Local Firm's Target Is to Build Prototype of World's Fastest Computer," *Seattle Times*, August 5, 1991, p. B1.

Donlan, Thomas G., "Cray's Lament: Stock Sags As Industry Grows," *Barron's*, July 19, 2004, pp. 17-18.

———, "Dream Machines: Cray, the Pioneer of Supercomputers, May Have a New Winner," *Barron's*, June 23, 2003, pp. 38-39.

———, "Not So Super Outlook: For Cray Research, Competition Looms," *Barron's*, February 5, 1990, p. 39.

Dudley, Brier, "Cray Co-Founder, CEO Steps Down," *Seattle Times*, August 9, 2005, p. D1.

Gomes, Lee, "Silicon Graphics to Lay Off Up to 1,500, Sell or Spin Off Units, Including Cray," *Wall Street Journal*, August 11, 1999, p. A3.

Gordon, Greg, "Trade Ruling Favors Cray in Rift with Japan Firms," *Minneapolis Star Tribune*, September 27, 1997, p. 1D.

Greenberger, Robert S., "Supreme Court Rejects NEC's Appeal of Supercomputing Price-Dump Ruling," *Wall Street Journal*, February 23, 1999, p. B17.

Haines, Thomas W., "It's Make-or-Break Time for Tera Computer," *Seattle Times*, October 23, 1996, p. D1.

Johnson, Jan, "A Look Inside Cray," *Datamation*, May 1982, p. 57.

"Jurassic Pact," *Economist*, March 2, 1996, pp. 58-59.

Lohr, Steve, "Silicon Graphics Reported Ready to Rescue Cray," *New York (/places/united-states-and-canada/us-political-geography/new-york) Times*, February 26, 1996, p. D1.

Markoff, John, "A Maverick Builds a New Supercomputer in a PC World," *New York (/places/united-states-and-canada/us-political-geography/new-york) Times*, February 9, 1998, p. D1.

———, "Now Cray Faces Life Without Cray," *Business Week*, May 29, 1989, p. 31.

———, "What? Cray Computers Eating Dust?," *Business Week*, November 25, 1991, p. 88.

Mitchell, Russell, and Gary McWilliams, "Cray Eats Crow," *Business Week*, October 4, 1993, p. 108.

Murray, Charles J., *The Supermen: The Story of Seymour Cray and the Technical Wizards Behind the Supercomputer*, New York (/places/united-states-and-canada/us-political-geography/new-york): Wiley, 1997, 232 p.

———, "The Ultimate Team Player: Lester T. Davis, Winner of the *Design News* Special Achiever Award, Supplied the Technical Vision That Helped Cray Research Dominate the Supercomputer Industry," *Design News*, March 6, 1995, pp. 88-95.

Murray, Chuck, "Changing Customers Fuel Supercomputing Shifts," *Chicago Tribune*, December 18, 1994.

"Perilous Descent: Cray and Supercomputers," *Economist*, April 21, 1990, pp. 81-82.

Port, Otis, and Hiroko Tashiro, "Gunning for Speed: Japan Still Has the Fastest Supercomputers, but U.S. Companies Are Closing In," *Business Week*, June 7, 2004, pp. 132-34, 136.

Schatz, Willie, "Who's Winning the Supercomputer Race?," *Datamation*, July 15, 1989.

Stedman, Craig, "Cray Fights for New Users," *Computerworld*, March 6, 1995.

Werner, Larry, "The City (/literature-and-arts/performing-arts/theater/city) and the Supercomputer," *Minneapolis Star Tribune*, January 4, 2004, p. 1D.

—Donald R. Stabile

—update: David E. Salamie

International Directory of Company Histories