Fairchild Semiconductor

Company Details

Name: Fairchild Semiconductor
Sector: Semiconductor Sector

Description

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THIS SITE WAS ESTABLISHED TO COLLECT AND PRESENT INFORMATION AND STORIES RELATED TO FAIRCHILD SEMICONDUCTOR AS PART OF THE OCTOBER 2007 CELEBRATION OF THE FIFTIETH ANNIVERSARY OF THE FOUNDING OF THE COMPANY. IF YOU HAVE ANY CORRECTIONS OR ADDITIONAL INFORMATION TO CONTRIBUTE PLEASE CONTACT THE FACILITATORS LISTED BELOW.

Overview

Founded in 1957 in a building now designated as California Historical Landmark # 1000 in Palo Alto, California by eight young engineers and scientists from Shockley Semiconductor Laboratories, Fairchild Semiconductor Corporation pioneered new products and technologies together with an entrepreneurial style and manufacturing and marketing techniques that reshaped Silicon Valley and the world-wide industry. The Planar process invented in 1959 revolutionized the production of semiconductor devices and enables the manufacture of today's billion transistor microprocessor and memory chips.

Funded by and later acquired as a division of Fairchild Camera and Instrument Corporation of Syosset, New York, Fairchild was the first manufacturer to introduce high-frequency silicon transistors and practical monolithic integrated circuits to the market. At the peak of its influence in the mid-1960s, the division was one of the world’s largest producers of silicon transistors and controlled over 30 percent of the market for ICs. Director of Research and Development, Gordon Moore observed in 1965 that device complexity was increasing at a consistent rate and predicted that this would continue into the future. “Moore’s Law,” as it became known, created a yardstick against which companies have measured their technology progress for over 40 years.

Starved by the parent company for funds for investment in new production facilities and for equity to retain key employees, by the late 1960s the Semiconductor Division encountered serious problems with introducing new products and satisfying fast growing customer demand. As all of the founders and many senior employees had left the company, a new team composed of former Motorola executives, led by C. Lester Hogan, was appointed to head Fairchild Camera and Instrument Corporation in 1968. Hogan moved the corporate headquarters to Mountain View and the company continued to innovate in new technologies and products, including the industry’s first volume production of high-performance semiconductor memory devices. Ventures into consumer products, including digital watches and video games were less successful. Revenues grew substantially but the company was never able to regain its former profitability and prominence.

Having been overtaken in sales and significance by companies started or managed by former employees (Fairchildren), including Advanced Micro Devices (AMD), Intel, and National Semiconductor and buffeted by aggressive US and international competitors, French oilfield services conglomerate Schlumberger purchased the company in 1979. Unable to restore its fortunes, Schlumberger sold the assets to National Semiconductor, another company managed by Fairchildren, in 1987.

In 1997 National divested a number of mature former Fairchild product lines in a leveraged buy-out to a group of executives based in the South Portland, Maine facility. Through internal development and strategic acquisition of compatible products for power, interface, analog, mixed signal, logic, and optoelectronic applications, the reborn Fairchild Semiconductor is once again a public company (NYSE: FCS) with annual revenue of more than one billion dollars.

Facilitators

- David Laws - Email

Statistics

Contributors (9), Events (187), Stories (50), Documents (180), References (75), Discussions (0 threads, 0 posts)

Entered By: Luanne Johnson
June 29, 2006

Contributors

Contributor Henry Blume

Date Joined October 1960

Job Description
see attached
Accomplishments
see attached
Date Left 1969

Statistics
Stories (1)
Date Entered August 17, 2007

Contributor scott boutwell

Date Joined January 6, 1978

Job Description
Hired by Gil Ameleio in 1978. He did not want to pay me my requirements to move from Austin even though I worked for Motorola, inventor of the 6800 family. It worked out great in that I became head Product Engineer, and the Division Manager over microprocessors.

Accomplishments

A succesful relationship with Ford&Delco GM to make the original car computers valid. They needed a secondary relialble source and we provided. I was the Product Engineer for the 6802(Moto)or the (3902) Fairchild. We sold millions as the first car computers. This is missing from the history. We had the first products that equalled or exceeded 'mil-spec' because of the extreme conditions required. That was the cash-cow for Fairchild not mentioned.

Date Left March 9, 2011

Date Entered March 8, 2011

Contributor Michael Bromham

Date Joined February 7, 1961

Job Description

Shipping clerk

Date Left January 6, 1988

Statistics

Documents (2)

Date Entered March 9, 2008

Contributor Martin DeLateur

Date Joined December 21, 1977

Job Description

Hired from collage at UC Berkeley, I was in Product Engineering for the Transistor, Discrete and Analog Divisions as well as the Operation Manager in Cebu from 1977 to 1987.

Date Left June 21, 1987

Statistics

Stories (1)

Date Entered October 3, 2007

Contributor Floyd Harris

Date Joined June 10, 1964

Job Description

Product Marketing and inside sales at diode plant in San Rafael, Calif.

Accomplishments

Was responsible for coordinating sales activities,quoting prices to field sales, creating internal specifications, monitoring progress and tracking orders placed by major customers such as Hughes Aircraft, Litton Guidance and Control, Litton Data Systems, Autonetics, Space Technology Labs. and other Western Region military and aerospace customers.

Date Left June 1, 1966

Statistics
Stories (1) , Documents (2)
Date Entered September 4, 2007

Contributor Mike Humphries

Date Joined June 3, 1970

Job Description

I was a product marketing engineer in Advanced Digital MSI Devices. Mike Markula ran the whole marketing group. Our products were the 9300 family of digital components. I had product responsibility for the northeast US. I also spent a stint in Market Research and Planning, when they needed someone familiar with the Fairchild product line who could also figure out how to automate a key market share reporting process, which was on hold because they had laid off the guy who was 50% of the way through the task!

Accomplishments

The only important thing I did was build a pretty complete system for automating the monthly task of reporting Fairchild device sales (units and dollars)by device type to the industry association, and take the resulting aggregated information returned back to us by them and produce various share of market reports (compared our share in units and dollars to the industry total as well as our prices compared to the industry average)that our company executive committee used for changing pricing and other strategies. By automating the process, the Fairchild cycle time starting from reporting our info to getting key market reports went from 30 days (manual) to a few days, and the result was much quicker decision making for mid-course corrections. Also luckily for me, the technology that I used from Tymshare to make it all work was so interesting that I left Fairchild soon after returning to product marketing to join Tymshare for a career in sales!

Date Left January 9, 1972

Statistics

Stories (2) , References (1)

Date Entered July 28, 2006

Contributor David Laws

Date Joined January 1966

Job Description

I worked at SGS-Fairchild in marketing and field sales positions in the UK until 1968 when I joined Fairchild Semiconductor in Mountain View, CA. There I worked in a variety of sales and marketing roles, including Burroughs Program Manager, Digital Product Planning Manager, and Product Marketing Manager for Bipolar Memory.

Accomplishments

My most satisfying accomplishments at Fairchild included helping to plan and

introduce the first Isoplanar memories (93410, 93415, etc), working with Rex Rice's group at R & D to help them win the Illiac IV memory contract (the first semiconductor main memory system), and, most challenging of all, devising and implementing a customer-friendly version of Fairchild's arcane product numbering system.

Life after Fairchild included 11 years at Advanced Micro Devices in Sunnyvale where I ran the PAL business for several years. My last position was Vice President, Business Development. Moving on to Altera Corporation I was the first Marketing Vice President and after that the first CEO at QuickLogic.

Date Left June 1972

Statistics

Stories (44) , Documents (176) , References (74)

Date Entered June 30, 2006

Contributor Ted Malcolm

Date Joined August 16, 1965

Job Description

Equipment engineering department. Managed design office and fab shops to provide the production departments with the tools and equipment required to produce the product.

Accomplishments

Led the project to build 50 stud welders for Hong Kong.

Led the project to build 3 dedicated 1N4148 automated test and finish lines for Cebu. They became the basis for equipment that provided for future capacity increases.

Developed a Dix sealer process to produce "beaded leads" for use in producing DO7 whisker leads.

Led a team that worked the TO3 automated test and finish line into a production qualified status.

Date Left January 15, 1988

Statistics

Stories (1)

Date Entered October 4, 2007

Contributor John Springer

Date Joined August 1969

Job Description

Worked as an application engineer in the basement of building 20, for Clive Ghest, Bob Ulrickson, Peter Alfke, and John Nichols.

Accomplishments

Got investigated by the security dept for having long hair and flashing the peace sign to a photographer. Went on the great peace march in SF in 1970 with Norman

Doyle, dressed in uniform as captain something. Shared in a patent award for the memory chip in the illiac computer. Hung out at the wagon wheel on Fridays, and eventually got hired by AMD.

Date Left August 1971

Date Entered July 29, 2006

Contributor Robert Waits

Date Joined January 1962

Job Description

Engineer, Research & Development
Engineer, Mountain View, Radiation-Resistant Integrated Circuits (1974)

Accomplishments

Developed silicon-chromium thin film resistor process.

Date Left June 1974

Date Entered August 24, 2006

Timeline

1955

Milestones

Beckman funds Shockley Semiconductor Labs (September 5, 1955)

William Bradford Shockley, inventor of the junction transistor, and co-inventor with John Bardeen and Walter Brattain of the original point contact transistor at Bell Labs in 1947, signed an agreement with Beckman Instruments founder Arnold O. Beckman to finance a new company “to engage promptly and vigorously in activities related to semiconductors.” Shockley set out to recruit “the most creative team in the world for developing and producing transistors.”

Related References
Riordan: "Crystal Fire"
Related Documents
Shockley, Bardeen & Brattain - 'Electronics" cover photo

1956

Milestones

Shockley Semiconductor opens in Mountain View (February 13, 1956)

In February 1956 Shockley and Beckman publicly announced the formation of Shockley Semiconductor Laboratory in a former fruit packing shed at 391

S. San Antonio Road, Mountain View. Shockley's young recruits proceeded to establish the first silicon technology research and manufacturing facility in what will eventually be called Silicon Valley. Later many of them played major roles in the development of the region.

Related References
Lécuyer: "Making Silicon Valley"
Riordan: "Crystal Fire"
The Rise of Silicon Valley: Shockley Labs to Fairchild Semiconductor
Videos of Shockley Semiconductor legacy panels
Shockley Labs announcement article
Shockley Labs 4-layer diode
Wolfe: "The Tinkerings of Robert Noyce - How the Sun Rose on the Silicon Valley"
Related Documents
Shockley Labs exterior photo 2006
Shockley Labs bronze plaque photo
Shockley Labs commemorative poster unveiled - photo
"Birthplace of Silicon Valley" poster
Shockley Labs exterior photo - circa 1960
From Bell Labs to Silicon Valley
Shockley, William biography
"Shockley Transistor Labs is Formed in Palo Alto"

Shockley awarded the Nobel Prize (November 1, 1956)
Shockley learns that he will share the 1956 Nobel Prize in Physics. His senior staff joins him in a celebration lunch even though by this time many of them are becoming disenchanted with his difficult management style and obsession with developing a very complex four-layer diode device. They believed that improved silicon transistors would generate more immediate revenue.

Related References
Riordan: "Crystal Fire"
The Rise of Silicon Valley: Shockley Labs to Fairchild Semiconductor
Shockley, William - biographies
Related Documents
Shockley employees toast the Nobel prize winner

1957

Milestones

Shockley Semiconductor dissidents plan to leave (July 1957)
Continuing frustration with the direction of Shockley Semiconductor stimulates seven scientists and engineers to seek alternative employment as a group. Julius Blank, Victor Grinich, Jean Hoerni, Eugene Kleiner, Jay Last, Gordon Moore, and Sheldon Roberts met with Alfred "Bud" Coyle and Arthur Rock of New York investment bank Hayden Stone to explore options for their future Coyle and Rock recommended that they start a new business.

Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
Riordan: "Crystal Fire"
Wolfe: "The Tinkerings of Robert Noyce - How the Sun Rose on the Silicon Valley"
Related Documents
From Bell Labs to Silicon Valley

Shockley defectors resign, FC&I agreement negotiated (September 18, 1957)

Coyle contacted Sherman Fairchild, founder of Fairchild Camera and Instrument Corporation of Syosset, New York. President John Carter assigned vice president Richard Hodgson to negotiate a financing arrangement to establish Fairchild Semiconductor Corporation with the group that now included Robert Noyce. The Shockley defectors resigned on September 18.

Related References
Berlin: "The Man Behind the Microchip"
Hodgson, Richard - Interview
Lécuyer: "Making Silicon Valley"
Rock, Arthur - Interview
Riordan: "Crystal Fire"
Malone: "The Big Score"
Moore, Gordon - Interview
Rock, Arthur - HBS Biography and Time feature
Wolfe: "The Tinkerings of Robert Noyce - How the Sun Rose on the Silicon Valley"
Related Documents
Group resigns - Shockley notebook entry
"Fairchild's Offspring"
Dollar bill signed by Fairchild founders

Charleston Road, Palo Alto buiding lease signed (October 1957)

After working in various founder's homes, including building probers and benches in Vic Grinich's garage at 615 Georgia Avenue, Palo Alto, the company signed a two year lease on a new 14,000 sq. ft. building at 844 Charleston Road, Palo Alto. The building was commemorated as California Historical Landmark # 1000 in 1991.
Afrer the division offices and manufacturing moved to Whisman Road in Mountain View, the Charleston facility became the Research and Development buidling. It later housed the Instrumentation operation.

Related References
Lécuyer: "Making Silicon Valley"
"New Palo Alto electronics company plans to produce transistors"
"'Traitorous Eight' Leave Shockley Labs"
"Fairchild Silicon Transistors"
Related Documents
No Electricity
Instrumentation Department
Charleston Road building photos (1958-9)

Fairchild People

Bay joins as head of marketing & sales (December 1957)

Thomas Henry Bay (Tom) taught physics at the University of Connecticut prior to selling potentiometers for a division of Fairchild. Richard Hodgson recommended Bay to the founders who hired him as Director of Sales and Marketing. For a short time in the late 1960's he served as General Manger of Semiconductor. Other important hires in that quarter included employee number 9, Applications Manager Murray Siegel, and David Allison, a diffusion expert from Shockley.

Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
"'Traitorous Eight' Leave Shockley Labs"
Related Documents
Tom Bay Memorial invitation

Financial Data

Financing agreement details (September 23, 1957)

Fairchild Semiconductor Corporation is incorporated with 1,325 shares of stock. Each founder purchases 100 shares at $500, 300 are reserved for future employees, and, through the efforts of Arthur Rock and Alfred "Bud" Coyle in arranging the transaction, New York investment bank Hayden Stone owns 225. With options to buy the company, Fairchild Camera and Instrument Corporation loans Semiconductor $1.38 million and controls the company through a voting trust.

Related References
"Contract among the California Group, et al"
"The Fairchild Chronicles"
Related Documents
Dollar bill signed by Fairchild founders

1958

Milestones

IBM places first order (February 1958)

Even though the company had not yet built a single device, on learning that IBM, Federal Systems Division, Owego, NY was unable to procure a high-performance, core memory-driving silicon transistor for the B-70 navigational computer from its regular suppliers, Bay and Noyce, aided by the intervention of Sherman Fairchild with Thomas Watson Jr., secured an order for 100 devices at $150 each. Moore (an NPN) and Hoerni (a PNP) were each charged with developing a different solution to satisfy the order.

Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"

Moore, Gordon - Interview
"The Fairchild Chronicles"
Related Documents
IBM Transistor Pricing
Check from IBM for $1500

First product (2N696/7) - mesa process, facilities & devices developed in just 5 months (May 1958)

By May, Fairchild engineers installed the facilities, built the manufacturing equipment, developed photolithographic masking techniques, established pure aluminum as a reliable method of making contacts, and installed a double-diffused mesa device production process. Moore's NPN version of the transistor was fabricated and shipped to IBM early that summer. As types 2N696 and 697 they were introduced, to great acclaim, as the first commercial, double-diffused silicon transistors at the Wescon trade show in August.

Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
Fairchild 2N697
Moore, Gordon - Interview
"Fairchild Silicon Transistors"
Related Documents
Condensed Catalog - 1959/60
Silicon Transistors

New manufacturing plant in Mountain View (1958)

Ground was broken for a new 64,000 sq ft manufacturing plant at 545 Whisman Road, Mountain View. Joseph Rogers, President, Fairchild Camera & Instrument; Joseph Ostele, Vice President; R. Hodgson, Executive Vice President; and Charles Morse, Vice President of Ferry-Morse Seed Company attended the ceremony.

Related Documents
Ground breaking at 545 Whisman Road
Architectural rendering of Whisman Road plant
Whisman Road assembly area photo
Welcome to Fairchild

Minuteman reliability problem surfaces (1958)

Late in 1958 large orders from Autonetics for the Minuteman missile were in jeopardy. Loose metal particles that threatened to short across exposed junctions in the mesa structure could only be detected with a laborious manual “pencil tap test.” The survival of Fairchild was at stake; Jean Hoerni's solution revolutionized the industry.

Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
Related Documents
Mesa transistor cross-section diagram

Fairchild People

Baldwin hired as General Manager (February 1958)

Ed Baldwin former manager of diode operations at Hughes Semiconductor in Southern California was hired as General Manager; Noyce had been offered the position but preferred to head R&D. Baldwin's managerial expertise made important contributions to the young company, including recruiting engineers from Hughes, but he was never accepted into the inner circle of the founders.

Related References
Berlin: "The Man Behind the Microchip"

Financial Data

FC&I Financial Results for 1958 (December 31, 1958)

Fairchild Camera and Instrument recorded Net Sales of $31,674,000 for 1958 down from $36,989,000 in 1957. Net Profit of $544,000 was down from $799,000.
Fairchild Semiconductor Corporation employment was 165 at year end up from 20 the prior year. Sales reached approximately $500,000.

Related Documents
Annual Report 1958

1959

Milestones

Hoerni invents the planar process (January 14, 1959)

Swiss physicist Jean Hoerni recalled a 1957 experiment of covering the silicon surface with an oxide layer. In January 1959 he realised that this could be used to eliminate the reliability problem by protecting a device junction from contamination. By selective diffusion through a series of windows etched through the oxide it also allowed fabrication of transistors with a flat surface profile – hence the trade name "planar." Historian Christophe Lécuyer describes the invention Hoerni claimed in a patent disclosure written that day as "the most important innovation in 20th century technology."

Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
Hoerni Planar Patent
Riordan: "Crystal Fire"
"State of the Art"
"The Planar Process"
Wolfe: "The Tinkerings of Robert Noyce - How the Sun Rose on the Silicon Valley"
Related Stories
If Bob Noyce had purchased four lenses would the Planar process and the IC have been invented a year earlier?

Related Documents
"A Briefing on Integrated Circuits" - Booklet
Planar Progress Report
Hoerni: “Planar Silicon Diodes and Transistors”
Planar Silicon Transistors (TP-14)
From Bell Labs to Silicon Valley

Noyce conceives a method of manufacturing integrated circuits (January 1959)

Aware of Hoerni’s work with oxide, in late January Robert Noyce wrote up ideas for fabricating multiple devices on a single piece of silicon and laying down the interconnections as part of the manufacturing process. His patent # 2981877 filed in July 1959 is the basis for the monolithic integrated circuit.

Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
Riordan: "Crystal Fire"
Noyce: “Semiconductor Device-and-Lead Structure”
Wolfe: "The Tinkerings of Robert Noyce - How the Sun Rose on the Silicon Valley"
"The Fairchild Chronicles"
Related Documents
Noyce - Basic IC Patent #2981877
Last photo of Bob Noyce
From Bell Labs to Silicon Valley

Rheem Semiconductor is first Fairchild spin-out (March 1959)

General Manager Ed Baldwin is fired by Richard Hodgson of FC&I because of his negotiations with Rheem Manufacturing to form a competing business to build mesa transistors. Eight senior employees depart with Baldwin to found the first spin-out from Fairchild Semiconductor. Noyce is appointed to replace Baldwin.

Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
Related Documents
Rheem Semiconductor plant
"Fairchild's Offspring"

First planar transistor demonstrated (March 12, 1959)

Working with Jay Last, Jean Hoerni fabricated an NPN transistor using his oxide masking technique. He demonstrated the first working planar device with its flat topology and unique teardrop shape to his fellow workers. He proved its resistance to contamination by spitting on the unpackaged die. Noyce immediately recognized the importance of Hoerni's invention.

Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
"State of the Art"
Wolfe: "The Tinkerings of Robert Noyce - How the Sun Rose on the Silicon

Valley"
"The Fairchild Chronicles"
Related Documents
First Planar Transistor - die photo
Planar - "The Fairchild Planar Story"

TI announcement spurs Fairchild IC activity (March 1959)

By connecting two mesa transistors with gold wires on the same sliver of germanium, in September 1958 Jack Kilby of Texas Instruments, Dallas, TX demonstrated the industry's first integrated flip-flop. At the March 1959 IRE show TI announced Kilby's germanium "Solid Circuit" concept. Spurred by this competitive threat, Noyce urged Jay Last to develop a practical silicon circuit that could be produced in volume with adherent aluminum interconnects using Hoerni's Planar process.

Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
Riordan: "Crystal Fire"
Kilby Nobel Prize Lecture

2N1131 and 1132 First Fairchild PNP transistors (March 1959)

Fairchild's first PNP transistors, the double-diffused Mesa 2N1131 and 1132 were introduced. Together with other Fairchild original devices, the 2N1132 was an important component in the Minuteman program.

Related Documents
Condensed Catalog - 1959/60

2N706 First Gold-doped Transistor (May 1959)

The 2N706 was Fairchild's first transistor to use gold doping to increase switching speed. Gold diffused into the NPN mesa transistor reduced minority carrier lifetime to achieve a fast 16ns switching speed. At 5 sq. mils (1.2 x 10-4 cm2) it was also three times smaller than the older 2N696.

Related References
Sah: "Evolution of the MOS transistor-from conception to VLSI"

Last begins "microcircuit" development (September 1959)

Jay Last assembled a "microcircuit" development team comprising Issy Hass, Lionel Kattner, Jim Nall, and Bob Norman and handcrafted a demonstration 20 MHz multi-chip flip-flop for the fall Wescon Show. Noyce described the device (called a Hexistor in the 1959 annual report) as the "middle ground" between discrete circuits and future "microscopic computer sub-elements."

Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
Annual Report 1959
Related Documents
From Bell Labs to Silicon Valley

San Rafael diode plant opened (1959)
A site at 4320 Redwood Hwy, San Rafael, Califoria was selected as the first manufacturing plant outside Santa Clara County. Specializing in high performance diode devices, the facility reached profitable operation within one year and remained in service until 1988. The first planar diode (FD100) was introduced in January 1960.

Related References
Yu, Albert - Interview
Swanson, Bob - Interview
Related Stories
Simpler Times and almost the largest diode order in history
"I went to San Rafael and stayed there for the better part of four years."
Memories of John Ready
Diodes to DRAMs - Memories of San Rafael and beyond
Giving away Money
Related Documents
San Rafael Diode plant feature in Leadwire
John Ready - photo
Condensed Catalog - 1959/60

Hamilton Electro Sales appointed distributor (1959)
Started by Tony Hamilton in 1957, Hamilton Electro Sales was the nation's first semiconductor distibutor. The agreement signed with Fairchild in 1959 proved a significant factor in Hamilton's growth into one of the world's largest distribution organizations as well as Fairchild's penetration of the Industrial market. Hamilton merged with Avnet in 1968.

Fairchild Culture

First badges (October 21, 1959)
The success of the organization now requires ID badges

Related Documents
Badge memo from Bob Noyce

Leadwire started publication (1959)
"Leadwire" was a monthly journal "Published by and for Employees of Fairchild Semiconductor/Instrumentation" from company headquarters in Mountain View from 1959 until 1970.

Related References
"Leadwire"
Allen, Bender, & Steinheimer - Interview
Related Documents
Leadwire 5
Semiconductor Division Group Directors 1970

Fairchild People

Fairchild "Eight" photograph taken (1959)
One of the most familiar photographs of Silicon Valley entrepreneurs shows

Noyce at the center surrounded by the other seven founders of Fairchild Semiconductor seated beneath the original "Flying F" logo. It was taken by a business magazine photographer in 1959. The same pose was recreated 26 years later by photographer Carolyn Caddes.

Related References
Wolfe: "The Tinkerings of Robert Noyce - How the Sun Rose on the Silicon Valley"
Related Documents
Famous Eight photograph

Sporck joins as Production Manager (October 1959)
Charles E. Sporck joined Fairchild as production manager from General Electric where he served as Supervisor of Shop Operations. Charlie, as he is known to everyone, was promoted to operations manager, and later vice president and general manager. His defection in 1967 to run National Semiconductor along with many senior Fairchild staffers represented a serious setback for the company. [Leadwire January 1960]

Related References
Sporck: "Spinoff: A Personal History of the Industry that Changed the World"
Sporck, Charlie - Interview
"Leadwire"
"The Fairchild Chronicles"
Related Stories
"When I arrived at the Fairchild Whisman Road facility, they didn't know me from Adam."
My Fairchild Stories
Related Documents
Sporck memo seeks engineering personnel
"Fairchild 71" campaign brochure
Leadwire - May 1965

Valentine joins as a salesman (1959)
Don Valentine started in Los Angeles as one of the first West Coast salesmen. He moved to Mountain View as National Sales Manager and later Director of Marketing. He left Fairchild in 1967 and joined Charlie Sporck at National. In 1971 he started Sequoia Capital, one of Silicon Valley's first and most successful venture capital companies.

Related References
Valentine, Don - Interview
Related Documents
"Sell from a Position of Power"

Financial Data

FC&I acquires FSC (October 16, 1959)
With sales growing rapidly at a high profit margin, on September 24 Fairchild Camera and Instrument advised Noyce that it planned to exercise its option to acquire all the shares of Fairchild Semiconductor Corporation in a tax free stock swap valued at $3 million. The transaction was completed on October 16. FSC became a division of FC&I.

Related References
Berlin: "The Man Behind the Microchip"
FC&I Annual Report 1958
Wolfe: "The Tinkerings of Robert Noyce - How the Sun Rose on the Silicon Valley"

Semiconductor revenue mix (October 9, 1959)
John Carter, president of Fairchild Semiconductor's parent firm, Fairchild Camera and Instrument Corp. stated that the semiconductor division's business was 80 percent from military customers and 20 percent from commercial [Palo Alto Times, October 9, 1959; clipping in diary of William Shockley, Stanford University Archives]

FC&I Financial Results for 1959 (December 31, 1959)
Fairchild Camera and Instrument recorded Net Sales of $443,442,000 for 1959 with a net profit of $2,071,000.

Related Documents
Annual Report 1959

1960

Milestones

First public details of Micrologic devices (February 12, 1960)
Isy Haas, Jay Last, and Robert Norman wrote a paper "Solid-state Micrologic Elements" which was first presented at Irvine Auditorium on Friday February 12, 1960 in a conference session on Microelectronic Considerations revealing the first public details of the planned Micrologic Family of integrated circuits. Norman read the same paper at the Solid State Circuits Conference in Philadelphia. [Leadwire March 1960]

Related References
Norman: "Solid-state micrologic elements"
"Leadwire"
"Micrologic elements being developed"
Related Documents
Mask layout of first Micrologic flip-flop
Micrologic wafer on cover of Business Week

2N1613 - First planar transistor introduced (April 1960)
The introduction of the first planar transistor, the 2N1613 NPN device, was the "Big news at the IRE Show in New York." Planar technology was claimed by the company to insure reliablity levels of over 5 million operating hours. The device was extremely successful and continues to be sold today. [Leadwire April 1960]

Related References
"Leadwire"
Fairchild 2N1613
"The Planar Process"

Wolfe: "The Tinkerings of Robert Noyce - How the Sun Rose on the Silicon Valley
Related Documents
Planar transistor cut-away view
"What is a transistor"
Condensed Catalog - 1959/60
Planar Silicon Transistors (TP-14)

Minuteman transistor order placed (May 1960)

The Autonetics Division of North American Aviation placed a "major" order ($450,000) for the original mesa process NPN transistors for use in the Minuteman missile program. The total value of the business eventually exceeded $8M. In June the company signed a contract to establish an Autonetics Reliability Evaluation Division. [Leadwire May & June 1960]

Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
"Leadwire"
"Fairchild Silicon Transistors"

First planar IC demonstrated (May 1960)

Group Manager Jay Last's team demonstrated functional units of the industry's first monolithic integrated circuit in May 1960. These initial units of a four-transistor flip-flop electrically insulated one active element from the other by etching silicon from the back side of the wafer to create physical isolation channels that were then filled with epoxy.

Related References
Lécuyer: "Making Silicon Valley"
Lojek: "History of Semiconductor Engineering"
"Micrologic elements being developed"
"State of the Art"
Wolfe: "The Tinkerings of Robert Noyce - How the Sun Rose on the Silicon Valley"
Related Stories
Chronology of the first Micrologic devices
Notes on early work on Monolithic ICs at Fairchild
Related Documents
First Planar IC - die photo
Micrologic wafer and device
Mask layout of first Micrologic flip-flop
Photo of Micrologic flip-flop with diffused isolation
Micrologic Elements: Their Applications in Circuit Design
Micrologic Type F - Flip flop element
Micrologic diffused isolation - Isy Hass notes
Micrologic diffused isolation - Lionel Kattner notes
E-Mail from Bob Norman

SGS - Fairchild established to serve Europe (August 1960)

Fairchild Camera and Instrument signed an agreement with Olivetti and Telettra to create a joint venture to be called SGS - Fairchild to manufacture and market Semiconductor Division products in Europe. Hodgson and

Noyce served on the board of the company.

Related References
Berlin: "The Man Behind the Microchip"
"Leadwire"
Related Stories
"How would you like to go to Italy?"

Noyce predicts price declines (August 10, 1960)
In a prescient interview, Noyce said "Although the transistor business has moved rapidly I think it has a long way to go yet. There should be continuing price declines in the future." [Interview in Palo Alto Times August 10, 1960]

Related Documents
"Future Trends in Semiconductors"

Diffused isolation developed for Micrologic (October 1960)
Lionel Kattner and Isy Haas worked with David Allison to develop a process for electrically insulating individual devices from each other on a chip by diffusing isolation regions from the top and bottom of the wafer. First working units of this fully planar approach, which made volume production of integrated circuits practical, were produced in October or November.

Related References
Lécuyer: "Making Silicon Valley"
Related Stories
Chronology of the first Micrologic devices

Financial Data

FC&I Financial Results for 1960 (December 30, 1960)
Fairchild Camera and Instrument recorded Net Sales of $67,900,000 for 1960. Semiconductor contributed approximately $21 million of this total.

Related Documents
Annual Report 1960

1961

Milestones

2N914 First epitaxial planar transistor (March 1961)
The 2N914, Fairchild's first planar epitaxial transistor, was introduced at the IRE Show. Epitaxy, the vapor growth of a thin layer of single crystal material on the wafer, greatly improves device performance. [Leadwire, February 1961]

Related References
"Leadwire"
Epitaxial technology
Moore: "The Role of Fairchild in Silicon Technology in the Early Days. of 'Silicon Valley'"

Wolfe: "The Tinkerings of Robert Noyce - How the Sun Rose on the Silicon Valley"

Micrologic introduced at IRE Show (March 1961)

Samples of the first Micrologic device were shipped to customers and the product was introduced to great acclaim at the IRE Show in New York. Initially descibed as modified DCTL (Direct Coupled Transistor Logic), the circuit configuration of the type "F" Element – a dual flip-flop device, was later called RTL (Resistor Transistor Logic).

Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
"Leadwire"
Related Stories
Chronology of the first Micrologic devices
Related Documents
First Planar IC - die photo
Micrologic wafer and device
Micrologic Elements: Their Applications in Circuit Design
MAGIC - An Advanced Computer for Spaceborne Guidance Systems
MARTAC 420 Multipurpose Digital Control Computer
MARTAC - "Use of Integrated Circuitry in a Digital System."
Micrologic wafer on cover of Business Week
Micrologic - µL Product Introduction Brochure
Micrologic - "The Inside Story on Fairchild Micrologic"
E-Mail from Bob Norman

Transistor tester announced (March 1961)

The Type 4 transistor tester was announced at the March IRE Show. A brochure headlined "A New Capability from Fairchild" introduced the first commercial offering of many generations of equipment that led to the Fairchild Instrumentation division. [Leadwire, March 1961]

Related Documents
Instrumentation Department

Planar transistors approved for Minuteman (May 1961)

Based on the results of extensive reliability testing, Autonetics approved the planar process for supply to the Minuteman program in place of mesa devices. [Leadwire, May 1961]

Related References
Lécuyer: "Making Silicon Valley"
"Leadwire"
Related Documents
"Sell from a Position of Power"
Planar Silicon Transistors (TP-14)
Planar - "The Fairchild Planar Story"

2N709 switching transistor developed for CDC 6600 (July 1961)

The 2N709 (FT-1310) was introduced as the first silicon transistor to exceed germanium performance. The device was developed with $500,000 in

funding from Seymour Cray of Control Data Corporation to meet the sub-3 nsec speed requirement the CDC6600, the world's fastest computer.

Related References
Lécuyer: "Making Silicon Valley"
Thorton: "Design of a Computer"
Sah: "Evolution of the MOS transistor-from conception to VLSI"

Three new Micrologic elements introduced (December 1961)
Three new Micrologic elements as well as the first PNP planar epitaxial transistor were introduced at the Fall Joint Computer Conference. More to come. [Leadwire, December 1961]

Related Documents
Early Ad for Micrologic ICs

Fairchild People

Hoerni, Last & Roberts leave to form Amelco (February 1961)
Disillusioned with Fairchild's lack of emphasis on integrated circuits, three of the founders, Jean Hoerni, Jay Last & Sheldon Roberts, left to start the Amelco Semiconductor operation of Teledyne in Mountain View. Teledyne was a 1960 spin-out from Litton financed by Arthur Rock.

Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
Rock, Arthur - HBS Biography and Time feature
Related Documents
"Fairchild's Offspring"

Micrologic team departs for Signetics (April 1961)
David Allison and Lionel Kattner, two key engineers in the Micrologic development team, were joined by David James and Mark Weissenstern as founders of Signetics. Incorporated in August, Signetics was the first company to base its business solely on integrated circuits. It's DTL pin-configuration with considerably improved specifications provided the foundation for Fairchild's 930 Series.

Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
Malone: "The Big Score"
Related Stories
A long skinny Englishman
Related Documents
"Fairchild's Offspring"

Sanders joins as salesman in Hollywood office (April 1961)
W. J. (Jerry) Sanders III joins from Motorola as a salesman in the Hollywood office in April 1961 He later served in roles as Consumer Product Sales Manager, Western Regional Manager, and Director of Marketing before being fired by Les Hogan in 1968. Jerry founded Advanced Micro Devices

(AMD) together with a group of other ex-Fairchild employees in 1969.

Related References
Sanders, Jerry - Interview
Malone: "The Big Score"
Related Stories
"How do I get a job with these guys?"

Financial Data

FC&I Financial Results for 1961 (December 31, 1961)
Fairchild Camera and Instrument recorded Net Sales of $92,254,000 for 1961 with a net profit of $5,252,000. Micrologic integrated circuit sales were approximately $500,000.

Related Documents
Annual Report 1961

1962

Milestones

Apollo Guidance Computer first Micrologic Order (February 16, 1962)
The first order for integrated circuits for a high profile computer design, the Apollo Guidance Computer that landed humans on the Moon in 1969, was placed in February 1962. MIT Instrumentation Labs ordered 100 Type “G” Micrologic elements for evaluation. The decision to use Micrologic in the Apollo AGC was approved in November 1962.

Related References
Lécuyer: "Making Silicon Valley"
Fairchild Micrologic in the Apollo Guidance Computer

Business Week covers Micrologic (April 14, 1962)
A Business Week cover photograph featured a Micrologic wafer. The accompanying article included extensive coverage of Fairchild. [Leadwire, May 1962]

First Fairchild FET introduced (May 1962)
The 2N2457, the first Fairchild field effect transistor was introduced. The low noise, bipolar FET was designed for low level signal applications. [Leadwire, May 1962]

Palo Alto R&D under construction (June 1962)
A June 30, 1962 report to shareholders noted that the company recently broke ground in Stanford Industrial Park on a new building to house the Palo Alto Semiconductor R&D Laboratory. The August edition of Leadwire included a profile on R&D with many photographs of personnel and equipment.

Related References

Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
Related Documents
Leadwire feature on R & D
Charleston Road building photos (1958-9)

All transistor TV prototype (November 1962)
To expand sales in the consumer market, applications engineers Jack MacIntosh and Sam Schwartz demonstrated “the world’s first” all silicon transistor TV prototype. Their basic design was later mass produced by GE, Sylvania and Zenith. [Leadwire November 1962]

Related References
Lécuyer: "Making Silicon Valley"

First complete IC airborne computer (November 1962 ca.)
The AC Spark Plug of General Motors, Milwaukee, WI designed the MAGIC 1 airborne digital computer for navigation, guidance, and control in late 1962. Company reports claim this as the first complete airbone computer to have its logic circuits mechanized with integrated circuits. It used 6 different Fairchild micrologic device types for a total of 2098 packages.

Related Documents
Organization of MAGIC II Advanced Computer
Computer for Simplified Intertial Guidance System

New South Portland plant opened (December 28, 1962)
A permanent building for the first manufacturing facility outside California opened with 80 employees in South Portland, Maine. Operating from temporary quarters through most of 1962, the first shipment directly to a customer was made in November. [Leadwire, January 1963]

Fairchild Culture

Annual Sales Conference held in San Diego (1962) (August 1962)
Annual sales meetings formed an important aspect of the Fairchild sales culture. They combined intense product and sales training sessions, team bonding sports events, eating, drinking and high-spirited carousing in exotic locations. The fourth National Sales Meeting was held at the Hotel Del Coronado, San Diego in 1962.

Related Documents
1962 Sales Conference photo booklet

Opening of the Mountain View patio (April 18, 1962)
An important event in the life of employees at the Mountain View plant was the opening of the "long awaited patio" financed by the Recreation Council. General Manager Bob Noyce officiated.

Related Documents
Leadwire feature - Noyce opens patio

Fairchild People

Fourth founder, Eugene Kleiner leaves (January 1962)
Charlie Sporck's ascendancy to the senior manufacturing post left founder Eugene Kleiner without a significant management role. He left Fairchild in 1961 and in 1972 founded Kleiner Perkins, which grew into one of the most high profile Silicon Valley venture capital groups.
Related References
Berlin: "The Man Behind the Microchip"
Lécuyer: "Making Silicon Valley"
Venture Capital

Noyce elected VP of FC&I (June 1962)
Robert Noyce, General Manager of the Semiconductor Division is elected a Vice President of the Corporation. [Fairchild Views: July/August 1962]

Related References
Berlin: "The Man Behind the Microchip"
Noyce: "Semiconductor Device-and-Lead Structure"
Wolfe: "The Tinkerings of Robert Noyce - How the Sun Rose on the Silicon Valley"
Noyce, Robert - biographies
Related Documents
Last photo of Bob Noyce
Leadwire - May 1965

Financial Data

FC&I Financial Results for 1962 (December 31, 1962)
Fairchild Camera and Instrument recorded Net Sales of $101,600,000 for 1962 up from $92,300,000 in 1961. This is this first year corporate revenue exceeded $100 million. Semiconductor was the largest division with sales of approximately $21M.
Fairchild microcircuit sales for 1962 were 35,000 units for $1.1M. Total sales for the industry were $5.8M.

Related Documents
Fairchild IC Sales thru 1964 - memo
Annual Report 1962

1963

Milestones

Wanlass invents CMOS (February 1963)
Frank Wanlass and C.T. Sah introduced the concept of CMOS devices with a paper "Nanowatt Logic Using Field-Effect Metal-Oxide Semiconductor Triodes" at ISSCC. Wanlass filed a patent for his invention of CMOS technology ("Low Stand-By Power Complementary Field Effect Circuitry" #3,356,858) on June 18.

Related References
Moore, Gordon - Interview

Sah: "Evolution of the MOS transistor-from conception to VLSI"
Wanlass: "Nanowatt logic using field-effect metal-oxide semiconductor triodes"
Bassett: “To the Digital Age”
Related Documents
Wanlass CMOS patent # 3,356,858

Snow identifies sodium as MOS stability culprit (October 1963)
Drift in MOS structures had been a serious inhibitor to their commercial application. While working on electron beam evaporation of aluminum at R & D, Ed Snow identified sodium as the major source of contamination. This allowed engineers to address the problem and develop reliable LSI devices.

Related References
Bassett: “To the Digital Age”

NEC technology license (1963)
With significant assistance from Bob Noyce, legal counsel Roger Borovoy negotiated an exclusive license for Nippon Electric Corporation to use Fairchild planar and integrated circuit patents in Japan. [Leadwire, October 1963]

Related References
Berlin: "The Man Behind the Microchip"

Hong Kong is first offshore plant (1963)
Manager of Administration & Planning Jerry Levine paid his own way to explore the opportunity to tap Hong Kong as a source of low cost, highly skilled labor. The board approved an assembly plant in 1964 and within a year Fairchild was the largest electronics employer in Hong Kong and led the industry drive to major offshore operations throughout Asia.

Related References
Berlin: "The Man Behind the Microchip"
Related Stories
Jerry Levine & the Hong Kong plant
Related Documents
Honk Kong plant and the "Flying F" logo photo

Custom IC Design (1963 ca.)
To speed the adoption of integrated circuits in high volume applications, the company began a major program of building custom designs for computer manufacturers. Families of circuits were developed for General Electric, Honeywell, NCR, SDS, RCA, Univac, and others.

Related References
Lécuyer: "Making Silicon Valley"
Related Documents
Custom Microcircuit Design Handbook

Fairchild Culture

Annual Sales Conference held in Bermuda (1963) (1963)

Annual sales meetings formed an important aspect of the Fairchild sales culture. They combined intense product and sales training sessions, team bonding sports events, eating, drinking and high-spirited carousing in exotic locations. The 1963 Sales Conference was held in Bermuda.

Related Documents
1963 Sales Conference photo booklet

Customer/Application focus (1963)
To develop new opportunities in computer, consumer and industrial customers, sales, marketing and applications engineering reorganized to address the specific needs of these markets. R & D established a Digital Systems department under IBM engineer Rex Rice to understand how to apply ICs to computer systems. This new focus played an important role in diversifying Fairchild business beyond military and aerospace customers.

Related References
Lécuyer: "Making Silicon Valley"

Fairchild People

Grove joins R&D (July 1963)
Hungarian immigrant Andrew S. Grove joined the Solid State Physics group of R&D managed by C. T. Sah. He collaborated with Bruce Deal and Ed Snow to expand the early work of Frank Wanlass on metal oxide semiconductor (MOS) technology before becoming Assistant Director of Research and Development. Joining Moore and Noyce at Intel in 1968, Grove became CEO in 1987 and is one of the nation's most widely recognized and honored technology leaders.
[Leadwire, July 1963]

Related References
Bassett: “To the Digital Age”
Grove, Andrew - Interview
Grove, Andrew - biographies and articles

Micrologic engineers found first MOS company (1963)
Micrologic engineers Bob Norman and Phil Ferguson quit together with salesman Howard Bobb to found General Micro Electronics (GME). Funded by Pyle National they planned to build low-power bipolar ICs for NASA but after hiring Frank Wanlass became the first company to develop commercial MOS products.

Related References
Lécuyer: "Making Silicon Valley"
Bassett: “To the Digital Age”

Financial Data

FC&I Financial Results for 1963 (December 31, 1963)
Fairchild Camera and Instrument recorded Net Sales of $TBA for 1963. Fairchild microcircuit sales for 1963 were 183,000 units for $3.8. Total sales

for the industry were $15.8M.

Related Documents
Fairchild IC Sales thru 1964 - memo

1964

Milestones

Low-power Micrologic Family introduced (February 1964)
A family of seven low-power versions of the original Micrologic elements called Milliwatt Micrologic was introduced. Funded by NSA these devices were intended for use in the agency's spy satellites. They were packaged in a new low-profile TO-5 can. [Leadwire, February 1964]
Related References
"Leadwire"
"State of the Art"
An Examination of the Applicability of Microelectronic Circuits to the Telemetry and Command Subsystems of Several Applications Spacecraft

µL916 J-K Flop-Flop added to Micrologic Family (March 1964)
With 12 transistors and 11 resistors, the µL 916 J-K Flop-Flop is the eleventh and largest member of the Micrologic Family of integrated circuits. [Leadwire, March 1964]

Related References
"State of the Art"

Fairchild Drive named (March 1964)
The former Frontage Road in Mountain View was renamed Fairchild Drive in recognition of the location of the headquarters building to number 313. [Leadwire, March 1964]

Sperry LORAN Micrologic order worth nearly $1M (March 1964)
Fairchild booked an order worth nearly $1M for flat-pack Micrologic devices from Sperry Gyroscope, Great Neck, NY for LORAN navigation systems. This one of the largest Micrologic orders received to date. [Leadwire, March 1964]

Low-cost Industrial Micrologic introduced (June 1964)
To encourage the wider use of integrated circuits in commercial applications, a new range of Industrial Micrologic devices was introduced with prices as low as $2.55 per unit at the 100 piece level. Data Disk of Palo Alto was named as one of the first users in a data storage device offering capacity “equivalent to 12,000 IBM cards.” [Leadwire, June 1964]

Related Documents
Industrial Micrologic Datasheet

DTL 930 Series Developed (June 1964)
A design group headed by Pierre Lamond at R & D created the DTL 930 Series integrated circuits following an original Signetics’ family pin-out. With

improved noise margin, faster speed through the use of epitaxial technology, and priced at less than 50% of Signetics, the Fairchild family quickly became the industry standard.

Related References
Lécuyer: "Making Silicon Valley"
Epitaxial technology

CDC Production Contract for $5M (September 1964)

The CDC development contract (see July 1961) for the high speed 2N709 transistor led to a production order worth $5M for 10 million transistors and 2.5 million units of high speed, gold-doped diodes. This was "one of the largest single sales in the history of the semiconductor industry." Each CDC6600 system used over 600,000 transistors. [Leadwire, December 1964]

Related References
"Leadwire"
Sah: "Evolution of the MOS transistor-from conception to VLSI"

µA702 Operational Amplifier introduced (1964)

Applications engineering manager John Hulme hired Robert Widlar in 1963 to design an operational amplifier. Widlar worked with process engineer Dave Talbert to develop the µA702 op amp that became the semiconductor industry's first significant commercial analog product and established Fairchild as the major vendor of linear circuits for many years.

Related References
Lécuyer: "Making Silicon Valley"
"State of the Art"
Gifford, John - interview
Related Stories
In the beginning… there was Widlar!
Three Fairchild Tales
Related Documents
APP-111 Using the uA702A
The Father of Analog Integrated Circuits

Fairchild Culture

Annual Sales Conference held in Hawaii (1964) (1964)

Annual sales meetings formed an important aspect of the Fairchild sales culture. They combined intense product and sales training sessions, team bonding sports events, eating, drinking and high-spirited carousing in exotic locations. The 1964 Sales Conference was held in Hawaii

Related Documents
1964 Sales Conference photo booklet

Fairchild People

Gifford hired as salesman (December 1964)
John (Jack) Gifford was hired as a salesman in the Los Angeles office. With his background in analog circuit design he moved to Mountain View in 1965 as the first Linear Product Marketing Manager. He co-founded Advanced Micro Devices in 1969 and Maxim Integrated Products in 1983. [Leadwire, November 1964]

Related References
Gifford, John - interview

Financial Data

FC&I Financial Results for 1964 (December 30, 1964)
Fairchild Camera and Instrument recorded Net Sales of $138,700,000 for 1964.
Fairchild microcircuit sales for 1964 were 641,000 units for $6.2M. Total sales for the industry were $40.8M.

Related Documents
Fairchild IC Sales thru 1964 - memo
Annual Report 1964

1965

Milestones

Fairchild Integrated Circuits custom designed for Spectra 70 (February 1965)
The RCA Spectra 70 Series announced in December 1964 was the first commercially available computer family to use monolithic ICs extensively. Fairchild supplied three RCA Current Mode Logic “superfast” custom devices in 14-pin packages under a $500,000 cooperative development agreement. [Leadwire, February 1965]

Related References
RCA Spectra 70 brochure highlights CML ICs
Related Documents
Custom Microcircuit Design Handbook

Microwave Products Group (February 1965)
The Microwave Product Group was announced as a new semiconductor business unit for the company. [Leadwire February 1965]

“World’s Largest Microcircuit” (February 1965)
The FLPA–200 array of 576 light emitting diodes fabricated on a single silicon chip was announced as the world’s “smallest flashing signboard.” [Leadwire, February 1965]

Shiprock Plant begins operations (March 1965)
A semiconductor assembly operation began at Shiprock, New Mexico in temporary quarters on the Navajo Reservation. A 120,000 square foot permanent facilty employing 950 people was completed in 1969 and leased by Fairchild from the Navajo Nation. [Source: Fairchild Views, March 1969]

See also "Shiprock plant closed" in March 1975.

Related Documents
Shiprock dedication commemorative brochure
Paul Driscoll wins Business Week Award - article

First plastic ICs announced (March 1965)

RTL Micrologic devices in low-cost plastic epoxy TO5-style packages were announced at a March 18 press conference in New York. Binary flip-flops were quoted at $2.70 each in 100 unit lots. Gates and buffers were $1.00 each “in quantity lots.” [Leadwire, March 1965]

Related Documents
Industrial Micrologic Datasheet

$1M order IC order is “industry’s largest” (March 1965)

$1M order IC order is “industry’s largest”
Salesman Ed Turney booked a $1M order for custom monolithic integrated circuits from SDS Corporation of Santa Monica, CA. It was believed to be the highest valued single order for placed for commercial ICs. [Leadwire, March 1965]

Related Documents
Custom Microcircuit Design Handbook
Leadwire - May 1965

CTL described in Electronic Design (March 1965)

An article in Electronic Design magazine described a new family of high speed Complementary Transistor Logic (CTL) integrated circuits. The devices were claimed to offer “average propagation delays per logic decision of 5 nsec” and binary counting rates of 30 Megacycles.

Moore's “Law” published in Electronics (April 1965)

In an article “Cramming more components onto Integrated Circuits” in Electronics magazine, Director of R & D Gordon Moore predicted that the number of transistors on a silicon chip would increase from 50 in 1965 to 65,000 by 1975. “Moore’s Law,” as it became known, created a yardstick against which companies would measure their technology progress for over 40 years.

Related References
Moore, Gordon - Interview
Moore: “The Role of Fairchild in Silicon Technology in the Early Days. of ‘Silicon Valley’”
Related Stories
How we gave away the crown jewels
My friend Douglas A. Tremere
Related Documents
"Cramming more components on to integrated circuits"
"The Future of Integrated Electronics"
Even an Intel Founder Can Still Be Impressed By Technology’s Pace

Dual-Inline-Package (DIP) introduced (August 1965)

The R & D Digital Systems Group under Rex Rice developed a low-cost package configuration for integrated circuits. With leads that could be easily inserted into standard printed circuit boards and handled by automatic equipment, the DIP significantly expanded the number of designs for the DTL 930 series and became widely adopted by the industry.

Memory Products Group forsees semiconductor memory (December 1965)
A new Memory Products business unit was established at 2525 Charleston Road, Mountain View, CA with a 13-member R & D staff to manufacture, ferrite cores, stacks of core planes, and monolithic semiconductor scratchpad assemblies. [Leadwire, October – December 1965] “All semiconductor IC memory systems pioneered by Memory Products promise to be the wave of the future.” Employee count rose to 350 by mid-1967 with annual sales exceeding $2M. [Leadwire Vol. 9, No. 9 – September]

µA709 introduced (November 1965)
With substantial design improvements over the µA702, together with significant applications and promotional support from its creator, Bob Widlar’s next operational amplifier the µA709 became an industry standard analog device that continues to be produced today.
Related Stories
In the beginning… there was Widlar!
Three Fairchild Tales
Related Documents
Sporck smooches Widlar
The Father of Analog Integrated Circuits

Fairchild Culture

Annual Sales Conference held in Puerto Rico (1965) (1965)
Annual sales meetings formed an important aspect of the Fairchild sales culture. They combined intense product and sales training sessions, team bonding sports events, eating, drinking and high-spirited carousing in exotic locations. The 1965 Sales Conference was held in Puerto Rico

Related Documents
Souvenirs - Lapel Pins
1965 Sales Conference photo booket

Fairchild People

Widlar and Talbert move to Molectro (December 1965)
With attractive stock options, Molectro Corporation a Fairchild spin-off started by J. Nall and D. Spittlehouse in 1962 hired linear experts Talbert and Widlar to start an analog IC business. The comany was purchased by National Semiconductor of Danbury, CT a few months later.

Related References
Sporck, Charlie - Interview
Related Stories
In the beginning… there was Widlar!

Three Fairchild Tales
Related Documents
Sporck smooches Widlar
The Father of Analog Integrated Circuits

Financial Data

FC&I Financial Results for 1965 (December 30, 1965)
Fairchild Camera and Instrument recorded Net Sales of $181,100,000 for 1965 ($160 million from continuing operations) up from $138,700,000 in 1964.

Related Documents
Fairchild IC Sales thru 1964 - memo
Annual Report 1965

1966

Milestones

Burroughs computers use Fairchild CTL (March 1966)
Burroughs announced the B2500 and B3500 mainframe computers built around the Fairchild high-speed Complementary Transistor Logic (CTL) integrated circuit family jointly developed by the two companies. [Leadwire Vol. 8 No. 4, April 1966]

New Hong Kong Plant opens (March 9, 1966)
A new eleven story assembly plant housing 3,500 employees opened in Hong Kong.

Related Stories
Jerry Levine & the Hong Kong plant

Australian facility opened by Bob Noyce (May 10, 1966)
New laboratory facilities for Fairchild Pty. were opened in Australia by the US Ambassador Ed Clark accompanied by Robert Noyce and Charles Sporck.

Related Documents
Australian Laboratory dedication
Australian artist's image of a silicon wafer
Reardon, Chris - Fairchild Australia

Fairchild and TI patent license agreement (September 1966)
After years of skirmishing and in spite of ongoing controversy over whether Jack Kilby's work constituted a true integrated circuit, management and lawyers representing Fairchild and Texas Instruments agreed to settle legal claims and grant patent licenses to each other. [Leadwire Vol. 8 No. 9, September 1966]

Related References
Noyce: "Semiconductor Device-and-Lead Structure"
Related Documents

Noyce - Basic IC Patent #2981877

Largest ever order for ICs (November 1966)
Fairchild salesman Steve Zelencik negotiated an agreement with Burroughs covering the supply of over 20 million ICs, transistors and diodes. This was described as the “largest single IC order ever given in the semiconductor industry.” Each Burroughs B2500 and 3500 used over 9,000 CTL packages. The B8500 used 150,000.
[Leadwire Vol. 8 No. 11, December 1966]

Related Documents
Zelencik receives sales Award

Fairchild Culture

Annual Sales Conference held in Acapulco (1966) (1966)
Annual sales meetings formed an important aspect of the Fairchild sales culture. They combined intense product and sales training sessions, team bonding sports events, eating, drinking and high-spirited carousing in exotic locations. The 1966 Sales Conference was held in Acapulco

Related Documents
Souvenirs - Lapel Pins
1966 Sales Conference photo booklet

Fairchild People

Kilby and Noyce share Ballantine Medal (October 1966)
Jack Kilby and Robert Noyce shared the Franklin Institute’s Ballantine Medal “for their significant and essential contributions to the development of integrated circuits.” The Franklin Institute Awards are among the oldest and most prestigious comprehensive science awards in the world.

Financial Data

FC&I Financial Results for 1966 (December 31, 1966)
Net Sales (from continuing operations) of $206,053,000 generated Earnings of $18,913,000. Net Earnings after losses due to discontinued activities and taxes were $15,896,000. The number of employees at year end stood at 19,424.

"Fairchild 71" campaign to reach $400M by 1971 (1966)
In 1966, Semiconductor Division management developed a business plan to reach “an ambitious but realistic goal” of $400,000,000 in sales by 1971. This included a major reorganization of the operating groups under General Manager, Charlie Sporck.

Related References
Sporck, Charlie - Interview
Related Documents
Sporck memo seeks engineering personnel
"Fairchild 71" campaign brochure

1967

Milestones

TV Broadcast on ICs (October 10, 1967)

"A Briefing on Integrated Circuits" featuring Harry Sello and Jim Angell of Stanford University was broadcast on 32 TV stations and seen by an estimated 2 million viewers. This attempt to reach a broad audience of potential customers is believed to be one of the nation's first "infomercials."

Related References
Berlin: "The Man Behind the Microchip"
Related Documents
"A Briefing on Integrated Circuits" - Booklet

First TTL-MSI product announced (September 1967)

Fairchild's first TTL-MSI product the 9300 Universal 4-bit shift register became one of the best selling general-purpose logic devices on the market.

Related References
9300 data sheet and CCSL strategy
Related Stories
Patents and the 9300 MSI Family

Largest IC order placed by Univac (September 1967)

Univac placed an order to 3 million custom integrated circuits worth approximately $7M with salesman Herb Criscito. This was claimed to be the largest single order ever placed by the mainframe computer manufacturer. [Leadwire Vol. 9, No. 9 – September (?) 1967]

Related Documents
Custom Microcircuit Design Handbook

Committment to the LSI business (September 8, 1967)

A marathon meeting on this date attended by Bob Noyce, Gordon Moore, Tom Bay, Jerry Sanders and others (see document file) committed the company to pursue LSI products based on the Micromatrix and Micromosaic technolgy using CAD design tools.

Related Documents
LSI Meeting transcript

Fairchild becomes unprofitable (October 1967)

An industry downturn, compounded by manufacturing difficulties and loss of market share to Texas Instruments SN7400 Series TTL Family, resulted in Semiconductor losing money for the first time since 1958. As the division now contributed more than 50% of corporate sales, CEO John Carter was fired and replaced by Richard Hodgson

Fairchild Culture

Annual Sales Conference held in Hawaii (1967) (1967)

Annual sales meetings formed an important aspect of the Fairchild sales culture. They combined intense product and sales training sessions, team bonding sports events, eating, drinking and high-spirited carousing in exotic locations. The 1967 Sales Conference was held in Hawaii.

Related Documents
Souvenirs - Tie Clips
Souvenirs - Lapel Pins
1967 Sales Conference photo booklet

Fairchild People

Noyce named to Board of Directors (April 1967)

"Dr. Robert Noyce was one of three men recently elected to the board of directors of Fairchild Camera and Instrument Corporation. Group vice president, Dr. Noyce heads both the Instrumentation and Semiconductor Divisions."
From "Leadwire" Volume 9 (1967), No 4 pg 13.

Related References
Berlin: "The Man Behind the Microchip"
"Leadwire"
Noyce, Robert - biographies
Related Documents
Last photo of Bob Noyce

Sporck resigns to join National Semiconductor (March 1967)

Frustrated with low investment in Semiconductor by the corporate offices and lack of stock options to attract and retain personnel, Charlie Sporck moved to National Semiconductor as CEO taking many senior managers, including Pierre Lamond, with him. Their departure seriously damaged Fairchild's manufacturing capability

Related References
Sporck: "Spinoff: A Personal History of the Industry that Changed the World"
Sporck, Charlie - Interview
Related Stories
"When I arrived at the Fairchild Whisman Road facility, they didn't know me from Adam."
My Fairchild Stories
Related Documents
"Fairchild's Offspring"
Sporck smooches Widlar

Financial Data

FC&I Financial Results for 1967 (December 31, 1967)

Net Sales (from continuing operations) of $196,952,000 generated Earnings of $4,622,000. Losses from discontinued actvities and extraordinary items resulted in Net Earnings (Loss) of <$7,547,000>. The number of employees at year end stood at 19,385. [Source: FC&I Annual Report 1968]

1968

Milestones

µ741 Op-amp Introduced (May 1968)

Dave Fullagar learned of the success of Bob Widlar's LM101 at National. He felt that Fairchild's technology would allow him to add an on-chip compensation capacitor. His answer, the µA741, became the most popular op-amp of all time.

Related Documents
The Father of Analog Integrated Circuits
"Easy to use" wins: The µA741
Dave Fullagar, Analog-IC Designer and Entrepreneur

Industry's first standard MOS-LSI product (May 1968)

The 3801 monolithic MOS/LSI 10-bit serial to parallel – parallel to serial converter using P-channel enhancement mode technology was introduced in a 36-pin DIP package as the industry's first standard LSI product

Related References
3810 MOS-LSI data sheet

Ellis Street HQ Opens (June 1968)

The new 342,000 sq ft headquarters building at 464 Ellis Street opened in Mountain View. Designed by Simpson, Strata & Associates, the external steel-framed structure was affectionately known to Fairchildren as the "Rusty Bucket." It was one of the first Silicon Valley buildings to include a two-story parking garage.

Related Documents
464 Ellis Street HQ Building

Noyce Resigns (June 25, 1968)

After helping Sherman Fairchild to recruit Dr. C. Lester Hogan of Motorola to head the corporation, Noyce resigned in June. He acknowledged a degree of responsibility for the decline in Semiconductor's fortunes and noted in his letter of resignation that he wanted to "get close to advanced technology again."

Related References
Noyce, Robert – biographies

Hogan's team arrives in Mountain View (August 12, 1968)

Dr. C. Lester Hogan former General Manager of Motorola Semiconductor in Phoenix arrived at the Ellis Street headquarters of the Semiconductor Division with a team of ex-Motorola executives chartered to revive the company's fortunes. Known as "Hogan's Heroes" after a popular TV series of the era they included Gene Blanchette, Wilfred Corrigan, Leo Dwork, Tom Hinkleman, Andy Procassini, and George Scalise.

First commercial silicon gate MOS IC introduced (October 1968)

On assignment from the Italian affiliate SGS-Fairchild, Federico Faggin

designed the circuit and aided by Tom Klein he developed the process for the 3708 8-bit analog multiplexer with decoding logic, the first commercial silicon gate IC.

Related References
The Silicon Gate Technology
Faggin, Federico - interview

First MOS Micromosaic Custom Design shipped to GE (September 2, 1968)
Under the headline "LSI may get job in SST computer" Electronics magazine of September 2, 1968 described the delivery of the first MOS Micromosaic design to General Electric Avionic Controls. The order was won by Bill Bennett and produced under the direction of George Vaschel.

Related Documents
MOS Micromosaic custom chip for GE

First TTL-LSI product introduced (1968)
4700 Series Micromatrix devices - arrays of 150 uncommitted gates that can be connected with a metal mask to a customer specific pattern - were introduced. (Today these are called gate arrays) The TTL bipolar device was claimed to be the industry's first available TTL-LSI circuit. [Source: FC&I Annual Report 1968]

SAM Multichip Modules enter preproduction (1968)
Semiconductor Active Memory (SAM) 1024-bit modules comprising 16 MOS 64-bit SRAM chips face-down bonded to leaded ceramic substrates measuring approx 1.5" by 1.5" entered pre-production. A 3" high stack of SAM modules provides 16,000 bits of memory at a price competitive with core-based systems. [Source: FCI Annual Report 1968]

Related Stories
SAM - the first semiconductor memory system product
Related Documents
SAM 1024-bit Hybrid Memory Stack

Fairchild Culture

Annual Sales Conference held in Hawaii (1968) (August 4, 1968)
Annual sales meetings formed an important aspect of the Fairchild sales culture. They combined intense product and sales training sessions, team bonding sports events, eating, drinking and high-spirited carousing in exotic locations. The last Sales Conference with the "Old Guard" in attendance and in control of the company was held at the Hilton Hawaiian Village, Honolulu from August 4-10, 1968. On Friday August 9, it was announced that Dr. Lester Hogan of Motorola and seven senior executives would assume management of the company.

Related Documents
1968 Sales Conference Agenda
1968 Sales Conference photo booklet

The Fairchild Finger (1968 ca.)

Fairchild marketing personnel were never short of opinions on their competitors. The competition had similar strong feelings. The photos posted under documents attest to that.

Related Documents
The Famous Fairchild Finger

Fairchild People

Noyce realizes that he will not assume the top job (February 1968)

With no sales recovery in sight, the board removed Hodgson as CEO. Robert Noyce and two others were appointed to the office of president. Disappointed at the decline of the Semiconductor Division's fortunes and realizing that Sherman Fairchild would not offer him the top job, Noyce approached Gordon Moore with the idea of starting a semiconductor memory company.

Related References
Moore, Gordon - Interview
Noyce, Robert - biographies

Moore resigns and Intel is founded (July 3, 1968)

One week after Noyce left, Gordon Moore resigned from his post as head of R&D. The two new entrepreneurs incorporated NM Electronics on July 18. Investors in the company that would soon change its name to Intel included five founders of Fairchild Semiconductor (Blank, Hoerni, Kleiner, Last, and Roberts) and Arthur Rock as chairman of the board

Related References
Moore, Gordon - Interview
Noyce, Robert - biographies
Related Stories
How we gave away the crown jewels
Related Documents
"Fairchild's Offspring"

Sanders fired by Hogan (1968)

After tossing his hat into the ring as a candidate for vice president and general manager of Fairchild under Lester Hogan, director of marketing Jerry Sanders quickly learned that instead of a promotion he would shortly be replaced. His brash style conflicted with the new Motorola management team. He was approached by two groups of former Fairchild employees led by John Carey and Jack Gifford to join them in starting a new company. With Sanders as president, in July 1969 they raised financing to start Advanced Micro Devices, Inc. to produce digital bipolar and linear integrated circuits in competition with Fairchild.

Related References
Sanders, Jerry - Interview
Related Stories
"How do I get a job with these guys?"

Financial Data

FC&I Financial Results for 1968 (December 31, 1968)

Net Sales (from continuing operations) of $198,470,000 generated Earnings (Loss) of <$3,492,,000>. Losses from discontinued actvities and gains from extraordinary items resulted in Net Earnings of $373,000. The number of employees at year end stood at 20,867. [Source: FC&I Annual Report 1968]

Related Documents
Annual Report 1968

1969

Fairchild Culture

Customer hospitality (1969 ca.)

In the late 1960's the Semiconductor head office in Mountain View enjoyed a constant stream of visitors from across the globe. Entertaining these customers in an appropriately hospitable manner was an important priority for the Headquarters Sales department. See the 1969 Restaurant Guide for a list of popular spots.

Related References
Walker's Wagon Wheel
Related Documents
Fairchild Restaurant Guide

Annual Sales Conference held at La Costa Resort (1969) (1969)

The first sales conference held under the Hogan regime took place at the La Costa resort in Southern California.

Related Documents
Lyle Ronalds - "May you always roll winners"

Hong Kong Plant gains the Flying F (1969 ca.)

The "Flying F" was erected on the front of the Hong Kong building in the 1969-1970 era.

Related Stories
Jerry Levine & the Hong Kong plant
Related Documents
Honk Kong plant and the "Flying F" logo photo

Fairchild People

Van Poppelen named General Manager (July 1969)
Joe Van Poppelen who joined Fairchild from ITT in September 1968 shortly after the arrival of the Motorola team was named General Manager of the Semiconductor Division replacing Dr.Hogan who had filled the postion on a temporary basis. [Microwire July 1969]

Related Documents
Van Poppelen named Semiconductor General Manager

Financial Data

FC&I Financial Results for 1969 (December 31, 1969)
Net Sales $250,659,000 generated Net Income of $2,696,0000. The number of employees at year end stood at 23,125. [Source: FC&I Annual Report 1969]

Related Documents
Annual Report 1969

1970

Milestones

First Semiconductor Memory System delivered (April 15, 1970)
The industy's first commercially available semiconductor main memory system was delivered to Burroughs Corporation for use as the Processor Element Memory on the Illiac IV supercomputer. Based on the 93400 (4100) 256-bit bipolar TTL device, the system was designed and fabricated at R&D in the Digital Systems Dept managed by Rex Rice. [Source: Fairchild Views April/May 1970]

Related References
"State of the Art"
Related Documents
Fairchild Completes Delivery of Illiac IV Memory System

Weisbaden Plant Construction begins (November 1970 ca.)
The foundation stone was laid for a 120,000 sq. ft. manufacturing plant in Wiesbaden, W. Germany. Local dignitaries and Vice President and Semiconductor General Manager Joe Van Poppelen attended the ceremony. [Source: Leadwire, January 1970]

Singapore Plant opens (October 1970 ca.)
Joe Van Poppelen and Gene Blanchette attended the official opening of the Fairchild Singapore assembly plant. [Source: Leadwire, January 1970]

Fairchild People

Systems & Applications organization (October 1970)
Systems and Applications Engineering under Bob Ulrickson comprised five groups in 1970. Automotive - Bob Hood, Digital Systems - Peter Alfke,

Consumer - Norman Doyle, Instrumentation and Interface - Bob Ricks, and Packaging - Lee Marley

Related Documents
Systems and Applications Engineering feature

Semiconductor Organization Changes (October 1970)
One year after he was appointed General Manager of Semiconductor, Joe Van Poppelen was named Group Vice President for several divisions including Systems Technology. He was replaced in the Semiconductor Division by Wilf Corrigan; V.P. Domestic Operations, Leo Dwork; V.P. Memory Systems, George Scalise; V.P. International Operations, and Doug O'Conner; General Manager European Operations, all reporting to Dr. Hogan.

Related Documents
Organization Changes

Financial Data

FC&I Financial Results for 1970 (December 31, 1970)
Net Sales $219,138,000 generated Net Income (Loss) of <$19,309,000>. Semiconductor sales contributed $150,516,000. The number of employees at year end stood at 14,074. [Source: FC&I Annual Report 1970]

Related Documents
Annual Report 1970

1971

Milestones

"Silicon Valley" is named (January 11, 1971)
Written by journalist Don Hoefler for industry newspaper Electronic News, a 3-part series of articles (January 11, 18 and 25, 1971) on the history of the semiconductor industry in the Bay Area referred to the region as "Silicon Valley - USA" for the first time in print. For 10 years from the mid-1970's Hoefler published "Microelectronics News" a muckraking newsletter exposing the foibles of Silicon Valley executives.

Related References
Don Hoefler's "Microelectronics News"
Wolfe: "The Tinkerings of Robert Noyce - How the Sun Rose on the Silicon Valley"
Related Documents
First Silicon Valley dateline
Silicon Valley dateline - full article
Hoefler, Don - Obituary

Isoplanar Process announced (March 29, 1971)
Isoplanar, a new oxide-isolated process promising higher speed and smaller die size was announced with an article in "Electronics" magazine headlined

"Isoplanar Process Stirs IC Houses"

Related Documents
Isoplanar Process introduction brochure

Microwave and Optoelectronics (MOD) moves to Palo Alto (April 1971)
The Microwave and Optoelectronics Division (MOD) under Dr. John Atalla consoldated operating units from six different locations in a new 80,000 sq.ft. facility on Deer Creek Drive in Palo Alto [Microwire April 1970]

Related Documents
MOD Makes New Move

Fairchild People

Sherman Fairchild dies. To be replaced as chairman by Walter Burke (March 28, 1971)
Chairman of the board Sherman Fairchild died on March 28th after an extended illness. On April 22, 1971 Dr Hogan announced that Walter Burke will replace him.

Semiconductor Components Group formed (November 22, 1971)
Dr. Hogan announced the formation of the new Fairchild Semiconductor Components Group headed by Wilf Corrigan, vice president and group general manager, comprising five divisions that encompassed the operations of the former Semiconductor and MOD Divisions.

Related Documents
Fairchild forms Semiconductor Components Group

Financial Data

FC&I Financial Results for 1971 (December 31, 1971)
Net Sales $193,088,000 generated Net Income (Loss) of <$7,841,000>. Semiconductor sales contributed $123,759,000. The number of employees at year end stood at 15,144. [Source: FC&I Annual Report 1971]

Related Documents
Annual Report 1971

1972

Milestones

"Birth of 3 inch wafers" (September 1972)
The Analog Division fabrication area became the first operation in Fairchild to introduce three inch wafers into production. [Microwire II, September 1972}

Related Documents
"Fairchild Announces Birth of 3" Wafers"

TDK Joint Venture in Japan (September 1972)
Fairchild and Tokyo Denki Kagaku Corporation (TDK) of Japan agreed to form a joint venture (TDK-Fairchild) to manufacture advanced technology semiconductor products in Japan.[Fairchild International Insights, Oct/Nov 1972]

Applications Van (1972)
In 1972 Bill Bennett was responsible for sales to "hundreds of small customers" throughout Northern California and Nevada. Bill worked with applications engineer Jerry Lawson to develop a 23-foot mobile home into a rolling demonstration lab to take to remote customer locations. The concept was so successful that by 1974 five vans were operating across the country.

Related Documents
Santa Clara Applications Van Heads North

Fairchild Culture

Annual Sales Conference held in Hawaii (1972) (1972)
Annual sales meetings formed an important aspect of the Fairchild sales culture. They combined intense product and sales training sessions, team bonding sports events, eating, drinking and high-spirited carousing in exotic locations. The 1972 Sales Conference was held at the Hilton Hawaiian Village, Ohau, Hawaii

Related Documents
1972 Sales Conference photo booklet

Financial Data

FC&I Financial Results for 1972 (December 31, 1972)
Net Sales of $223,896,000 generated Net Income of $11,026,000. Semiconductor sales contributed $161,714,000. The number of employees at year end stood at 18,866. [Source: FC&I Annual Report 1972]

Related Documents
Annual Report 1972

1973

Milestones

Wappingers Falls MOS plant acquired (April 1973)
Fairchild aquires the 50,000 square foot former wafer manufacturing facilty of Cogar Corporation in Wappingers Falls, New York to expand production for the MOS Products Division.

Indonesian plant site announced (September 11, 1973)
Fairchild announced the formation of a wholly owned subsidiary to manufacture integrated circuits near the capital city of Jakarta. Paul Driscoll, former plant manager at Shiprock, NM, was named president of the new

subsidiary.

First Charge-Coupled Area Image Sensor (October 1973)
The Digital Products Group announced the availabilty of the industry's first commercially available Charge-Coupled Area Image Sensor. The CCD-201 uses an array of 100 x 100 solid state elements to create a television picture signal directly from light focused on the surface of the sensor. [Microwire, October 1973]

Fairchild Culture

Annual Sales Conference held in Hawaii (1973) (1973)
Annual sales meetings formed an important aspect of the Fairchild sales culture. They combined intense product and sales training sessions, team bonding sports events, eating, drinking and high-spirited carousing in exotic locations. The 1973 Sales Conference was held at the Hilton Hawaiian Village, Ohau, Hawaii

Related Documents
1972 Sales Conference photo booklet
International Sales Conference, Mallorca 1973

Fairchild People

Components Group Consolidates (February 21, 1973)
The five operating divisions of the Semiconductor Components Group created in November 1971 were consolidated into to Discrete Products Group under Greg Reyes and the Digital Products Group under Tom Longo

Related Documents
Fairchild Components Group Consolidates

Philip Thomas joins as MOS general manager (May 1973)
Philip (Phil) Thomas, formerly with the MOS/LSI Division of General Instrument, was named general manager of the MOS Products Division, part of the Digital Products Group.

Related Documents
Philip Thomas named General Manager/MOS

Discrete, Digital and Analog Groups Reorganized (July 1973)
The Semiconductor Components Group is organized into three operational groups - Discrete Group under Greg Reyes, Digital Circuits Group under Tom Longo, and the Analog Circuits Group under John Sussenberger.

Related Documents
"Organizational change provides a structure for growth"
Linear Division Staff - 1974

Deardorf appointed plant manager of Wappingers Falls (August 1973)
Phil Thomas, General manager of the MOS Products division announces

the promotion of Dave Deardorf to plant manager of the former Cogar facilty in Wappingers Falls, New York that was acquired in April 1973.

Financial Data

FC&I Financial Results for 1973 (December 31, 1973)
Net Sales of $351,171,000 generated Net Income of $41,159,000. Semiconductor sales contributed $281,370,000. The number of employees at year end stood at 25,525. [Source: FC&I Annual Report 1973]

1974

Financial Data

FC&I Financial Results for 1974 (December 31, 1974)
Net Sales of $384,933,000 generated Net Income of $27,032,000. Semiconductor sales contributed $321,548,000. The number of employees at year end stood at 18,092. [Source: FC&I Annual Report 1974]

Related Documents
Annual Report 1974

1975

Milestones

Shiprock Plant Closed (March 12, 1975)
The Shiprock, New Mexico assembly plant was closed after being seized on February 24 and occupied by armed Indians unrelated to the company or the Navajo Tribal Authority. Fairchild began operations on the Navajo reservation in 1965. [Source: Fairchild Horizons, Spring 1975]

Related Documents
Shiprock seizure flyer
Shiprock dedication commemorative brochure
Paul Driscoll wins Business Week Award - article

CCD Memory introduced (January 1975)
Fairchild's first CCD memory device was introduced for storage applications faster than disk and lower in cost than MOS or core technologies. The CCD-450 offers 9216 bits of serial storage organized into a format of 1024 words by 9 bits [Source: Horizons, Spring 1975]

Related Documents
CCD Demonstrates new capabilty

F8 Microprocessor introduced (1975)
Description to come [Source: Horizons, Spring 1975]

Related References
F8 Preliminary Microprocessor Users Manual

Digital Watch Market entered (July 25, 1975)
Fairchild entered the consumer watch market with 9 styles of five-function LED digital watches ranging from $115 to $195. Vice president Greg Reyes claimed that the less than 3/8" thick models were slimmer than all previous digital watches. [Source: Palo Alto Group News, August 1975]

Related Documents
"Timely entry into consumer market"

Fairchild People

Corrigan on Business Week cover (October 6, 1975)
Sigrun and Wilfred Corrigan are featured on the cover of Business Week magazine to illustrate an article on "Young Top Management"

Related Stories
How we gave away the crown jewels
Related Documents
Business Week cover article

Financial Data

FC&I Financial Results for 1975 (December 31, 1975)
Net Sales of $291,524,000 generated Net Income of $13,073,000. Semiconductor sales contributed $226,036,000. The number of employees at year end stood at 17,405. [Source: FC&I Annual Report 1975]

Related Documents
Annual Report 1975

1976

Milestones

Silicon Plant joint venture with Applied Materials (January 7, 1976)
Construction on a polysilicon plant in Chandler, Arizona begun as a joint venture with Applied Materias,Inc.

Related Documents
Annual Report to Employees 1976
1976 Highlights

4K Bipolar DRAM introduced (June 7, 1976)
The Bipolar Memory and ECL Products Division of the LSI Group introduced a 4K dynamic RAM based on Isoplanar Integrated-Injection Logic (I-cubed L) technology.

Related Documents
Annual Report to Employees 1976
1976 Highlights

Consumer products shown at CES (June 14, 1976)

The Consumer Products Group introduced five styles of LCD watches and demonstrated the Video Entertainment System to the public for the first time at the Consumer Electronics Show (CES) in Chicago.

Related References
Channel F - Interviews with Jerry Lawson
The Fairchild Video Entertainment System
Related Documents
Annual Report to Employees 1976
1976 Highlights

Video Game system receives FCC approval (October 20, 1976)
The Model FVE100 video game system received FCC approval. Shipments beginning in November at a retail price of $169.95 made the F8 microprocessor-based console system the first to offer plug-in semiconductor memory cartridges to reproduce games in full color and sound on a TV screen. [Source: Fairchild "Newspaper," November 30, 1976]

Related References
Channel F - Interviews with Jerry Lawson
The Fairchild Video Entertainment System
Related Documents
Channel F System II promotional flyer

San Jose plant occupied (December 13, 1976)
First employees move into a new 265,000 wafer fabrication plant in South San Jose. Dedicated to LSI products, the plant was designed to manufacture 4-inch wafers.

Related Documents
Annual Report to Employees 1976
1976 Highlights

Financial Data

FC&I Financial Results for 1976 (December 31, 1976)
Net Sales of $443,221,000 generated Net Income of $12,456,000. Semiconductor sales contributed $298,187,000. The number of employees at year end stood at 21,293. [Source: FC&I Annual Report 1976]

Related Documents
Annual Report 1976
Annual Report to Employees 1976

1977

Milestones

Cray 1 Supercomputer uses Fairchild ECL (March 1977)
The Cray 1 supercomputer "the world's most powerful information processing machine" uses 250,000 dual subnanosecond ECL gates and 65,000 ECL RAMs manufactured by Fairchild.

Related Documents
Cray 1 computer uses Fairchild ECL

50th Anniversary of FC&I (1977)
1977 marked the 50th anniversary of the founding of Fairchild Aviation Corporation, the forerunner of Fairchild Camera and Instrument, the corporate parent of the Semiconductor Division. In the current year semiconductor products comprised over 70% of corporate sales.

Related Documents
FC&I 50th Anniversary Photo Album

Fairchild Culture

Fairchild/Silicon Valley Genealogy (May 25, 1977)
The Semicon/West '77 Souvenir Banquet Program honoring Drs. Bardeen, Brattain, and Shockley on the 30th anniversary of the discovery of the transistor included a copy of the first publication of the Silicon Valley Genealogy chart that traced the lineage of 66 semiconductor companies founded between 1959 and 1976 back to Fairchild.

Related Documents
Fairchild/Silicon Valley Genealogy Chart
Fairchild's Offspring

Financial Data

FC&I Financial Results for 1977 (December 31, 1977)
Net Sales of $460,108,000 generated Net Income of $11,162,000. Semiconductor sales contributed $330,686,000. The number of employees at year end stood at 19,893. [Source: FC&I Annual Report 1977]

Related Documents
Annual Report 1977

1978

Financial Data

FC&I Financial Results for 1978 (December 31, 1978)
Net Sales of $533,832,000 generated Net Income of $24,764,000. Semiconductor sales contributed $383,437,000. The number of employees at year end stood at 25,939. [Source: FC&I Annual Report 1978]

Related Documents
Annual Report 1978

1985

Fairchild People

Brooks named president (January 3, 1985)
Donald W. Brooks has been named president and chief executive officer of the Fairchild Camera and Instrument Corporation, the semiconductor manufacturer said yesterday. Mr. Brooks, 45, succeeds Thomas C. Roberts, 42. Mr. Roberts has held the posts at Fairchild since the company was purchased by Schlumberger Ltd. in 1979.

Related References
Brooks, Donald - Interview

1987

Milestones

National takes Fairchild reigns (October 1, 1987)
National Semiconductor received federal approval to complete its purchase of the company on August 31, 1987

Related References
National takes Fairchild reigns today
Fairchild Semiconductor: The Lily of the Valley 1957 – 1987

Fairchild People

Fairchild Chief Resigns Post (October 7, 1987)
Donald W. Brooks, who led an unsuccessful attempt to take over the Fairchild Semiconductor Corporation, resigned as the company's president and chief executive. The acquisition of Fairchild, a unit of Schlumberger Ltd., by the National Semiconductor Corporation was expected to be completed later this week.

Related References
Donal Brooks resigns

Financial Data

Citicorp Unit Said To Seek Fairchild (August 20, 1987)
Citicorp Venture Capital has reportedly joined in the bidding for the Fairchild Semiconductor Corporation, which is being sold by its parent, Schlumberger Ltd. The San Jose Mercury News said today that Citicorp had been working with Fairchild's president, Donald Brooks, to finance a leveraged buyout.

Related References
Citicorp Unit Said To Seek Fairchild
INTERGRAPH INTERESTED

1988

Fairchild Culture

Thank You Fairchild (April 14, 1988)
A party to celebrate the memory of Fairchild Semiconductor and to give thanks to the prolific progenitor of Silicon Valley was held at Hyatt Rickeys Ballroom, 4219 El Camino Real, Palo Alto on April 14, 1988. All eight founders of Fairchild Semiconductor Corporation attended the event.

Related Documents
Thank You Fairchild Invitation
Famous Eight photograph
Leadwire - FAIRCH Heart cover

1997

Milestones

National announces sale of Fairchild to investment group (January 28, 1997)
National Semiconductor announced that it will sell majority ownership of Fairchild to an investment group made up of Fairchild's current management and a unit of Citicorp in a deal valued at $550 million.

Related Documents
"National Semi letting go of a legend"

2000

Fairchild Culture

Walker's Wagon Wheel closes (May 2000)
Walker's Wagon Wheel, the legendary Mountain View watering hole where semiconductor workers from line operators to top executives retired to celebrate the week's successes, seek solutions to a yield bust, or look for a job, closed in May 2000. From its opening in 1962, "The Wheel" became a breeding ground for industry rumors that filled the pages of Don Hoefler's weekly Microelectronics News.

Related References
Lécuyer: "Making Silicon Valley"
Don Hoefler's "Microelectronics News"
Walker's Wagon Wheel
Related Stories
I had no financial interest in "Walker's Wagon Wheel"
Related Documents
Walker's Wagon Wheel (1962 photo)
Silicon Valley napkin
Fairchild Restaurant Guide
Walker's Wagon Wheel (RIP 2003)
Wagon Wheel artifacts – shirt, can opener, and poker chips
Wagon Wheels donated
Hoefler, Don - Obituary

2007

Milestones

Fairchild@50 - Fiftieth Anniversary Events (October 4, 2007)

THE 50TH ANNIVERSARY OF FAIRCHILD SEMICONDUCTOR
Celebration Events at the Computer History Museum and Stanford University October 4-6.

Fairchild alumni and friends attended a series of panel sessions, presentations, and receptions to remember and celebrate their time at the company. Exhibits included a display of donated artifacts, a tour of Fairchild related systems in the museum collection, photo displays, a recreation of the Walker's Wagon Wheel bar, etc.

THURSDAY OCTOBER 4, 2007
EVENING FOUNDER'S PANEL AT STANFORD FROM 6:00 TO 7:30PM
Co-sponsored by Stanford Libraries and the Bill Lane Center for the Study of the North American West at Cubberley Auditorium, Stanford University.

Julius Blank, Jay Last, Gordon Moore and Arthur Rock - three company founders and the venture capitalist who backed them - discussed the firm's early years and its significance in a discussion moderated by Leslie Berlin of the Silicon Valley Archives at Stanford University. Stanford President John Hennessy introduced the panel discussion.

FRIDAY OCTOBER 5, 2007
AFTERNOON AND EVENING PRESENTATIONS AT THE COMPUTER HISTORY MUSEUM
Presented by Fairchild Alumni & the Computer History Museum
Sponsored by Alumni of Fairchild Semiconductor

AFTERNOON FROM 1:00 TO 5:30PM
Eight panel discussions featured 35 speakers covering the following topics, [session moderators listed in parentheses]: Founding Years and R&D [Harry Sello], Manufacturing and Support Services [C. E. "Ed" Pausa], Discrete Devices [George Wells], International Sales & Marketing [Robert Blair], Bipolar Digital [Bill Welling], Linear [Norman Doyle] MOS [Gil Amelio], U.S Sales & Marketing [Bernie Marren].

EVENING FROM 6:00 TO 9:00 PM
Reception and "The Legacy of Fairchild" panel discussion with Fairchild alumni and semiconductor industry leaders Wilfred Corrigan, Gordon Moore, and W. J. Sanders III moderated by Floyd Kvamme.

SATURDAY OCTOBER 6, 2007
EVENING GALA REUNION PARTY AT THE COMPUTER HISTORY MUSEUM

Related References
Video of Fairchild Founder's Panel
Related Stories

‘Fairchildren’ tell tales out of school
Related Documents
Tracing Silicon Valley’s Roots
Founder's banner for Fairchild@50
Fairchild@50 - "A Love Affair"
Fairchild@50 - Event Brochure
Fairchild at 50 - Silicon Valley's Seminal Start-Up
The Legacy of Fairchild in the Computer History Museum's Visible Storage Exhibit
Silicon Valley's founding fathers
Even an Intel Founder Can Still Be Impressed By Technology’s Pace
Leadwire - FAIRCH Heart cover
"An American Epic" - an interview with Gordon Moore

Stories

Title: Food fight
Author: Norman J. Abbod
Created: October 27, 2007
Cataloguer:
Copyright:

Story:
I worked for Fairchild Test Systems Group from 1977 through 1983 as a Senior Sales Engineer. I sold the SENTRY, XINCOM and INTEGRATOR systems.

As one of the top Sales Engineers for Fairchild, I was invited to a special Sales Dinner at the Hyatt Hotel in San Jose.

After some excellent (and short) speeches we enjoyed a sumptuous dinner. Then, someone started beaning people wih doughballs from the sourdough bread that was served. (I have NO IDEA who started this). Pieces of fruit were next being thrown at each other. When a LARGE SOURDOUGH loaf of bread just missed Wilf Corrigan's head, these silly (but fun) experiences CEASED. Fairchild was a GREAT and EXHUBERANT PLACE to work and those years hold some of my fondest memories.

Norman J. Abbod
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Entered By: David Laws
October 27, 2007

Title: A ”Garage Shop Operation”
Author: Paul Bartlett
Created: August 23, 2007
Cataloguer:
Copyright:

Story:
My Fairchild Story pre-dates my times at Fairchild (1963-70 & 1997-2002).
In 1958 I was in marketing at Transitron, Wakefield, MA. We were attending my first big sales meeting at a fancy resort hotel on the North Shore of Boston. I do not recall if it was Marblehead, Swampscott or someplace else, but it was an impressive rambling white complex; a typically impressive resort of that era.

During the banquet session there was an opportunity for Q & A from the floor to David or Leo Bakalar, the co-founders, and the rest of the management staff.

This is the only question I remember - someone asked about a start-up semiconductor company (Fairchild) out in Mountain View and is it a threat?

The answer, I think from one of the Bakalars, dismissed it as a "Garage Shop Operation" and it will go no where, we all laughed and clapped. Where was Transitron ten years later? Gone.

Some of the individuals who graduated from Transitron included Wilf Corrigan, Dave Fullagar, Pierre Lamond, Tom Longo, Bob Swanson and Nick De Wolfe (founder of Teradyne)
Regards, Paul

Entered By: David Laws
August 25, 2007

Title: A HORIZONTAL LOOK AT FAIRCHILD 1960-1969
Author: Henry Blume
Created: September 3, 2007
Cataloguer:
Copyright:

Story:
Abstract:
Below are notes and memories of a nearly 9-year career at Fairch, beginning in Process Development and rotating thru Manufacturing Product Engineering, Customer Applications, Micrologic Applications, IC Design (RTL, DTL, TTL, MOS), and culminating in a military sub-system design.

1. Arrival and Process Development

I was hired in 1960, age 28, with a couple of degrees, 3 years Navy, and a couple of years non-descript project engineering, on recommendation of former supervisor Dean Householder, who probably wanted a loyal cadre for his future ambition. I was assigned to Bill O'Keefe's Process Development (3 chemists, 3 physicists, 3 mathematicians, no semiconductor theory) and to develop a gold doped 4300 based on the new planar 4200 transistor. Jean Hoerni debriefed me on his last day; he had made two runs with beta's of 2 and 200 and thought it a simple engineering problem to get consistent beta's of 50 with predictable short lifetimes. It turned out that the mesa 4000 had a base width (gallium) of 9 microns, but the 4200 planar base width (boron) was 5 microns. Gold moved interstitially through the lattice and rapidly. I found that lowering the gold temperature quite a bit allowed some variability in the fast pull rate from the gold spiking furnace, thus making the gold process producible and was able to transfer the 4300. [In the lab was a lady technician named ‘Tex' who licked the back of Arsenic doped wafers to make backside electrical contact.] I also took Tom Sah's semiconductor physics class, of permanent value to me. I note that marketing and product engineers were also assigned to this class, (which began with Schroedinger's Equations); they were hopelessly overwhelmed and stopped attending after 2 lectures. Fairchild built all its production equipment and did all its own

training; the technology was so new that Fairchild did not have a good idea of what incoming experience was needed.

In the Process Development group were Moe Levitsky, always moaning about water quality, Tony Roder (who excelled at ordering off-menu items at our Friday family style lunches at Qui Hing Low), and Bill Fitch, with a calculator instantaneously telling you if a set of numbers was statistically significant, et al. On Friday's Rupe's was the bar of fashion (on Good Friday from 12 to 3 when the factory shut down, Saint Rupe's). An irony: Rupe sold to new owners, who redecorated the facility as St. James Infirmary, and planned a gala opening, except nobody came because Walker's Wagon Wheel opened the same day.

Bob Trent had been hired as manager of engineering; he didn't get along with marketing manager Tom Bay and production manager Charlie Sporck (who were good friends). Trent was removed; his engineering departments were reassigned or disbanded (SAAL, semi-automatic assembly line, always controversial was killed, e.g.). Process Development had been previously depleted by a diode yield task force in San Rafael and was now also killed. I recall Roger Crosby visiting back in Mountain View from San Rafael with a photo of mushrooms growing in his motel room rug.

2. PNP Daze

I was assigned to the 4500 PNP production line under Jack Storey; Mac Johansen was fab product engineer, and assembly and test were my areas. In germanium, PNP's were standard; NPN's were difficult. In silicon, NPN's were easy; PNP's were hard, and the mesa 4500 was weird. The process used a high temperature antimony base from a hopefully dry antimony oxide source, a very high temperature boron emitter (the furnace tubes cracked upon cooling, goop in the top of the tube grabbed a few of the vertical 13/16 inch wafers, process variability required prerunning the emitter to get a target beta (HFE), e.g.), then a phosphorus base ring pretreat was applied (to allow metal contact to the base), then a strong acid was used to etch the excess silicon creating the mesa. Black wax was used; NPN engineers considered this obsolescent or worse.

ECCB

In etching the mesa, the acid first etched the field oxide and heated up, creating a too rapid silicon etch. I carried out a suggested experiment removing the field oxide earlier, allowing a more controlled silicon etch. On the test, assembly yield improved from 85% to 93%; reliability results were also promising. A process change was proposed to the Engineering Change Control Board (ECCB) of which Gordon Moore was chairman and only voter. ECCB turned down my proposal without reason being given. The PNP mesas continued to be etched in angry acid, with particulates at the junction.

Ultrasonic NAOH

Before the base ring phosphorus doping, the wafers were subjected to a bath of NAOH in an ultrasonic generator. When the generators were tuned by maintenance, the yield went to 0. Well regarded engineer Len Carlson had signed the process spec; I searched him out and questioned him on this step. He replied that he wasn't sure that the step was necessary, some tests had been run and results were generally better with the ultrasoneration than without, but if I wanted to remove the step it was OK by him. Not having enjoyed my first ECCB experience, I decided to simply detune the generators each time they were tuned. I even asked maintenance to stop tuning the generators; they said their rules required them to tune the generators, but they did give me their tuning schedule, so I could detune after each maintenance before more wafers were damaged.

Hand carried runs

4500 yield was about 3%, with 1 or 2 runs a week yielding 20% and the rest 0-1%. I was assigned to hand carry a couple of runs and report on what I observed. Usually, after the antimony base oxide had been grown, the wafer surface was badly pitted. A "dry" antimony source was a fiction; water vapor and antinomy-based acid were inevitable. But my first run had beautiful, clear unpitted oxide. If I hadn't gotten greedy, trying for 100% "A" beta yield, and punched thru too many die, I think yield could have been above 30% instead of the achieved 20%. My second run had mildly pitted oxide and yielded 15%.

I also prepared a 12 page report for Jack Storey on what I observed in fab; basically a total lack of discipline with almost total disregard for the specs. My report was given to foreman Pat Wilson, who left it prominently displayed on his desk in fab. I liked and respected Pat, but he never talked to me again. Also, no operator splashed HF on me.

Hi-Switch

Shockley had wanted to make PNPN 4-layer diodes. The 4500 was die attached to a gold plated header, where the gold was deposited in or after a phosphorus bath. The 4500 was a PNPN. In fact, before my time, an attempt was made to deliberately make PNPN's as a product, but they melted after each turn on.

So, after getting to "finished goods stores" but before shipping, the 4500 went though an I-Switch (called Hi-Switch) test, which consisted of placing the transistor in a 2x3x1 inch block, the block on a Rube Goldberg heated race track about 20 feet long and 8 feet wide, after which the hot 4500 was pulse tested to see if PNPN action was turned off. Yield was generally above 95%.

One day the yield went to 0. When Fairchild was shipping about $1 million per month, I acquired about $1 million of finished good stores inventory in a cabinet in my office with a REJECT tag. [5 years earlier, I had been a Navy Supply and Fiscal Officer; I was responsible for accounting for every dollar, skivvy, or slice of meat. In fact, I had a letter from the Secretary of the Navy saying that I had overfed the crew $750 the previous quarter and would I please send him my personal check for $750 (or semi-starve the crew in the current quarter)]. I was cringing at the thought of end-of-the-month inventory accounting.

My million $ of 4500's were not missed!! I could have sold $250,000 of PNP's on the grey market for months, and the parts would not have been missed.

Of course a mild panic ensued about the 0 yield; I got to know George Parker and Bernie Barringer in Applications. They verified the I-Switch testing and trained me on testing in the Apps lab. After a bit, I noticed that the glass seals in the headers were of several colors. Some colors yielded OK; some didn't. [Of course, there was no tracking the raw material header inventory by manufacturer.]

To get production restarted, I would pre-run some assembly by header lot and color of glass and then test. I also had first dibs on all incoming headers; we got the line back up but limping. Later, Martin Oudewaal developed a P-type germanium preform for die attach. PNPN action disappeared.

Micrologic production was starting and George Vashel arrived with PNP experience, so Harry Sello traded me to Vic Grinich's Applications group for Murray Siegel, Fairchild's first employee and badge #9, who was moved to Micrologic product engineer.

3. Transistor and Micrologic (Customer) Applications

There was an applications group (Larry Blaser was a star in this) doing data sheets and App Notes, basically looking for better ways to use Silicon transistors in analog applications and a customer applications group, doing more immediate stuff like reviewing customer specs and correlating special testing. Murlin Vellequette (known as Merlin the Magikan) supervised the group, he took one look at my background, moved Mauri Morin from digital to analog and placed me to digital (where there was no theory, no prior practice, etc.) Another big break for me! That was my last contact with Vellequette that I can recall. A little later Jerry Sanders was brought into the factory to start Consumer marketing. While I was chatting with Morin, Jerry walked down the hall, flamboyantly coiffed and attired. I asked if (Jerry) was gay; Mauri replied, "No, more like the author of 101 ways!"

Sales and Marketing Force: the best ever!

In these years, 1962-4, The Fairchild Sales and Product Marketing personnel were the best I have ever seen, and by a large increment. Not only Don Valentine and Jerry Sanders, with fellow luminaries like Howard Bobb, Jim Martin, Chris Coburn, Bernie Marren, Marshall Cox (and the knowledgeable reader could add half a dozen more) but juniors like Herb Richman, Jack Gifford, Mike Markulla, and Floyd Kvamme. They became their customer's semiconductor consultants, wrote specs for the customer, acquired "account control", etc. As an example, Marshall Cox and another Los Angeles hotshot took over the East Coast and Boston; in a month they changed a couple of customer specs trivially and booked a couple of million dollars of transistor orders, that the prior sales team didn't know that Fairchild could supply and hadn't quoted.

I generally talked to most of the salesmen about 2-3 times a month, sometimes because they were far away and lonely.

"Silicon Gulch??" The following needs some research or endorsement: The Fairchild salesmen emphasized the advantages of silicon over germanium, temperature range, mechanical durability (if you dropped a germanium transistor, you didn't bother picking it up), etc. I recollect hearing the Fairchild salesmen referred to as "the boys from Silicon Gulch". Several years later Don Hoefler invented the term "Silicon Valley". I have a strong recollection of the priority of "Silicon Gulch", but I can't find printed evidence.

A major duty was determining added production screens or culls when a customer spec did not match a basic product spec. If our cull was imprecise and QA rejected a lot, Production Control Manager Jack Magarian was on my case with a box of rejects and request to fix the problem. Production tested on Saturdays; if I had only one box outside my office on Monday, it was a good weekend. Sometimes the boxes were stacked high enough on Monday morning that I couldn't get into my office. By 9AM, Magarian's expeditors were on my case. I was assisted by a technician of fierce integrity named Aniko Szass (who had escaped Hungary in 1956); if Annie thought my correlations or guarantees were too optimistic, she had the data on my desk with a firm finger pointing to my error. Annie saved me and Fairchild a lot of grief.

Some random experiences:

-Product Marketing engineer Terry Kilduff had quoted Control Data a good price for 250,000 1321 transistors for Seymour Cray's new machine. CDC bought. It was Fairchild's first high volume order. Of the first production shipped, I got a handful of slow units back marked "bad beta". These transistors passed all our tests, including the tausubs switching test. After some experimenting, I determined that the problem was base resistance, and evidenced by high VBEon in a curve tracer. I took the units back to Small Geometry production, with notes as to what was OK and what not. Saturday morning I ran into John Sentous in his office, who chided me with a twinkle in his eye, for saying only that his great new transistors had "bad beta". I don't recall the production fix; I tend to believe that the high base resistance came from undesirable processing for other reasons as well. The problem quickly disappeared.

-Ron Smith, while not a glamorous salesman, had a knowledge and control of Sandia to match any account control. Sandia was a weird customer with strange requirements. There was a transistor spec, with all fallout parameters, except superlow room temperature ICBO. In fact, only an operator with long, skinny, cold fingers could hold the transistor to pass this test. Specifying the operator was not easy, but we got through this, while Ron Smith got to our test floor to help move the process forward.

- RCA failed in semiconductors, noting that RCA had 2N709/1310/1321 technology and also MOS technology to match Fairchild's. The following shows some RCA issues:

An RCA military account in New Jersey was misusing our transistors. Since Jim Paris, the Philadelphia salesman covering the account, had just been arrested going 75 mph in the Holland Tunnel, I arranged to drive down from my in-laws in New York and meet him at RCA. RCA had two problems that I saw. First, they had laid off all the junior engineers who knew anything about transistors, leaving senior tube engineers to flounder in transistor design. After looking at their design, I suggested a couple of resistor changes/additions. Second, I could have made those changes and measured the result in 15 minutes on my bench. However, RCA had technicians who were not allowed to solder; wiremen who were not allowed to use oscilloscopes; and engineers who were forbidden either. Hopeless inefficiency. About 6 of us spent 4 hours verifying my suggestion. RCA accepted that our transistors were good and used them.

-Jack Smith took me into IBM Poughkeepsie, where IBM showed me Seymour Cray's circuit designs, but also showed trend data on 1321/2N709's and complained that we were trending badly for their use. I knew that we had a pile of reject wafers that missed our specs but met IBM's needs. On my return I asked if Fairchild wanted to ship $50,000 of reject dice in molytabs to IBM, and Fairchild did. I earned my vacation.

About this time I was appointed Fairchild's first MOS applications engineer and supplied with R&D MOS transistors. They lasted about a day in my desk and about a minute in a curve tracer. Then, static discharge and sodium mobility in Silicon were discovered; for a while R&D engineers and researchers carried salt shakers for quick reliability testing. I did give Bob Noyce MOS transistors to forward to his thesis advisor at MIT and challenge him about how the devices worked. I also recall running into Frank Wanlass at R&D presciently asking for someone to design an MOS memory bit.

At some point in late 1962 or early 1963, I was morphed into Micrologic Applications joining Dick Crippen and reporting to Bob Seeds, but without changing offices as I recall. Crippen lasted 20 years at Fairchild. At the moment our lab was necessarily temperature controlled and called "The Alpine Room", as the Micrologic (RTL) parts were temperature sensitive and barely met any specs even with rigid temperature control. I recall Crippen stopping outside the Micrologic Operations manager's office on the way back from lunch, and screaming "we will never make Micrologic as long as (name withheld) manages Micrologic Production". After that, I walked back from lunch a different way or at a different time.

There were military design wins for Micrologic, but spec negotiations were always contentious. On the day Kennedy was killed, we had had a difficult session with, if I recall, AIL. Long Island salesman (and leprechaun) Dave Conway tried to keep a lid on the discussions. We were in a conference room overlooking Moffett Field; when they lowered the flag, we calmed down.

By now, DTL 930 series, well designed by Dick Bohn, had arrived. I was tasked with a final data sheet and product specs. If you came into the business before 1963, the only allowed power supplies were 1.5, 3.0, 4.5, and 6.0 volts. Rob Walker, then at Philco WDL was developing a line of modules using the DTL 930 and accepted a 5V VCC, which I had determined was optimal for fan-out and noise margin. I thus specified the DTL 930 family at 5V VCC. At this time, Hughes had a military "Phoenix" project using a TTL gate, and a 6.0 Volt power supply. This tended to blow up input transistors, so Hughes used a forward dropping diode in series with the VCC

supply, and a capacitor for every 15 units, or about 5V for the TTL. Power surges at the unit moved VCC around; this was the beginning of +/- 10% power supply specs. Sylvania and then TI also specified their early TTL at 5V VCC. If you entered the business after 1964, the 5V power supply was as rigid and honored as the 10 commandments. But, I claim that Rob Walker and I at least co-invented the 5V power supply.

An article appeared in the Wall Street Journal with IBM announcing a writeoff of $16 million of new product. It turns out the issue was electromigration. IBM called Gordon Moore to ask if he knew anything about it; Gordon did. Ilan Blech, an Israeli engineer, had just completed and published a detailed study of electromigration, with movies showing void creation and enlargement as electrons hit aluminum atoms. I have believed that from that point IBM consulted with Moore and that this relationship bore fruit when IBM picked Moore's company and product to supply their PC need 20 years later. I used Blech's work almost immediately; Hughes Aircraft had connected incandescent lamps to DTL 944 outputs and melted the ground metal trace. Based on Blech's graphs, I redesigned the metal mask with confidence, sampled Hughes in a month, and we booked a $240,000 order. Electromigration rules were now added to the design layout rules.

MIT/Raytheon was an important early customer for Micrologic (RTL). Now, they wanted a lower power version. With higher value resistors, no specs could be met with 3V VCC. I asked MIT if a 4V VCC could be used and it could. Low power RTL wasn't a high revenue design, but specs and yield were clean from the getgo. Also, MIT had visited the factory and received a series of promises and predictions from a senior (and not to be named) marketer who had a knack for telling the customer anything they wanted to hear, however little truth laid behind the story. A couple of months later, MIT asked me to visit to tie down details of the LPRTL; this took about 15 minutes, after which we went for a 4 hour lobster lunch at Anthony's Pier 4, during which time MIT unloaded on me every untruth, marginal truth, and general behavior of Fairchild. It was a good lobster but difficult trip report to write.

I was assigned to the EIA standards committee for developing integrated circuit standard parts specifications, like the transistor 2N numbers. I asked product marketers Bill Welling and Bill Richmond what they wanted. They wanted no standards, no 2N type numbers, but instead wanted to market Fairchild brands and numbers. So I conceived my role as to delay the standards without getting blamed for it. This assignment got me to a few extra conferences. In retrospect, I doubt that standard EIA product numbers and specs were possible for digital integrated circuits.

Chip layout provided a problematic set of interfaces. At first R&D did all the layout; the Mountain View applications group was not allowed to see the drawings or artwork, so when a new chip arrived, the first step was to pop a lid and trace out a schematic and see if the chip was wired correctly. Errors had been found. Next, applications and then design could look at a drawing or set of rubies, but not participate in their creation. A profession of mask designer was created, reporting at first to R&D, then to production. The mask designers enjoyed the first 15% of the project, known as the "stick layout", after which the layout was routine dogwork. However, the ‘stick' dictated all the parasitic resistance and capacitance, and thus chip performance. The mask designers (and process engineers) lacked the educational background to understand how layout affected performance. Also, in digital, production manager Jack Gates had a rule that if he could lay a dime on unused area on a rubylith, the layout wasn't dense enough and needed rework. Eventually, layout migrated to design, or at least design control, and with central layout groups since engineer's workloads did not provide for balance in layout workload. But, at no time did this interface become easy or problem free. Some of the mask designers were stars; some prima donnas; I am sorry that I don't recall names.

Another task that started about now and persisted was being the guinea pig for Instrumentation's new integrated circuit testers. We always started with FAIL lit up; then, I had to work out why the tester was in error and not the chip.

In 1963 I started taking EE courses at Santa Clara and applied for Stanford's Honors Coop, which Bob Schultz (who had taken over applications from Vic Grinich) endorsed, and in 1964 I enrolled at Stanford. A little later I arranged a transfer to R&D under Bob Seeds, with a heavier course load. In the group were Les Vadasz, Bob Nevala, Ed Porter, Ken Moyle, and Warner Bridwell (who had large boxes of IBM cards and was doing ECL circuit simulation on a computer in the basement of Palo Alto High School). We soon acquired a computer; you could have chained Ed Porter to it without inconveniencing him, except for a brief time when 2-layer metal didn't work and Porter put on his lab coat for a couple of weeks to show how easy 2-layer metal was. 2-layer metal wasn't easy nor even feasible for years. I don't remember having any serious project accomplishments; I was assigned a logic study to show that CTL had logic advantage over CML/ECL but I couldn't find any.

4. Back to work at Mountain View, and some serious stuff

In 1965 I ate some deep dish humble pie and arranged to go back to Mountain View to manage standard digital IC design under John Hulme. I inherited and built very talented group: Bill Sievers, Sven Simonsen, Jim Kubinec, Per Mogensen, and soon Tony Holbrook, Lee Boysel, and Bob McConnell, amongst others, of which Simonsen, Holbrook, Boysel, and McConnell had awesome post-Fairchild careers.

However, my major recollection is of a disaster, which I still have not figured out how I could have avoided. Everyone agreed that TTL would be the dominant logic family for at least the next decade. Fairchild had done a TTL gate (the Phoenix gate), at about 25 nsecs. This gate was extremely badly designed and laid out; I believed with proper design under 18 nsecs was reasonable on the 0.25 mil process.

No story of Fairchild could be complete without telling of Bob Widlar and his processing partner Dave Talbert. Widlar was as technically conservative as he was personally flamboyant; he made sales presentations in a Superman costume.

For my purposes, Talbert had shown that you could optically shrink a mask set and get more die and better performance. DTL and the Phoenix gate ran on a 0.25 mil process. Roger Smullen and John Carey assured me that 0.2 mil tolerance was not only feasible but would be routine on their current equipment. We made plans to do a 0.2 mil TTL family, which should have been easily under 15 nsec.

Gordon Moore got wind of this and offered to move up an R&D 0.10 mil shallow process. It turned out that R&D couldn't make 0.1 mil yet, so they backed off to 0.15 mil. They couldn't make that either, and so backed off to 0.20 mil. The shallower process had excessive input leakage due to inverse beta; TI solved this problem by adjusting the base doping profile; Bob Seeds solved the problem by very large input emitters to kill the inverse beta of the input transistors, and thus adding area and capacitance (and delay) to a sensitive node. The outputs also had a sharp rise time; customers soon insisted that we add large clamping diodes to the output. But this was only part of the story; the initial product set was about ten products and in each of 3 pinouts (Sylvania SUHL was first, TI Series 54 was inevitable, and Fairchild DTL 930 for retrofit). At one point I counted 73 wasted mask steppings, and I am sure I missed some.

After a year of this flailing, TI had a dominant market share, 10 solid products, and a second ten in advanced design. Fairchild went from a dominant, technological leading supplier of digital IC's in 1963 to being a 2nd place contender in 1965; people loss was a major part of this, but I will always believe that if left alone, Mountain View could have contended for and probably won the dominant TTL supplier role, and a generally strong digital market position in 1966.

" A flop's a flop!"

Digital Design had early on had logicians: e. g., George Powers and strategist Maurice O'Shea. Now, a more serious group was formed under Bob Ulrickson with Jack Irwin and Dick Derickson. My first encounter was being told to add features to a flip-flop at about 25% added area. I complained to Ulrickson about cost; later he showed me a price list with no added price for the features. I then brought this up to TTL marketing manager Bill Seifert, who said "A flop's a flop; that's all it's worth". I was probably impatient; if you are trying to buy your way back into a market, featuring is a reasonable strategy, but I didn't enjoy added cost every time I looked around and no input into product featuring. So I arranged a realignment to MOS responsibility only.

Another novelty began about this time: product planning meetings with R&D, Mountain View Operations, Design (which had wobbled back and forth between reporting to Marketing and to Operations), and Marketing. My only recollection is Gordon Moore's high concern over a 65 Mw. TTL MSI ("The chip will fry!" quoted GEM), but the chip was large enough and power distributed, so power was not an issue.

5. Serious MOS: two lessons from Fairchild to Intel

R&D (Vadasz) had a reliable, but very undense PMOS process where n doping surrounding the transistors was used to increase field threshold. Jim Kelley had done some experimental work for Andy Grove; now he came up with a process step called VAPOX where he thickened a field oxide by depositing a filthy oxide under a small flame thrower in his office (fab wouldn't let his dirty flame thrower in at first). Kelley argued that a bias less than the field threshold would not cause the mobile ions in the oxide to migrate. I had a discussion with Kelley in my office and drew a diagram on my blackboard showing that with even a very low bias, the ions would migrate, and then the field oxide threshold would collapse. Kelley said that "if I were correct, we were all out of a job!" Our discussion ended there.

I ASSUMED that Kelley would discuss my concern with Grove. I ASSUMED that Kelley would take his task of producing a reliable process seriously. And, I ASSUMED that it was not up to me to "rat" on Kelley to Andy Grove at R&D (and to be a traitor to my class). [Those who later worked at Intel would note that a Grove mantra was "NEVER ASSUME"!].

A product launch with advertising fanfare was scheduled. A month or two after my conversation with Kelley, Gordon Moore on a plane flight from Tokyo to SFO drew the same diagram at his plane seat, concluded that Kelley's VAPOX was inevitably unreliable, talked to now-general manager Tom Bay, canceled the MOS launch, and had the MOS organization report to Moore. An MOS task force of Moore, Grove, Vadasz, Chuck Sutcliffe and his 3 MOS production managers (including George Vashel and Charlie Ellenberger), Kelley, and me, who while I was not part of the MOS production organization, provided much of the data taking and analysis. We called the task force ‘Bible Study', where R&D came down from the mountain with commandments in monolithic silicon. Ignore the initials.

I had some spirited discussion re design and process with Les Vadasz, who was promoting his NMOS guard ring approach. I told him that this was not dense enough. Les persisted; I finally said that I should be responsible for design; he should be responsible for a better process. A couple of days later, Andy Grove (a neighbor) asked me to drive him to the 8AM task force meeting, and on the way told me he wanted to "Grump" at me. Grove could "grump"! Grove told me that I had hurt Vadasz's feelings; I promised a nicer attitude. In the event, Vadasz designed and built a short dynamic shift register using his n-ringed process; it was just as unreliable. In fact it was more quickly unreliable, as the field inverted to the n-ring and the charge that should have been stored leaked off.

However, there is a more serious point here. At Fairchild, nobody outside R&D/processing reviewed processing; nobody outside design reviewed designs; and nobody outside marketing reviewed marketing plans. We all ASSUMED the others would perform. At the early Intel,

everybody reviewed everybody, with some frequency. All were assumed responsible for all aspects.

I don't know if the MOS experience I was central to was seminal in Grove's thinking of the early Intel or just correlating.

A couple of years later I met Kelley at a Seals-Bruins hockey game in Oakland; Kelley was assisting the Bruins' radio broadcast.

We did a CMOS version of a popular TTL MSI chip; then with a RIF killed the CMOS for at least a year. A few years later Wilf Corrigan, newly President, suggested to Rob Walker that MOS should consider making CMOS versions of MSI chips. Rob said, in effect, fishing some of these now old units out of his desk, "Here they are."

When Sporck et al left for National on a Friday afternoon, I saw Bob Noyce with a silly grin on his face saying "I guess we got through that OK". The next morning, I ran into Don Yost in the cafeteria. Instead of saying "big shoes to fill, but big opportunities" or something inspirational, Yost said, "I guess we'll muddle through somehow". I should have quit on the spot.

As a new MSEE, Lee Boysel had interviewed with Bob Widlar, but chose digital. However, Lee was immensely impressed by Widlar's exploiting the opamp technology and by his entrepreneurial accomplishments (a year earlier Widlar had talked Peter Sprague into funding National Semiconductor West and more recently had talked Charlie Sporck et al into joining him.) Boysel's chosen technology was dynamic MOS 4-phase logic and his application was IBM compatible terminals. Boysel was driven; for example, he laid out and cut the rubies for an Read-only Memory chip. Prior to Fairchild, Lee had been a customer of GI's custom chip operation and met and talked to many MOS designers. We had a cordial but tense relationship; I was 100% concerned in getting out products that Fairchild could make and market, while Lee had some percent attention to learning how to make 4-phase logic computer terminals. We should have had deeper product planning discussions with the marketing team of Jerry Larkin, Cloyd Marvin, and Gene Carter, but I don't recall any.

Chuck Sutcliffe had been hired as MOS Operations manager; he designed an executive style office with 5 business management texts prominently displayed, and staffed his operation with 3 production managers and staffs, but no products and for a while no process. During this period, I had run into Tom Bay and asked him how his much-expected reorganization was going; he responded ‘slowly', then asked me if I wanted to report to Sutcliffe; and I responded with the 1960's equivalent of NO WAY!

I couldn't stand the heat in the kitchen and arranged to get out; Boysel succeeded me, but left within a year to found Four-Phase Systems.

6. Out of the frying pan, and into the project of my life!

Fairchild had had Hybrids since at least 1961 when Bob Robson controlled his reported costs by midnight requisitions into NPN and PNP die inventory. Now, under Geoff Winkler (who would be managing potato farms a couple of years later) production manager John Bruning was at war with Dick Bader in engineering. The matched pairs went well, under Bruning's well-oiled group. I couldn't find much of a purpose in more complex designs. Ron Smith in Albuquerque had gotten us a contract for a linear thing with epoxy attached capacitors plus transistors that presumably would survive EMP (electromagnetic pulse) at ground zero. It was the flimsiest thing I ever saw mechanically, and totally un-testable except by engineer at bench. I steered clear of it. The engineer assigned, named Max (if I recall) and from the British Empire, seemed happy with the status quo, and he kept it.

Ron Smith also brought in my lifetime project, the COIN (counter-insurgency) module common elements. This was totally classified, even the name of Sandia's customer was classified. The general application was "McNamara's wall" or remote surveillance. We were to design and make 3 modules that, when potted, looked like green hockey pucks with through electrical connections.

Some metrics: our competitor Radiation Inc started 11 months earlier and finished 9 months later; i.e. we did in 11 months what the more experienced Radiation took 31 months to do. Upon delivery and field testing of samples, we received a contract for $9 million of production and $800,000 of production tooling. Input to me was a TTL plus discrete schematic and some very loose specs. The story below shows what resources Fairchild had.

For the Encoder, Rob Walker in MOS Micromosaic using Les Vadasz's process designed the (one) chip from the TTL schematic. For the more complex Decoder, Jack Morris was assigned. He partitioned the logic into 3 chips, and (having resigned) delivered the chip logic and test vectors to me on his last day. Being curious, I put the 3 chip decks into 1 deck, discarded the input and output pads where they were internal connections only, added some logic for the discretes, and ran a system simulation. The system failed! I told Jim Downey, managing Micromosaic, to put a hold of the decoder chips, that I had a problem, and that I thought I could fix it in a week. Sandia came to review the program that day; after lunch in the executive dining room while waiting for dessert, I saw the solution to my problem. That night, I revised the logic, reran test vectors, reran the system simulation, and next day gave Jim Downey a corrected deck. Of the 20 months we gained on Radiation, I believe at least 12 came from having an internal source of MOS chips, and probably another 4 came from my systems simulation. [The problem was that the R-S flip-flops used were "1's catchers"; i. e. with 0-0 inputs, the flip-flop should not toggle, but if an input rippled to a 1, then 0 before the clock; the flip-flop would toggle. It was a pretty familiar problem.] At the time catching this problem seemed like a part of design, at a 40 year remove, I believe I was very lucky indeed, to have had the opportunity to systems simulate and then to have picked input vectors that displayed the error.

There were about 9 or 10 true hybrids in 10 lead T0-5 packages; hybrid product engineer Jeff Schlageter took this over for me...layout, test, samples...and did it superbly. I had hired technician Dave Egashira, ex Air Force, and he was very talented in testing amongst others.

When the module, deployed by bomb or howitzer, landed, impact activated the battery, starting at about 32 Volts and dying about 20 Volts. We needed a switching power supply outputting a filtered 6V (maybe 5) as the battery aged. Someone in Applications (and the name Bob Ricks comes to mind, but I am unsure) had switching power supply experience and gave me general ideas. I found military miniature coil catalogs, bought some, and built the regulator. If asked to explain how it worked, I wouldn't have had a clue, but it did work. Designing an unloaded VGG supply by voltage doubler (Cockcroft-Walton ladder) was trivial by comparison.

The Code Plug consisted of diode arrays and fuses in the 10-lead TO-5 package. I had noted in an R&D report that Harry Sello, back from Italy, had been running some thin film, nichrome (if I recall). Harry volunteered a run for me. Referring back to Ilan Blech's electromigration report, I designed some notched fuses on a silkscreen mask set that would melt quickly at 20 mA, but survive a very long time at 2 mA. Operating current was set at 0.5 mA. Essentially, we had a (hybrid) bipolar PROM two years before they were invented; had I been in communication with Joe Rizzi, Fairchild could have had the first PROM's.

Laying out a 3 inch or less diameter printed circuit board was tricky, and I recall Dave Egashira being creative and some long resistor leads as bridges.

Potting was done for us. My Sandia contact, with title "Technician" on his business card, took the units out of field trials to Panama and Arkansas. Sandia was always a strange operation, but they did give my contact the necessary support and responsibility, whatever his title.

When Hogan's 8 heroes arrived, they started hiring engineers and managers with one and two level promotions (to make up for their lack of talent, opined the old-timers).

However, Norm Miller was talented and had run MOTO's applications lab in Europe. He was assigned to pick up engineering responsibility from me, and quickly fixed the only spec problem I was aware of, a PCM signal to noise ratio, that he improved.

I had been reporting to Winkler; with successful sampling of modules to Sandia and Norm Miller's arrival, I was out of hybrid.

7. Leaving Fairchild

I really wanted to stay, however annoying Hogan's heroes and the mediocre new arrivals were. I did get an offer, spent a couple of hours looking at product photomicrographs on a wall, and thought I had so much emotion invested in these products that I couldn't leave and declined my offer. I was reporting to Jack Gates, newly back at Fairchild. Les Hogan had held up 3 packages and claimed they were a new calculator set. Gates asked me to take over this project and tell him the cost, whether 40 men for a year or 1 man for 40 years, e.g. Harlan Ng, a design engineer had quit. I checked 10 nodes; 4 were wired wrong by a mask designer from the pool. Peter Alfke, the logic designer, refused to release any documents or even talk. Not good omens! Too precisely, I told Gates I couldn't estimate cost until I could 'size' the project. Gates removed me forthwith. That week, I attended an R&D lecture and chatted with Jack Kabell, who asked what I was up to. I said nothing. Jack suggested several managers. I said that this was unlikely, that I had burned all my bridges.

And so I had. I reactivated my offer, and resigned. A couple of days later, Gates came up to me, said he wanted me out of the plant that afternoon, and after almost 9 years at Fairchild, I was walked out the back door, saying goodbye to no one.

Entered By: David Laws
September 3, 2007

Title: Three Short Stories
Author: Henry Blume
Created: November 16, 2007
Cataloguer:
Copyright:

Story:
Three Fairchild Stories by Henry Blume

1. Inventing the 5V Power Supply

In 1963 allowed digital power supplies were 1.5, 3, 4.5, 6, 9, and 12 V. Micrologic RTL used 3V; the so-called Phoenix TTL gate used 6V. Dick Bohn's DTL 930 came out with a typical (introductory) data sheet showing 3 to 6 Volt characteristics; it was my job to issue specs. My data showed that with 5V VCC, fanout and noise margin were optimal. About the same time and independently, Rob Walker, then at Philco, developed similar data and asked for 5V specs. DONE! This also gave me courage to pursue the non-conventional 5V VCC on the DTL 930 final data sheet.

More or less simultaneously, since 6V blew out TTL inputs (also DTL inputs), the Phoenix gates were used with a dropping diode in series with VCC to provide about 5V to the TTL. A bypass capacitor was used with every 15 gates; the power supply surges at the units caused + and - 10% power supply specs to be required. Soon, Sylvania and then TI issued 5V VCC data

sheets for their TTL. By 1965 and for 30 years, 5V VCC was as uniformly accepted and standard as anything in IC's.

Postscript. MIT/Raytheon wanted a low power version of Micrologic RTL. RTL had current hogging inputs and specification/yield problems beyond reason. LPRTL would have been worse. So I asked MIT/Raytheon if they could use a 4V VCC, and they could. While you needed +/- 10% resistors plus other processing control to yield RTL to its 3V VCC specs, with 4V VCC, I wrote specs to which +/- 25% resistors would yield 100% . LPRTL was not a big runner, but it was trouble free. There was something about bipolar and single polarity MOS that wanted VCC or VDD to be about 6 or 7 times the inverter turn-on voltage.

2. Modest Application of Fairchild Science (Electromigration Department)

In late 1964 the Wall Street Journal reported IBM writing off about $17 M of developmental inventory. It turned out that the problem was electromigration. IBM called Gordon Moore to see if he knew anything about it, and he did. Ilan Blech had just completed a detailed analysis of electromigration, with curves useful for developing design rules.

I made two unconventional uses of Blech's curves. Hughes Aircraft had hooked up DTL 930 buffers (with 40 mA output current rating) to incandescent lamps and zapped the DTL. Using Blech's paper and lamp characteristics supplied by Hughes, I could with confidence redesign the metal mask. I think we turned this around in a month, sampled Hughes, and booked a $240,000 order. About 4 years later I needed field programmable devices for a Sandia classified project. I used Blech's paper to design the fuses with thin film nichrome (supplied by Harry Sello back at R&D) and a silk screen mask. The fuses were programmable and survivable as predicted by Blech. I could even argue that we produced field programmable PROM's, albeit in hybrid form, several years before PROM's were invented.

At the Fairchild at 50 Party, I told Blech about my use of his paper; he told me that IBM not only called Gordon Moore but flew Moore and Blech back to Poughkeepsie for consultation. IBM had basically bet the company on their SLT modules and had a big problem when the first chips had electromigration in use.

I have this surmise, with no corroborating data whatsoever. After seeing Blech's paper, IBM developed or gained so much respect for Gordon Moore that they maintained some contact with Gordon and 17-18 years later invested in his company and used its rather indifferent 8088 processor in their PC.

3. Fairchild's 4-layer Diode

Fairchild's founders left Shockley primarily for management style, but with an added annoyance that Shockley wanted to make PNPN 4-layer diodes instead of transistors. It turns out that Fairchild did make PNPN's, albeit parasitics, and destructive parasitics at that. The PNP mesa 4500 was die-attached to a plated header which used heavy phosphorus in the plating; the phosphorus formed the N terminal. The PNPN action was tested out on a Rube Goldberg contraption called I-switch or Hi-Switch, consisting of a heating chamber in racetrack shape on a plywood board about 8 feet wide and 16 feet long overall. The 4500's were mounted in little blocks, heated up as they traversed along the track, and pulse tested for PNPN action. Yield was usually above 95% on units already in finished goods stores and thus fully valued; nobody paid much attention.

One day the yield went to 0. I had the problem. No one I talked to knew much about it. Luckily, I noticed that the glass-to-metal seals in the headers used different colored glass. Some colors yielded; some didn't. I was given first dibs on headers in raw stores and pre-ran header lots, to find which lots yielded. Production resumed at a limp. Of course, there was no lot

identification or much else on the headers. Later, Martin Oudewaal developed a P-type Germanium preform for die attach, and PNPN production ceased.

Two quick notes: a) before my time Fairchild had tried to make 4500's into PNPN's and I inherited some; I zapped every unit I experimented with. And b) with Fairchild monthly sales about $1M, I acquired about $1M of finished goods inventory in a cabinet in my office, upon which I placed a reject tag. Having recently been a Navy Supply Corps Officer and responsible and accountable for every $, cigarette pack, skivvy, or whatever; I was really sweating the end of month inventory. Fairchild's accounting was such that my $1M of 4500's were not missed. I was not even questioned. A couple of months later I hauled my rejects back to stores and formally zeroed them.

Entered By: Henry Blume
November 16, 2007

Title: Patents and the 9300 MSI Family
Author: Rob Walker, Hank Blume, Bob Ulrickson
Created: December 4, 2007
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Copyright:

Story:
Extracted from e-mail exchanges on "Memoirs of Fairchild 1960-73" between Rob Walker, Bob Ulrickson, Hank Blume, Dick Kors, John Nichols and Kris Rallapalli on December 3, 2007.
From: Hank Blume [Follow-up to a discussion on the lack of patents filed by the early semiconductor companies in Silicon Valley]

Dick Bohn (who designed DTL 930) and Tom Longo had a patent on TTL active pullup (at Sylvania). Howard Bogert (I believe) had at least one patent on MOS circuitry, the MOS transistor as a pullup rather than a diffused resistor (Fairchild). Dick Pashley at Intel before 1974 had a patent on MOS substrate bias generator, but AMI had prior art and I was running test wafers at Intersil with substrate bias generators (universally used in NMOS). I could argue that all of these were obvious to anyone familiar with the state of the art, but would a judge have believed me? Philips had an MOS patent so basic that Intel licensed some microprocessors at least (8048, 8051) to avoid potential exposure. If manufacturers had not agreed to cross-license, there would have been carnage and lawyers would have made more than manufacturers.

On Bob Ulrickson's notes on the 9300.....By the time Fairchild had finished floundering on TTL in about 1966, TI had its initial family of 8-10 unit logic chips out and was beginning to sample its next 8-10 chips, some at least of MSI complexity. The 9300 may have been better architected, but TI had MSI complexity chips out and in use. Thus, TI had immense advantage in market share and in a broader product line. You and Ulrickson believed the 9300 was superior, and it may have been, but did customers also believe?? And did it make an immense difference if customers had already designed in some of TI's second set of products. [I remember Intel arguing that its 2-bit slice was better architected than AMD's 4-bit slice, but AMD got dominant market share.]

Sporck's hiring of TI's TTL team (Kalb, Thorkelson, et al) at National in 1967 may have put a gap in TI's development but not in its market share. Thus, Fairch may have had a 1968 window to get back some share and product leadership, but it lacked good process/product engineers and managers something fierce. I had abdicated my TTL charter by then so I don't know the details, but the replacements for the losses to National and AMD were not nearly as good as those remaining and replacements, and pre-Schottky Fairch's TTL process was inferior to TI's.

From: Robert Ulrickson

I believe there is clear evidence that Fairchild's 9300 MSI product line was superior to the meager offerings of TI, and that is why Fairch originated logic functions became the standard of the industry. John Nichols and Clive Ghest conceived almost all of the 9300 logic designs beginning in 1966. The designs were well thought out, and conceived as a logic set to work together in digital systems. All the I/Os were not only compatible, eliminating as much SSI as possible, but pin-outs were constrained by system considerations like pcb layout, not internal chip layout. We analyzed TI's few MSI devices at the time and found them wanting. They looked like they were designed by customers: lots of NC pins, specialized logic functions with no attempt at compatibility, and not even synchronous. Those functions soon faded away as TI copied every 9300 device we created. Because of 54/74 SSI's popularity and head start in the market, Fairch eventually had to capitulate and accept the 54/74 numbering scheme. The industry standardized on the circuit specs which were a compromise among all the multi-source vendors at the time. Jerry Sanders made MSI and Linear the basis for founding AMD.

Here's a story that I haven't told to everybody before. In 1968 I visited the DEC brick factory building with a copy of the hot-off-the-press MSI flip chart presentation (conceived primarily by Kors). Herb Richman was the regional manager, and I forget the salesman's name. DEC was known for purchasing being in charge, keeping salesmen cooling their heels in the lobby, papering visitors with confidential disclosures, badges, and requiring escorts to visit engineering. Herb walked us in the back door without going thru purchasing and introduced me to a young engineer named Dick Sogge. I began pitching him using the flip charts and explaining the many features and benefits of 9300 MSI. I soon noticed that he was sharp enough to recognize the advantages of the MSI feature set by just looking at the diagrams, so I stopped explaining the detailed features, and just answered his questions. We left as clandestinely as we arrived. When we left DEC Herb was driving and the salesman was in the back seat. Herb casually asked if I knew any good logic designers on the west coast. In answer, I asked him - half in jest - "Where did you get your financing?" Herb hushed me up (the sales guy wasn't in on the deal) and became very flustered that I might know his secret. The following week an announcement hit the press that Edison DeCastro (designer of the PDP-8) was leaving DEC to form Data General with Herb Richman as Executive VP, and Dick Sogge as chief logic designer. The NOVA computer was based on the 9341 4-bit ALU (copied as 74181 by TI), and was loaded with Fairch MSI designs.

By 1973 when Nichols and I left Fairchild to start Logical, Fairch had a 22% share of market in bipolar digital circuits, shared with TI, National, Motorola, Signetics and AMD. Fairch's dollar share of market was far greater that its unit share because we had focused on MSI instead of SSI to keep the profit margin up, while TI and National slugged it out with marginally profitable pricing and much greater unit share of SSI.

We all see history from different points of view, and I am enlightened by Hank's perspective and his stories of pre-1966 before I arrived at Fairch. Obviously, we did not all have the same experiences. But, I remember the above facts vividly.

From: Rob Walker

Hank there is no question that 9300 was much better architected than early 74/54 MSI. TI, being no fools just copied them and gave them 74 numbers. But Fairchild, who didn't bother to patent the RAM and microprocessor sure weren't going to protect a four bit counter. One of my FSC memories was the 9601 retriggerable one-shot that I championed. When John Nichols blasted me with "good logic designers don't use one-shots," I said good, we will sell millions. We did and TI copied it.

Here's what Jerry Sanders told me:

"Charlie Sporck who had been General Manager of the business left to form National. Charlie hired me, he thinks he hired me. He made me an offer to be his Vice President of Marketing Worldwide and I said I couldn't do that without telling the people at Fairchild first. And they persuaded me that someday I would be the president of Fairchild, that there was no limit to where I could go. They laid some more stock options on me and I made the mistake of staying. Turns out it was the right thing to do as life worked out, but I didn't know it at the time. Any way Charlie Sporck, basically thought I had made a terrible mistake and he found out that the reason I had decided to stay was that, I had misspoken up until now. I wasn't yet the Worldwide Marketing Director. I was a sales manager and I said I wanted to be the Worldwide Director. If I would have joined Charlie I would have been, but I said I wasn't going to stay on and not be. Well there was a problem because there was already a Worldwide Marketing Director at Fairchild named Don Valentine, who was a good friend. But I said, you know, Don's there and I'm behind Don and I don't want to wait. And Tom Bay said well how much time will you give me? And in my brash youth I said, 'till Friday. And I think this was on a Monday. And on Friday Don was terminated and I was made Worldwide Marketing Director. I was shocked. So there I was at, you know, 30 years old, 31 years old, and wow, just had the world as my oyster.

But as it turns out Fairchild had to change managements, you know, Charlie Sporck left, Tom Bay was promoted, it didn't work out. They brought in a whole team of guys. Lester Hogan of Hogan's Heroes. Very interesting time. C. Lester Hogan is a brilliant guy and he'd made Motorola quite a success by automating the production of transistors, but of course transistors were old news. But that's what made Motorola's success. So he came in and instead of taking advantage of the wonderful innovations and technology that was in place at Fairchild, instead he seemed to want to make them over in Motorola's image. And as I said, I was a brash young man and I couldn't help but tell him why I thought a lot of things he was doing was wrong, but I guess I should take the time to tell one story that cost me my job. We went to visit Digital Equipment Corporation, in those days it was called DEC. Now it's just called Digital. Now its gone, it's part of Compaq; which is now gone, part of HP. But the founder of Digital had a meeting set up with Les Hogan. And we went to meet with him. And when we got there I had properly briefed Les Hogan on what we should say about our proprietary family of Digital building blocks which were TTL building blocks called MSI, Medium Scale Integration, the 9300. Ken Olson who was the founder of Digital Equipment was quite a good Engineer and I thought he would be very responsive and receptive to our pitch on why these were a superior way to assemble a computer. And why they were built with a system in mind, as opposed to just being random collections of gates. Well, we talked and Les said to Ken, so what do you want us to do? So Ken said, well you know I've got a problem, Texas Instruments has their series 54 and there's a lot of sources of that and you're a sole source on the series 9300. Sure would make my life easier if you'd just agree to build series 5474. And to my amazement Les Hogan said if that's what you want, that's what we're going to do. Well, what did that mean? It meant that all of our proprietary development, all of our invention, all of our innovation, all of our competitive advantage was down the tubes and all we had now was the opportunity to be an alternate source to TI who was already a giant manufacturer. So after the meeting, we were outside and I was just really so upset. I'd worked so hard, my people had worked so hard, all the engineering people had worked so hard to win that design and all we had to do was to say series 74 is not competitive with our solution. I'm sorry, but this is the way to go and I know he would have gone. I mean you could tell, he was just shocked that we agreed. So Les Hogan said, what do you think? And I said I think you just wrecked the company. Wrong thing to say to the president of a public company, especially when he has just recently taken over.

So I think that's what sort of signed my death warrant with Fairchild, but just to close that story out and move onto AMD, which is the pride of my life; short of my daughters, of course. One day, I decided that, which is amazing in retrospect, that I was the best candidate to run the semiconductor operation. As I had mentioned earlier Fairchild Camera and Instrument of which Les Hogan was the president, was the parent company, but he was also acting as Vice President and General Manager of Fairchild Semiconductor, which was really the heart and soul of the business. But at some point in time it was pretty clear he was going to name somebody to be president of Fairchild Semiconductor, at least I thought he was. So I said I'd throw my hat in the

ring. So I remember Les saying to me well, Jerry of course you'll be considered, you know, you're one of the smartest guys I know, and he said, but let me ask you this, what if you aren't named, what if you aren't the guy selected to be the president? Now I know now that the only thing to say was, Les whatever you want I know is, whatever you want to do, I'm sure that's the right decision and I'll support it 100 percent. But, you know, when you're 31, 32 years old, I said you know Les I can't guarantee my behavior. Oh, wow! So not guaranteeing my behavior was perceived by Lester as a threat. So he hired a guy from TI to replace me and bingo, I was out."

Entered By: David Laws
December 4, 2007

Title: "What a grand time it will be"
Author: Frank Burge
Created: June 14, 2007
Cataloguer:
Copyright:

Story:
The following story is taken from a column by Frank Burge published in Electronic Engineering Times on July 17, 2006.

I joined Fairchild Semiconductor in 1965 as a product manager for a line of modules for military applications. Six weeks into the job, Bob Noyce, one of the founders, and Tom Bay, the vice president of marketing, asked me to join them for a chat. After my presentation, Noyce asked, "Is this a business?" "No," was my answer. I had just moved my young family to Northern California and my job was about to go down the tubes. But Noyce saved the day. "Don't worry, we'll find a place for you," he said. And he did.

I became product manager in the instrumentation division with responsibility for analog modules, curve tracers, digital voltmeters and electronic counters. Ray Stata's upstart Analog Devices would give our module business fits. That upstart is now a $2.4 billion company.

Later I became sales manager for the semiconductor test systems business. In those days, quality was an issue. Another upstart called Teradyne, founded by Alex d'Arbeloff and Nick DeWolf, would make our lives miserable, particularly when they introduced a system with a PDP-8 computer. Our engineering guys tried to convince our customers that they didn't need a computer. But they wanted a computer. Score one for DeWolf and d'Arbeloff. Today, Teradyne is a $ 1.8 billion company.

Back then, Fairchild was a great place. Lots of smart, fun people. Many would go on to start or run companies: Jack Gifford at Maxim, who was also one of the original founders of AMD, along with Jerry Sanders; Charley Sporck, Don Valentine and Bob Widlar at National Semiconductor; Wilf Corrigan and Rob Walker at LSI Logic; Bob Noyce, Gordon Moore and Andy Grove at Intel; Mike Markkula at Apple; Marv Rudin and Garth Wilson at Precision Monolithics; Bernie Marren at AMI; Marshall Cox and Bernie at Western Micro. And many more.

But those were different times. Competitors and customers were mostly in North America, engineering jobs were plentiful and for most, going to work was fun, mucho fun. And you could buy a house in Silicon Valley for less than $40,000.

Next year Fairchild will turn 50 and a Silicon Valley celebration is already in the works. What a grand time it will be
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Entered By: David Laws
June 14, 2007

Title: Engineer sticks with Fairchild for 50 years
Author: Mike Cassidy
Created: December 7, 2007
Cataloguer:
Copyright:

Story:
The following story was written by Mike Cassidy and published in the San Jose Mercury News on December 7, 2007

So, I was sitting with Harlan Lawler in his company cafeteria after the big celebration in his honor and the man had the look of someone who'd really rather be somewhere else.

Like working.

It's what he does. What he's been doing for 50 years - at the same company. It's his passion, his calling, what he's decided to do with his retirement years.

"Some people garden," says Debbie Ferreira, who helped arrange the luncheon. "He engineers."

Fifty years ago this week, 29-year-old Lawler walked into the Palo Alto offices of a brand-new start-up: Fairchild Semiconductor, launched by eight brilliant mavericks who so hated their boss, William Shockley of Shockley Labs, that they left to form their own company.

In a region where work is often seen as a young man's game and where workers flit from company to company like digital hummingbirds, Lawler, 79, represents the un-Silicon Valley.

The Fairchild story is well-known. The company, founded by Bob Noyce, Gordon Moore and the rest of the "traitorous eight," became the first to design a practical way to mass-produce semiconductors. Fairchild, the valley's first chip company, inspired dozens of start-ups (think Intel, AMD, National Semiconductor) that inspired dozens more.

Employee No. 23

You might be less familiar with the Harlan Lawler story. As Fairchild and its followers were changing the world, Lawler was staying right where he was.

About 140 co-workers gathered this week to honor that fact in a lunchroom festooned with balloons.

Lawler's company is now called Fairchild Imaging, but it's a direct descendant of the business that hired him as employee No. 23 on Dec. 4, 1957.

"They put me right to work," Lawler says. Noyce and Moore and the rest were in a race to get somewhere that they weren't quite sure of. The newfangled transistor had potential, but the real beauty would be in harnessing many of the doodads to perform amazing electronic tasks.

"I had no idea what a transistor was," says Lawler, who in gray slacks and a plaid shirt open at the collar looked a decade younger than his years.

Earned loyalty

He learned. Lawler had a high school diploma when he started at Fairchild. He went to work in the machine shop. It really was a simpler time. One of Lawler's duties? Keep Noyce's wife's 5-year-old Chevy running well.

"About once a year," Lawler says, "he'd bring in a pack of spark plugs and points and his wife's car and ask me to tune it up a little."

There were no tools to make semiconductors when Lawler started at Fairchild. No suppliers to call.

Instead, engineers would come to Lawler with sketches on scraps of paper of fanciful gizmos they had dreamed up. And he would build what they wanted - simple, elegant devices to test circuits and hold silicon steady.

The father of three saw no reason to leave. His co-workers were bright, the work challenging and the brass supported him during his difficult times. Lawler's first wife died after a battle with cancer. Cancer took his second wife, too. His orders from the top? Take the time you need. Take care of your family. He's never forgotten that.

As for work? The man had a knack for design, a gift. As time went on, Lawler began designing his own tools and his own ways to build the casings that hold the tiny circuits.

"Some of what we do, what Harlan has worked on," says Fairchild Imaging chief executive Charles Arduini, "is as much an art and craft as science and engineering."

And, as it turns out, Lawler is a Michelangelo. A Michelangelo with no plans to stop creating masterpieces any time soon.

Read Mike Cassidy's Loose Ends blog at blogs.mercurynews.com/cassidy.
Contact him at mcassidy@mercurynews.com or (408) 920-5536.

Entered By: David Laws
December 9, 2007

Title: Hello from Lake Tahoe
Author: William H. Curtis
Created: August 5, 2007
Cataloguer:
Copyright:

Story:
Hello from Lake Tahoe,

Just the other day, I received an e mail advising me of the Fairchild reunion from David Cooper, who was at Fairchild at the same time I was. David went on to the Development Business as I did and we have been friends ever since. David and family moved to Sequim WA. when he retired, but we both have homes several blocks apart in Palm Desert.

My years at Fairchild were interesting, if not crazy. It appeared that we were mostly flying by the seat of our pants and only the engineers knew what was going on. My time in NPN transistors was a waste as I never did figure out what "it" did ! Finance and Long Range planning were much more my bag. Unfortunately, I will be in Europe the through the entire October weekend and am sorry that I will miss seeing so many of the Gang from the 60's. I

Send my best regards to:

Jerry Sanders- last seen on Russian Hill in San Francisco.
Joe Malone- who hired me in Mt. View and Judy Horst who worked with Joe, I believe. Roger Smullen - who was a real role model in my young days at Fairchild.
John Bosch - Last seen at Squaw Valley on the Ski Slopes.
Gunther Haller - who stuck it out long after I left.
Charlie Sporck - The incredible wizard, always running, always a good word.
Bob Bylin- who interviewed me at the Diode Plant in Marin County.
Gene Carter - whom I used to run into now and then in the Santa Clara Valley.
Brian Hollins - an engineer in the NPN dept. and later went onto Bob Swanson's Co., Linear Tech...
Ed Pausa, We served in the Naval Reserve Together for many years. Don Valentine - Didn't know him well, but what a great mind.
Rob Walker - Always running, Always yelling, Crazy and Fun.
Jim Diller - Last seen at the Post Office Restr. at Lake Tahoe.
Pierre Lamond - Encouraged me to buy my first Home and quit commuting.... Best move ever !!!
Mercer Curtis- Great Guy, Always Helpful

A special Hello to:
Paul Cusick - My last Boss at Fairchild.... a Mentor and would love to hear from him.
Wilf Corrigan - Who started LSI Logic and leased two of my Industrial Buildings. He put all of my kids through College, and paved the way for me to have a great retirement. Last seen at the Truckee Hotel, having a drink with his wife.
Floyd Kvamme - A very Special Man.... a 10 in anyone's Book.... Business, Family and Community.

All the best for a wonderful Reunion and please feel free to pass on my regards to all above.
WILLIAM H. CURTIS CAPTSKAYC@AOL.COM

Entered By: David Laws
August 5, 2007

Title: EDN Tales from the Cube: Remember Solid State Physics
Author: Martin DeLateur
Created: October 3, 2007
Cataloguer:
Copyright:

Story:
Remember Solid State Physic's to Convince Customers

KNOWING SOME BASIC RULES OF SILICON CAN HELP YOU CHANGE THE MINDS OF THE FIRMEST OF CUSTOMERS

I was working as a Product Engineer in the Discrete Division in San Rafael for Fairchild Semiconductor Company in the early 1980's. This was the time when the 3 Big Automotive Companies started to add many electronic accessories into each model year. It was also the time when under-the-hood temperature issues and reliability was a major concern causing many specs to be changed from 25degC to -40 to +125degC. I was advised that there were 3 shipments of 2N3906 transistors which had been rejected at incoming inspection for high leakage from the AC Delco assembly plant in Milwaukee. I received some samples of the "defective" units but found nothing wrong with them. By the time this problem reached my desk, the auto maker was going to be lines down within the week, so The QA manager, Gene Thomas and I flew out the next day with the returned units and correlation units. Upon arrival, the Component Engineer advised me that all the units where failing the leakage test at 30V for less than 50nA when heated to 125degC. I had to close my gapping mouth when I realized he was applying the room

temperature specification across the full temperature range. There was no acknowledgement that semiconductor performance should change with temperature. I pulled out my 1967 copy of Semiconductor Physics by Andy Groves to show how the leakage current will increase with temperature. The equations and graphs can be simplified to the basic rule the leakage will double for every 10degC increase in temperature. This was not enough to release the product so we headed down to the incoming inspection lab to test my correlation units and production samples using a Tektronix 576 Curve Tracer and TO-92 heating probe. The "defective" units, correlation samples, and production parts all showed the same leakage characteristics with temperature that would be expected from silicon. After another meeting, the Engineer agreed to approve the shipments only after the lots had passed a large sampling plan. The 2N3906 limit of 50nA at 25degC was expanded to 50uA at 125deg C and the sampling of the lots began.

I headed back down to the inspection area after two-thirds for the sampling had been completed. While watching the final units being tested, the thermal heat probe failed and could not be used to complete the sampling. Once again, this guy was not going to approve the units based on a smaller sample size and my solid state physics lessons. Knowing that I did not want to be part of Fairchild Division that caused a "lines down" situation for one of the Big 3, I had to come up with a solution. Pulling out the text book again, I showed the Engineer how Vbe is directly related to the die temperature as well. Again, the equation can be simplified when applied to silicon which reduces the Vbe(sat) by 2mV for every degree C. This translates to a 200mV reduction in Vbe for the added 100degC in temperature. Using the 576 Curve Tracer, we could watch the Vbe drop while heating the unit with of all things, a BIC lighter. Once the temperature was met or exceeded, we could change to leakage mode and confirm the parts were good. The sampling was completed using this method and the parts approved. The next day before leaving, the Production Manager told me that he had to send out envelopes with five 2N3906 in them to dealers because cars had been shipped to the dealers without these transistors installed in the dash. The five critical transistors were being used to drive the LED's which lite up when your door or trunk was AJAR.

Martin DeLateur is a Manufacturing Consultant in Silicon Valley after 30 years as a Product Engineer at Fairchild and National Semiconductor. He can be contacted by email at delateurm@all2ez.net.

Entered By: Martin DeLateur
October 3, 2007

Title: Stories collected at the FSC@50 event
Author: Numerous authors edited by David Laws
Created: October 5, 2007
Cataloguer:
Copyright:

Story:
Gil Amelio: With sales of $196 million dollars in 1971, Fairchild was the third largest semiconductor company in the world. The industry has come a long, long way since then. The $250 billion dollars that the industry does today started with the seeds that were planted in those days.

Charlie Askanas: Bob Noyce was the first real leader I ever encountered and I think everybody felt that way. Charlie Sporck was the toughest and fairest guy I ever met and, even all these years after that, whenever I get my behind in a crack, I say, "What would Charlie do?" And Tom Bay was the coolest guy I ever met so it was a hell of a bunch.

Mercer Curtis: I ran the Shiprock plant on the Navaho reservation when the American Indian movement came in and took over the factory. At one meeting this guy got up and said, "You are

our hostages." I go into an Indian mode and we talked for about an hour. I said, "I cannot make decision here. I must go back and see tribal chief Corrigan." So they let us go and we got out of there, fast. At another meeting I said can you guarantee me no one will do this again?" He said, "We have to have a pow wow at the next tribal council." I said, "When's your next tribal council?" He said, "Six months from now." So the decision was made to shut Shiprock down.

Jim Diller: I joined in 1963. I've spent over 40 years in the semiconductor business and this was the most exciting time I've ever seen. Bob Noyce was running it. Charlie Sporck was in charge of operations. Jerry Sanders was there. Gordon Moore. Andy Grove was an engineer at R&D. I have never seen such a collection of talent. It was just one of those perfect storms when everything came together. It was just an absolute thrill to get up in the morning.

Jim Diller: In those days, we didn't have computers, we didn't have printers. Just Xerox machines. The machine sat right outside plant manager Fred Bialek's office. My first day on the job, I come walking up to the Xerox machine, I lift up the cover, and there's this scowling 8 by 10 picture of Fred, with a big cigar in his mouth, saying, "Do you really need this copy?"

Norman Doyle: In July of 1966 I died and I went to heaven. I started work in the Consumer Applications Department. We were having the time of our lives. We were replacing vacuum tubes with transistors in every conceivable consumer product. This was an era when the incredible was in production and the impossible followed about a month later. Even getting up at 5.30 in the morning to spend the first 2 hours of the day at R&D in Andy Grove's semiconductor physics course only added to the enjoyment. Where else could you listen to Jim Early explaining the Early Effect?

Bill Elder: From pristine Switzerland we fly to Hong Kong. On the tenth floor of a 20-story building there's this little watch factory. Jimmy Chan, the managing director, comes out in a sweatshirt, shorts, flip flops. We take the tour to check out the capacity and make sure the machines are working properly. Suddenly this rat runs right across in front of us, and I jump back. Jimmy just looks, and says, "Don't worry. The cats take care of the rats." Later I feel this big clump in my hair. I pick it out the biggest cockroach I've ever seen in my life.

Federico Faggin: I joined the R&D group in 1968. I was supposed to stay six months and go back to Italy. I'm still on my sixth month. I found that Fairchild was, despite some rough spots, still the Mecca of semiconductor technology. Bruce Deal, Andy Grove, C. T. Sah, Ed Snow and others developed the most cogent understanding of the silicon-silicon dioxide interface that existed in the mid and late '60s. I don't think that there is another company that did more to create this industry than Fairchild in its first 12 years of existence.

David Fullagar: Les Hogan and the rest of the guys from Motorola showed up in their pin stripe suits and white shirts and ties. Somehow it's a little bit like the Nixon White House team taking over management of the Beatles. Maybe if Les Hogan had showed up with a pony tail and Birkenstocks it all would have been different.

David Fullagar: Mike Scott decided that it would be a great morale booster if we had a party. He was going to have a number of nude models show up and the design engineers were going to be given body paints. As we would get to express our artistic talents on these ladies, the question was, should we use our fingers or would we use brushes. Nowadays this would be totally politically incorrect but remember this was the time of Haight-Ashbury and the "Summer of Love." Really it didn't seem like it was anything out of the ordinary at the time.

Jack Gifford: When we started the Fairchild analog group there was essentially no industry. It comprised Dave Talbert, Bob Widlar, a couple of other guys and myself. Today the business is the largest segment of the integrated circuit market. Fundamentally it started at Fairchild in the mid ‘60s.

Jack Gifford: Jerry Sanders lived in Hollywood because he just loved being around starlets. He would wear the most amazing suits. He was a sight to behold but he knew his products like you wouldn't believe. And when Jerry would show up at Hughes Aircraft, he would have them announce it on the loud speakers. Hundreds of engineers would flock to the lobby and Jerry in his purple suit and his high button shoes would get up on the receptionist's counter and he would do a song and dance or whatever. It was like a vaudeville show, him and his transistors. It was the most amazing show that you had ever seen. It was a legend in our industry.

John Hulme: Bob Widlar came into my office one afternoon and he said, "Do you have a piece of paper?" I handed him a piece of paper and he wrote, "I resign effective tomorrow." I said "Why do you want to leave?" and he said, "Well, my goal is to earn a million dollars by the time I'm 30 and I'm getting pretty close." A couple of years later I got this call about 3:00 in the morning from some noisy bar. It was Bob, and he said, "I made it. I'm now worth over a million dollars."

Floyd Kvamme: I remember visiting the chief engineer at TV maker Zenith. We were trying to sell him on our transistors but he wasn't buying. We kept asking, "Well, what does the price have to be?" And he says, "You realize you're competing with free?" And we said, "Could you explain to that for us?" He says, "You understand we make most of our business on tube replacements. And so the manufacturers of the tubes give them to us. You're competing with free."

Jay Last: Seven of my friends and I started Fairchild in 1957. It was certainly the most interesting year of my life. We went into an empty building in the first of October in '57 and, by next summer, we had developed a product that scooped the industry.

Jay Last: The main thing I worked on with Bob Noyce was developing a photolithography process. This is something that had been tried by Bell Labs, who had said that this is a completely impractical process. Bob and I said, "If we don't develop this, we ain't got a company." That persuaded us that that had to be done.

Jay Last: Jean Hoerni was a very complicated guy. He was very French. He could be the sweetest guy in the world and could be the nastiest guy in the world. He would get very irritated about things and, fortunately for Fairchild, he did his best work when he was very irritated. And Jean was irritated a lot, so a lot of work came out.

Joe Malone: Bob Widlar gave me his transcript from the University of Colorado. It had all As on it except for one C. I asked him why he got that C and he said, "That was in Colorado history and you had to take that to graduate. The instructor said, 'Take out a blank sheet of paper and draw an outline of the state of Colorado.'" Instead of drawing the outline, Bob wrote "It's on the map behind you, you dumb SOB." He said, "The guy never liked me after that."

Cloyd Marvin: My job was to try to convince engineers at established mechanical calculator companies that they ought to take a look at this stuff called digital logic. Not one of them found it to be interesting. What they really were saying was "We don't know anything about logic so we don't know how to begin." It turned out that the people who did become interested in these products were the Japanese.

Gordon Moore: My colleague Jay Last once commented, he thought William Shockley could see electrons. You know, he had a physical intuition of what was going on with in these materials, but he had no idea what went on inside people. And the net result was he made an untenable atmosphere in which to work.

Gordon Moore: I think that Fairchild is really where Silicon Valley started. The company exploded into literally dozens of spin offs that took these bits and pieces of technology. It developed a bunch of tools that were used broadly. And it really developed the idea of the engineer entrepreneur who had an idea to go off and set something up. We weren't the first electronics company, there were the HPs and the Varians before, but they operated more like the classical

companies that would have been any place in the country. But at Fairchild you had this tremendous explosion that, I think, has made Silicon Valley unique.

C. E. "Ed" Pausa: At the end of '64, I took over as general manager of Fairchild's Hong Kong manufacturing operation. We had started construction of a new plant and in the process of constructing that building, and this was a high rise, I think 14 floors, we had a fire. After the fire there were some questions about the structural integrity of the building. So we did some very unique static testing. We loaded an upper floor with hundreds of wheelbarrows of sand to see if it would deflect.

Mel Phelps: In July of 1960, the monolithic IC using a planar process had come along and it was clearly superior. I made a trip to Europe. We were greeted like rock stars. There were flash cameras going off at the airport. You can't believe it. By the time we got to Paris, there was a room probably twice this size full of people with everybody with earphones on getting translations.

Jerry Sanders: I got into an altercation with Tom Bay about transferring an epitaxial reactor to National, when we were short of exitaxial capability. Charlie had had a commitment from Tom that he would give him the system and I said you can't do that, we need the capacity. Tom grabbed me by the shirt, by the tie and strangled me, and said "I made a commitment, my commitment counts." I said "yes sir" because he was two inches taller than I was, and I wasn't in a good position. I think I was stronger but he was the boss.

Jerry Sanders: What I remember the most is how young everybody was. When I joined Fairchild in '61 I was 24 years old, Gordon was 32. I think Bob Noyce and Charlie Sporck were 34. Tom Bay was around 34. This was a really, really young, young group. The belief of everybody was there was nothing we couldn't do. Everybody was just full of energy. And Fairchild was on its way to being the most important company in Silicon Valley history.

Jerry Sanders: We went over to Bob Noyce's house and the first thing I saw was he had a waterfall in the backyard, which I thought that's unusual and that's because somebody had put a freeway up nearby and he to put a waterfall in so he wouldn't hear the freeway noise. Now, most of the people I knew didn't put in waterfalls when somebody built a freeway nearby. They turned the radio up.

Laurenz Schmidt: I was quality manager in South Portland in 1985. Quality was a little bit different then than it is today. One customer returned some ICs with a complaint that there were no bond wires in the package. A junior customer quality engineer wrote back to the customer, "Are you sure you ordered them with such?" There was some damage control that needed to be done afterwards.

Harry Sello: The most interesting assignment was the one Bob Noyce gave me one day after appearing in my kitchen. He said, "Next month, you are due at SGS in Italy. You are now the operations manager." And I said, "How much time do I have to get there?" He said, "Well, you can take the next few days to go over and get acquainted but, at the end of the year..." and there were two more weeks left, "...we want you moved over there." I think this was typical of Fairchild of the period.

Bob Skurko: I'm in Japan and a man came and hit us broadside. It was a fairly bad accident but none of us were seriously hurt. My son had a slight cut. But the police came and it was a major deal. It took hours and hours before I got home. The next day at work the door opens and here comes a flock of people, mostly businessmen and a women and a girl. They come in bowing and scraping and said, "Skurko-san, we have a problem. The man that hit you, he's in jail and they will not let him out of jail unless you forgive him." And I said, "Well, I don't what the law is in Japan. I just got here." He says, "Well, if you don't forgive him, he won't get out of jail. And his daughter here will not get married." I said, "Hey, let him go. Let him go."

Murray Siegel: I met with Vic Grinich in my motel room, and we started kicking around what we would have to do to set up an applications lab. He said, "We need work benches" and I said, "Well, I work standing up all the time" So we designed a bench height that came right to our belly button. That became a standard in the Valley.

Elliott Sopkin: Marketing technology was a new sport. It was the frontier. It indeed was the Wild West and I was lucky enough to be right in the middle. No one had ever done technical marketing like this before. Somebody decided that transistors and integrated circuits could, indeed, and should be sold like soap, like cereal, just like any retail product. Now the circuits that Fairchild was making were important, but not necessarily obvious to those who would use them. Contrary to what the designers thought, Western civilization could make it for another day or two without these circuits. An integrated circuit had no inherent value unless someone else put a value on it and was willing to pay for it. So we hired a hot shot Los Angeles retail advertising agency, their name was Faust Day and turned them loose. Faust Day branded Fairchild. The campaign was magic. Semiconductor advertising would never be the same.

Rob Walker: I'm going to talk about how Fairchild invented ASIC and CAD. By that I mean standard cell, I mean gate arrays, logic simulation, place and route, LSI testers, and interestingly enough about how many [industry observers] deny that this ever happened.

Garth Wilson: We quickly learned the truth of a little homily that goes something like this: If you're working at Fairchild R&D it's easier to get something transferred to Sunnyvale than to Mountain View. For those of you who don't get the subtleties, Mountain View is where the Fairchild factory was; Sunnyvale is where the start ups were located.

Doug Usher: We spent a week putting a presentation together for Sherman Fairchild and we went to the airport at Frankfurt to greet him. And Sherman, who was, I don't know exactly, 70, 75, years old walked off of his plane with two young women about 25 years old, one on each arm. He came for the presentation, sat in the front row and fell asleep immediately and slept through the whole presentation. All of us went through it word for word. And then when it was over, people applauded and he woke up.

Entered By: David Laws
August 3, 2008

Title: Bob Beeson's transmission line!
Author: Isy Haas
Created: October 27, 2007
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Story:
Bob Beeson (Employee no. 69) was one of my fellow electrical engineers reporting to Vic Grinich as one of the application engineers. I am sad to say that he lost out to cancer a few years ago.

Bob and I were working on "fast" transistor switching at the time: he was working on high speed "current steering" (non saturating) circuits and I was working on the evaluation of "avalanche switching speeds" for various transistors. The fastest oscilloscope at the time was the Tektronix 545 scope, but this was not fast enough in "synchronizing" the sweep to the leading edge of the signal (standard procedure at the time).

So Bob figured that if we could get a "low loss" transmission line to delay the signal back to the scope "after" the scope had "locked" on the leading edge we should be able to view the entire signal. Bob searched through the catalogues and ordered the right length of a low loss transmission line. A couple of weeks later he got a call from "shipping and receiving" to come get

his transmission line. So he did, but came back to fetch me a few minutes later laughing himself in stitches!!! I followed him to shipping and receiving, and there was the transmission line, on a reel, sitting on the bed of a 16 wheeler!!!!!!!!!!!!!!!!!

I don't know where that transmission line rests today!!!!!

Isy Haas (Employee no. 89)

Editor's Note: Bob Beeson was co-author of the paper (Ruegg, H. W. and Beeson, R. H. "New Forms of 'All Transistor' Logic," Fairchild Semiconductor Technical Paper TP-21 (1961)) that inspired Tom Longo, then at Sylvania, to design the SUHL family of TTL circuits, the forerunner to TI's 7400 Series. See: http://www.computerhistory.org/semiconductor/timeline/1963-TTL.html

Entered By: David Laws
October 27, 2007

Title: Job Interview With John Ready
Author: Floyd Harris
Created: September 4, 2007
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Story:
After working at Motorola Semiconductor in Phoenix in hi-rel life test I had become aware of the superior reliability demonstrated by Fairchild Semiconductor products and sent them a resume; with the hopes of finding a position in marketing. Because of my background I interviewed with Ed Thompson in Quality Assurance for an opening at the San Rafael plant. I was given a few minutes at the end of the day to speak to John Ready. After about 10 minutes with John, he determined that I would fit into his group and offered me a position in product marketing. That interview gave me the opportunity to report to John Ready, who was a wonderful role model and teacher. The 2 years at San Rafael were two of the most exciting ones in my career in this industry. I left San Rafael to work with the Fairchild Semiconductor representative in Denver, Hyer Electronics, and was very successful selling against Motorola and other competitors in that market.

Entered By: Floyd Harris
September 4, 2007

Title: Giving away Money
Author: Robin Hodge
Created: November 9, 2007
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Story:

My wife and I had just spent a week on Interstate 80 driving from Toronto to San Francisco in a 62 Buick, and had signed a year's lease on an apartment in the Sunset District. We had been interviewing all over the Bay Area for a couple of weeks when I saw an Ad in the Chronicle for a Manufacturing Engineer at Fairchild, San Rafael. I dropped in there on a Friday in October 1965, and brushed up on what a diode was from the literature in the lobby. After interviewing all day, I wound up in the office of the Plant Manager, Jim Diller. He was proud to show me that he knew exactly the cost of each of his products from a series of prime cost sheets. I thought he might need decaf because he was very intense, but I later found out that it was his natural condition. The following Monday the HR guys called to offer me the job. They told me in Canada to ask for a

larger salary in California because they pay more. So I had jacked up the request to HR from $625 Canadian to $750 per month US. When the offer came in at $825 per month I thought this could be a good gig. My other offer at the time was at a toilet bowl manufacturer in Oakland. I took the Fairchild deal because the commute and the money were better. Who knew what the job would be like? There's a lot of Ceramic in both of them. A few days later I dumped the Buick and bought a new 1966 MGB for the ride to work over the Golden Gate Bridge.

The next four years was a wonderful time at the Diode Plant. It was like the United Nations without the corruption and incompetence. All kinds of brains were draining into the Company from Europe. We had Dave Marriot, Trevor Smith, (Brits), Mario Scavino (Italian), Bernie Boussynouse (French), John Eisenhoffer (Austrian), Horst Muenzenberger (German) and a few Americans. I was working for Herman Martin and Ray Brown and gradually progressed into Product Engineering . It turned out to be the broadest apprenticeship in semiconductor manufacturing one could hope for. We were assembling TO18 and TO5 cans , Cerpacs, Cerdips, DO7, GMD, Plastic Dip, a Photo Sensor and a custom plastic package for the 16 diode air isolated array. I was even pressed into working on hardware in Wafer Fabrication. They were trying to simplify what they referred to as a "jungle" hanging on the back of the diffusion furnaces. It consisted of a lot of bent glass tubes, flasks in heating jackets, and flow meters, all held together with grease and clamps. The whole contraption was always leaking and causing gross variability from wafer run to run. We mounted banks of Matheson flow meters to a solid frame which began to resemble later models of diffusion furnaces. I also remember trying to prevent the hot chromic acid resist stripping stations from corroding everything in the hoods including the hot plates. I found out that a splash from such a station also eats a hole in your pants in about 10 nanoseconds!

In 1969 I returned to the UK to show off my new son, and while working at Texas Instruments I discovered that if you get a critical mass of Brits in one meeting, nothing gets decided. After 11 months, I couldn't take the slow pace and returned to Fairchild Diode who kindly reemployed me. But a short time later, the business was in recession, so every Friday afternoon if you heard your name being paged over the intercom, you knew your job was toast. That was the end of my stint at Fairchild but it was a great ride. It was common at the time for folks to get riffed at Diode on Friday and get hired in Mountain View on Monday for more money! What is it with those HR guys? That was not my lot.

A few weeks later, I got hired by National Semiconductor (for more money) working for Bob Beard, Nelson Walker, Pierre Lamond, Ed Pausa, and Charlie Sporck. But that's another story.

Entered By: David Laws
November 9, 2007

Title: Were 1970-71 events visible signs of the beginning of a major inflection point in the business?
Author: Mike Humphries
Created: August 24, 2006
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Story:
It is possible, and based on surrounding events likely, that I happened to join Fairchild in 1970 just as it was poised to lose the position of industry leadership that it had enjoyed for many years. Or more likely, it was just that it was finally to a point that it was becoming obvious to even a 22 year old rookie.

Or maybe the real turning point was the exit of Jerry Sanders a couple of years earlier to start AMD. Those that were there said that Fairchild parties were never the same ever again.

I was recruited my senior year as a EE at Georgia Tech by Fairchild to join product marketing for advanced digital MSI devices. Being an unsophisticated 22 year old, I was not savvy enough to do a lot of research about the industry and Fairchild's position in it. But externally all the people that I met during my two day visit in Mountain View were very smart, and very agressive about planning and executing product strategy.

Part of my interviews were conducted at the Wagon Wheel. Even impaired by large amounts of chilled alcoholic beverages, the Fairchild manager conducting the interview there had a compelling story on why I should join them. It was good to be introduced early to the Wheel, since a large part of the culture was played out there any week-day evening of the week, and that was destined to be a big part of my future.

Most of the people I met at the beginning of my time at Fairchild went on eventually from Fairchild to do extraordinary things. Mike Markula, Mike Scott, Hank Smith, Don Bryson and John Springer all did great things at AMD, Intel, Apple Computer and other successful companies. In my case I was not certain what I would learn from working with these people, but I was pretty sure that it would be worthwhile. And at the top were industry icons Lester Hogan and Wilf Corrigan.

I was barely there 4 months when it became clear that Texas Instruments had turned a corner, won in competition with Fairchild some significant MSI orders and effectively become the industry standard (5400/7400 I think) for TTL digital MSI, the base components for digital computers and devices that had to compute for military and commercial uses. I am pretty sure that I was not the cause in my short tenure. Fairchild had cool products, but TI had won the sales edge and the confidence of buyers, so it seemed pretty clear we were not the leaders anymore. It worked OK for Avis, but Fairchild egos were not cut out to be Number 2.

Layoffs began. Significant layoffs. Some of the people recruited at the same time as me were laid off, and because Fairchild laid off on the installment plan-a little each week, pretty soon people were spending most of their time wondering who was next. It was a really harsh exposure to the real world for a (now) 23 year old like myself to see such a smart and talented bunch of people defeated. I myself survived layoff, but the cost was inside exposure to a group that remained with deflated confidence and energy.

Mike Markula, Hank Smith and Don Bryson left for Intel. John Springer followed Jerry Sanders to AMD. Hank later went to VenRock to become the first venture capitalist I ever knew. Markula, Scott and Bryson went eventually to Apple (Markula essentially founded it when he arranged to get it out of a garage and funded.) I was flattered to be offered a product marketing spot at Intel but by that time made a decision to leave semiconductors and join Tymshare, where the world of computer services and software applications looked to me like a new, better direction for my sales career.

I have no regrets about my original decision to join Fairchild-advice and knowledge from the people I met there influenced the rest of my career. I just wish I could have joined a couple of years earlier than I did to have been able to be experience the major success that Fairchild enjoyed then.

Even two short years at a major industry icon like Fairchild was sufficient for me to glimpse how events, innovation and influence at top mover and shaker companies shaped what was to become known as Silicon Valley. It helped me to understand in 1984 what we would go through at Oracle going from $10M to almost $1B in sales.

I hope the memory of Fairchild's accomplishments and truely outstanding people will continue through the years ahead.

Entered By: Mike Humphries
August 24, 2006

Title: Walker's Wagon Wheel
Author: Mike Humphries
Created: June 11, 2007
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Story:
I hope others will write their recollections of the Wheel-I know there are better stories than mine!

My introduction to the Wagon Wheel was early. On my recruiting trip out to Fairchild in February 1970 while I was still a senior at Georgia Tech I was taken to the Wheel at the end of a day of interviewing on Ellis Street with various Fairchild people. The guy who took me (and later became the president of a well know Silicon Valley icon) proceeded to get seriously drunk in a very short period of time. Since that is also what I was often involved in doing the last few months of my college career, I thought it was pretty cool, and probably as planned it left a positive impression on me. I also learned that when I went out for drinks with this same guy in the future, I needed to make sure that I was driving.

The Wheel was really not very large. But it was the only bar nearby, and it had become established as THE watering hole for the semiconductor crowd. Lore about the Wheel for those who had not been there would make you think it was a large beer garden kind of place. But it was not. It made up for it by packing people in like sardines. Getting from the front to the men's room in the back could be a 10 minute ordeal squeezing through the crowd.

At the Wheel, if you were a little late (6pm) the main parking lot was guaranteed to be full. So you had to park across the street. That meant that Darwinism was at work later in the evening when you came out after drinking for hours and had to cross a reasonably busy Middlefield Road. It must have improved the industry gene pool considerably over the years!

The Wheel was a true mixing place. There was everybody from CEOs and VPs to ladies (and they all were) in blue smocks. I used to wonder why they didn't remove them after work. It turns out that wearing a smock was pretty useful on many occassions at the bar. Plus in some cases, there was not a lot they were wearing under the smock!

Although a lot of people went to the Wheel evenings, by 7pm the ones that were married went home unless they were entertaining a customer, or were on to some particularly hot gossip or insider information. The rest that remained until 8 or 9 were the unmarried group, or the soon to be single group. Either way, it was a different crowd after 7pm.

The Wheel was a real body press many evenings. If you had a good spot at the bar a lot of people ordering drinks circulated by. We all wore suits and ties then-there was no exception. Since a large part of the population smoked back then, the polyester suits that were so popular in the early 70's were a real hazard. I got a burn in the back of the jacket to what at that point had been my favorite polyester suit. It helped convince me that wool really was better, since I never got a burn in one of them. It was a catalyst for me to upgrade my wardrobe.

Friday night was a big night at the wheel, and if you were single, it was an opportunity to line up a Saturday date if you had not already done so. There was no such thing as female engineers then, and very few others in any other spots except secretaries and the afore-mentioned blue-smocked line workers. So we met a lot of nice secretaries and assemblers. As assembly migrated out of the US it cut down on dating material, and forced a reassessment of one's social life. It turned out to be not a bad thing.

Back in 1971, there were no ATM's. So you had to remember on Fridays to get to the bank before they closed at 4pm, and cash a check. I used to cash one for $25. Believe it or not, it was enough for drinks at the Wheel for hours on Friday, and also covered a dinner date on Saturday night. I think a steak dinner at Chuck's in Los Altos was $8 each!

Please add your memories of the Wheel-for a lot of us it was our version of the private club that we did not have.

Entered By: Mike Humphries
June 11, 2007

Title: My semiconductor life at Fairchild and beyond
Author: John Husher
Created: October 27, 2007
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Copyright:

Story:
Prior to joining Fairchild, I was at Westinghouse where I made the first monolithic integrated circuit in 1959. It was called an FEB (functional electronic block). It predated any patent that Fairchild or TI had at the time. I was also General Manager of Sprague Electric Integrated Circuits in Worcester Mass.

I went to Fairchild in 1968 when the management from Motorola came to Fairchild. I had the responsibility of the South Portland Maine plant, Shiprock New Mexico plant, and Mountain View Digital. I was responsible for the Singapore Facility also. In 1982 I went to a test company named Micrel Test and took a small building and put them in the Integrated Circuit business. I left in 2002 when I was 70.

I have written four books and the first one was about my twin brother and my experiences that led to success for the two of us. The name of the book is "By a River, On a Hill." This book covers my experiences with Fairchild from 1968 to 1974, and then from 1976 to 1982. There are several funny stories in the book about Fairchild. Some not so funny, but fact. The other three books are not about my life - "Heroes Afar," "Beyond Global Warming," and "The Wonder of Life." The last book is just going to the publishers.

Some Fairchild related anecdotes from "By a River, On a Hill" follow:

1) In 1968 when I joined Fairchild they told me my first function was to go to South Portland Maine and fire John Sussenberger. I asked them why and they said that he had been transferred from Hong Kong and sent to South Portland to run that factory and he doesn't know anything about Intergrated Circuits. In my book explained how I went to South Portland and reviewed everything in the operation and came back and they asked if I had fired John and told them, "No, he is an excellent manufacturing manager. I will hire some product engineers to work for him and they will take care of the technical things."

2) I made out a list of equipment that I believed would make South Portland and Singapore great production facilities. It came to about $14 million dollars as best I can recollect. I happened to be in the Rusty Bucket just after it had been opened and the only person besides me in that building was Les Hogan. I went to Hogan and showed him my written listing of equipment needed to make these places production worthy. He thought it was a good idea. When I started to order things like Terradyne testers for S.P. the accounting people came and said I couldn't buy those things without a PPA. I showed them Hogan's signature on the bottom of my request and they went away.

3) In about two weeks I got a call from the Fairchild Test division and they told me I couldn't buy Teradyne testers. I had to buy Fairchild test equipment. I told them to go and speak to Hogan. Hogan called me and we talked for about 5 minutes. He then put out a memo that said that any manager that was responsible for a P&L could purchase test equipment from any one they chose to.

4) They fired John Carey and called me on the phone after I had been there about a month and said "we just fired John Carey, go and talk to Tony Holbrook the engineering manager and do what you can to keep him.

5) After looking at the death trap that Mountain View had for epi inside the Mountain View plant, I decided to have them tear it down and replace it with a safe building that people could get out of. I used the Purchase Order that Hogan had signed to pay for it.

6) John Sussenberger couldn't get the three product managers to do what he wanted and didn't understand the reason why he was having so much problems with them. I told him to never talk to more than one at a time because what one wouldn't think of the other ones would. He tried this but in about a month he called and said they were driving him nuts. I went up and spent another week looking at the various people in the plant and told John to make Jim Smaha the Operations Manager. He said, "Jim is my QC manager, what does he know about the products?" I told him that all the testers were under QC control and Smaha knew more about the products than anyone. I also said it would be popular since Jim was from Maine. He told me "No way". In about a month he called me and said he was going to make Jim the Operations Manager.

7) I hired Paul Regan from Raytheon and made him the Mountain View manager for digital circuits.

8) Joe Van Poppelan was made the General Manager of the Semiconductor Division allowing Hogan to step away from that position. After two weeks Van Poppelan called me into his office and said, "Do you know that you run 90% of the revenue for this company and I can't have one on one management. So, I am making John Sussenberger the manager of S.P., Reagan manager of Mountain View, Paul Driscoll the manager of Shiprock and I forget who took Singapore. I was left with nothing but to report to Wilf Corrigan.Later, after Tom Longo came to Fairchild he named me the Director of the Linear Group. Later Corrigan became President and he made 5 divisions of which one was called the Analog Division which had Linear, High Rel, and Automotive. After this I went to AMD and then back to Fairchild in 1976 and became the General Manager of CCD and then left in 1982 to start Micrel into the integrated circuit business. They were a Test company doing about $2 million a year.

The biggest thrill I got out of all this was that when National bought Fairchild they closed down many of the operations but not the South Portland one. Then when South Portland got the chance they bought themselves from National and became Fairchild again. The place was set up right for production and I was proud of that.

Take care, ========== but have fun.
John Husher

Entered By: David Laws
October 27, 2007

Title: 'Fairchildren' tell tales out of school
Author: Ron Iscoff
Created: October 10, 2007
Cataloguer:

Copyright:

Story:
'Fairchildren' pack Computer History Museum to reunite and tell tales out of school on the company's 50th anniversary

By Ron Iscoff, Editor Chip Scale Review, Oct. 10, 2007

MOUNTAIN VIEW, Calif.- It was an evening of pure nostalgia last Friday as a trio of Silicon Valley's living legends took to the stage to present recollections from the early days of Fairchild Semiconductor and Silicon Valley. Regaling the audience of perhaps 2000, most of them "Fairchildren," Dr. Gordon Moore, Jerry Sanders and Wilfred "Wilf" Corrigan, captivated their former co-workers with stories, anecdotes and historical facts. Dr. Moore, the late Dr. Robert Noyce, and six other employees of Dr. William Shockley's Palo Alto semiconductor lab were branded the "Traitorous Eight" when they left Dr. Shockley to join Fairchild Semiconductor in Mountain View-not far from the Computer History Museum, the anniversary site for Fairchild's 50th year celebration. Both Sanders and Corrigan were Fairchildren: Sanders was in charge of sales for the Los Angeles territory and Corrigan became president, chairman and CEO of Fairchild after Drs. Moore and Noyce left to form Intel Corp. Later, Sanders founded Advanced Micro Devices and Corrigan started LSI Logic, now LSI Corp., and fabless.

The trio was on a panel to explore the legacy of Fairchild, moderated by Floyd Kvamme, ex-National Semiconductor and Apple Computer executive. Kvamme asked Dr. Moore how Fairchild Semi decided to use Silicon, instead of one of the other materials that was popular in the early 60s, such as germanium, copper or GaAs. "I think I would have to blame Shockley for that," said Dr. Moore. "He decided he would set up a company devoted to doing silicon." Shockley, Dr. Moore added, "was an unusual personality!"

Moderator Kvamme asked Jerry Sanders, "What stands out in your mind when you joined Fairchild in 1961?" "How young everybody was," responded Sanders. "I was 24 years old; Gordon was 32; I think Bob Noyce and Charlie Sporck were 34. This was a really, really young group!" The reality, Sanders added, "was we all believed there was nothing we couldn't do; everybody was full of energy."

Sanders told the audience how he joined Fairchild from Motorola. "Bob Major, who is here tonight, was the Fairchild area manager in Chicago, where I was selling semiconductors (for Motorola) and I guess I was giving them a bad time." Sanders said Motorola had "this wonderful product, the 2034 silicon epitaxial transistor that they couldn't deliver but - as many of you know-that never stopped me!" Invited to interview in California for Fairchild, Sanders said he accepted the offer mainly so he could visit Las Vegas over the weekend. "I met Charlie Sporck, Tom Bay and Bob Noyce, and I got terribly drunk with Don Rogers, who was the sales manager for Fairchild, at Tiburon Tommy's." Sanders said he accepted the job as district sales manager - "not for Chicago, but for Los Angeles - much to the chagrin of the then-current sales manager in Los Angeles!"

Corrigan, who had also worked for Motorola, was asked what it was like to compete with Fairchild in those days, before he joined his competitor. At the time, Corrigan recalled, he was also young, only 23. He came to Silicon Valley to interview with Gordon Moore. "Bob Noyce wasn't around at the time, so I didn't see him." He did see Charlie Sporck, who then worked for Fairchild, but later went to National S e m i c o n d u c t o r. "Charlie with his big cigar seemed terribly old to me," said Corrigan. "He was 32 at the time!"

Sporck, who now maintains homes between Hawaii and upper New York State, was not present for the Friday night panel but was scheduled to appear at the final day's events.

Kvamme told Dr. Moore he wanted to discuss something "slightly more serious," the issue of immigration. "How did so many foreign engineers become entrenched in Silicon Valley," Kvamme asked. "You can blame our graduate schools for that," Dr. Moore said. "We hired the best people we could find from (U.S.) schools." The number, however, was not sufficient to fill the engineering jobs. Condoleeza Rice, while she was at Stanford, once visited Intel. When she saw the mix of workers, Dr. Moore reported, she said, "Wow, this is like going to the United Nations!

Entered By: David Laws
November 15, 2007

Title: Memories of John Ready
Author: Friends of John
Created: February 5, 2007
Cataloguer:
Copyright:

Story:
The following messages are from friends of John Ready on learning of his passing on February 1, 2007. A memorial service was held at St. Simon's Church, Los Altos on February 5, 2007.

From Murray Siegel

Time continues to take us one by one and it's always hard to say so long for the last time to a member of the "gang". We worked and played hard. The competition was the bad guy and we were the heros. No matter how long the separation of time since we last joined hands together the sudden news reminds us of those days spent in working together to solve a problem, close an order, or just commiserate over failures of the day. John had a great disposition and was always fun to talk with. It's too bad that we won't see his smile at the next gathering of the "clan," like many others of the team, he will be sorely missed.

From Floyd Kvamme

John was truly a great guy who always expressed the optimism of the Valley.

From John Richardson

John was a colorful guy who had many loyal friends. I feel really badly I cannot be there to celebrate the life of another legend of our industry.

From Jim Smaha

John was one of my first real 'Mountain View' Fairchild guys I got involved heavily with, being from the FSC Portland, Maine plant. He left a very positive & lasting impression on me. He was always a class act !!

From Dick Bader

I am so sorry to hear about John. I figured John was immortal and would last forever.

From Geri Hadly

I worked for John Ready in the Hi Rel group when we were located on the corner of Wisman and Middlefield Roads. John made a strong and positive impression on me in my early days at Fairchild and I was looking forward to seeing him again at the 50th reunion in October. I am sure many will have fond recollections of him.

From Nick Phillon

John was my boss when I was in charge of the applications lab at the diode plant. I loved him. He was colorful, he was exciting. I learned marketing from him, we made many business trips together. After two years at the diode plant he told me one day "Nick, I hate to lose you but you deserve new experiences and you should go to Mountain View. Tell me where you want to go and I will help you." He did recommend me and for a job in Mt. View, which I got. I have always remembered fondly John and our times at the diode plant.
May God rest his good soul in peace.

From Bill Strickland

Thanks for including me in your notice of the passing of John Ready. I am always saddened by the loss of those who helped make Fairchild the great company that it was to work for. One of my first personal assignments at Fairchild in mid-1967 was to hire 150 production workers per week into John's organization until he reached his full complement of operators. I worked seven days a week for several months and finally filled all of his requisitions. Along the way what never stopped was what I affectionately called the Friday Night Fights, i.e., the weekly call to John passing along the number of scheduled starts for the coming week. We did a lot of screaming in those days. Ultimately, John was the first person at Fairchild to thank me...for anything.

Entered By: David Laws
February 4, 2007

Comments:

From: Floyd Harris
Date: Sep 4, 2007 @ 11:28:35 AM
Subject: Shortest Interview I Ever Had

After interviewing with quality assurance in San Rafael nearly all day I was sent to talk to John Ready in sales for a few minutes. After about 10 minutes John Ready realized I would fit into his group and he offered me a job in product marketing. It was the shortest interview for what became one of the most exciting positions in this industry for me. John was a great role model and teacher for me.

Title: Chronology of the first Micrologic devices
Author: Jay Last
Created: October 17, 2006
Cataloguer:
Copyright:

Story:
In response to an e-mail question in October 2006, Jay Last describes the chronology of various version of the first Micrologic device below:

The first [working Micrologic] devices were made in May 1960 by physical isolation. During this time we made "hundreds" of devices. Isy Hass and Lionel Kattner began work on the diffused isolation version in September. I think the first successful devices were made by this technique in October or November. I have notes on this someplace. The early physically isolated devices were difficult to make, but they at least demonstrated that integrated circuits could be made -- that transistors could be isolated and could be interconnected on the surface of the chip. None of this

was easy and yields were low, but it encouraged us that we were on the edge of something that was going to work.

Devices were shipped in very small sample quantities for several months after the product announcement in March 1961. The round device was used originally because we wanted to make the package as small as possible, and put it in a very small TO-18 can. This proved to be too hard to put in circuit boards, and so the device was put into a larger more standard TO-5 package. The device illustrated in Life magazine in March 1961 was the epoxy (physically isolated) device in a TO-18 can, and I imagine that the first sample devices were in this form. I think only the four transistor flip-flop was made in the round form.

As the rest of the Micrologic family was completed throughout 1961 they were made with square chips in the bigger package. I doubt if any operating hardware was made with the round chips. It was probably the summer and fall before much hardware was made. I have a December memo someplace pointing out that devices were being shipped in reasonably large quantities at that time.

Entered By: David Laws
October 17, 2006

Title: Simpler Times and almost the largest diode order in history
Author: David Laws
Created: September 11, 2006
Cataloguer:
Copyright:

Story:
I joined SGS-Fairchild in South Ruislip near London, England in 1966. After 2 years in marketing and sales, Bill Welling rescued me from a lifetime sentence of English weather and cooking in 1968 and hired me as a Headquarter Sales Engineer in Mountain View. My yearly salary was equal to that paid to the Prime Minister of England. Thank you, thank you, thank you, Bill!!!

My first weekend was spent at the Monterey Pop Festival enveloped in a cloud of strange, sweet-smelling cigarette smoke watching Janis Joplin and band members of Big Brother and the Holding Company down a whole bottle of Southern Comfort during an extraordinary twenty minute rendition of "Me and Bobby McGee." The next week I discovered Bill Graham's Fillmore in San Francisco where Jimi Hendix was performing. Ken Kesey and the Merry Pranksters were terrorizing the residents of La Honda while Roy Kepler, of Kepler's Books, taught courses on non-violence to the likes of Joan Baez. Around the Stanford campus, the Midpeninsula Free University offered a curriculum of bee-raising, bread-making, massage, meditation, psychedelic dancing, and yoga. A simpler but memorable era!

My job was to sell anything that was not bolted down to any customer who would pay money up front west of the Rockies. This included bent silicon wafers to National (Charlie didn't want to pay for straight ones) and out of spec packages to AMI. One of the more enterprising characters, Arnie Aplebaum, made a lot of money selling "repurposed" reject power transistors to the military. He sawed the top off the metal can, removed the die and then mounted two side-by-side onto a new header wired into a Darlington configuration. This device produced sufficient gain to ship against a mil spec that he had somehow managed to gain approval on.

I very nearly closed the largest diode order in history with Joe Patridge (I'm pretty sure that's who it was) who at that time worked for Burns and Towne. B & T had an operation that purchased fallout devices and re-screened them to sell to Hong Kong radio manufacturers. Those that did not work at all would be mounted in unconnected sockets on the pc board. These radios could then be advertised as 12 transistor models to consumers who did not know that only 6 or so of

the transistors actually did anything. Anyway, back to the diode story. Ever since the diode plant had opened in San Rafael in 1959 reject devices had been stored in barrels in a warehouse next door. We estimated that these barrels held close to 100 million diodes. B & T knew that they could sell many of them as stabistors and reclaim the rest for their precious material content. We agreed a price that was approved by Tom Bay but by the time the P.O arrived in August of 1968 so had Hogan and crew. The new management thought that they could find a better deal and cancelled my potential historic order. As far as I know, when I left Fairchild 4 years later San Rafael was still paying to store the diodes in the rented warehouse.

While working on this deal I was taken on a tour of the San Rafael facility. It was a typical 1960's semiconductor plant where you could walk into the fab, test, and assembly areas in your street clothes. The exception was the wafer sort station. There you were best outfitted with a pair of rubber boots. Test engineering had figured out that most electrical failures were caused by voids in the die metallization. So rather than perform an expensive electrical wafer sort, they scribed the die and dropped them into a bucket of water. The metal voids trapped bubbles of air that caused potential die failures to float to the top. These were skimmed off and the good die at the bottom moved on to the assembly line. Simpler times indeed!

Entered By: David Laws
September 11, 2006

Title: My friend Douglas A. Tremere
Author: Otto Leistiko
Created: September 23, 2007
Cataloguer:
Copyright:

Story:
Name: Douglas A. Tremere
Year Deceased: Ca. 1981
Year Of Birth: ca. 1931
When at Fairchild: ca. 1960 - 1970
Last position at Fairchild: Member of the technical research staff
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Douglas you are one of my very best friends. You were a real renaissance man; well read and highly informed, extremely intelligent and incredibly funny when you wanted to be.

I will never forget the time when at one of the usual Friday meetings at Fairchild R&D on Miranda you came into the meeting just a couple of minutes late. Gordon Moore (Head of R&D), Vic Grinich, C.T. Sah and several other group leaders were already there. I should hasten to mention that you Douglas and I were junior junior engineers at the time, in short, nobodies.

You walked in looking a little serious, laid your patent notebook down; we always had our patent notebooks with us at R & D meetings. You stood at the end of the table then looked all around the room. You then said, without the slightest smile. "I suppose you are all wondering why I called this meeting"! Everything became deadly silent for a few seconds, then everyone exploded in laughter. No one could stop laughing but, after a few minutes we came to senses again.

Gordon then said in his quiet and somewhat tentative way, "Well, maybe we should get on with the short reports, I think you might just as well start, Doug". I don't remember anyone laughing at that moment but, I have never seen so many smiling faces at a R&D meeting as on that day.

Thank you Douglas.

Submitted By: Otto Leistiko
area code: +45
Phone: 45890561
email: leistiko@post9.tele.dk
Entered By: David Laws
September 23, 2007

Title: Jerry Levine & the Hong Kong plant
Author: Jerry Levine
Created: October 12, 2006
Cataloguer:
Copyright:

Story:
An e-mail message from Jerry Levine received on 10.12.2006

I joined Fairchild at the time that Bob Noyce became VP & General Manager. I started as Admin Manager at the then new diode plant in San Rafael. I then became Manager Administration & Planning of FSC in Mt. View, and evolved into International Manager as our relationships with SGS and the license with NEC evolved.

I launched the feasibility study of an Asian facility, went to Asia on my own dime, and stayed until the project was approved after visits to Hong Kong by Julie Blank with Charlie Sporck.

As I recall, we had 800 employees in Mt. View in 1963 and two years later there were 5000 in Hong Kong and 3000 in California.

During the years in Mt. View, most of us on the "Executive Committee" worked late, and a few times a week I would stay over at the Noyces since I was a bachelor with digs in San Francisco.

Entered By: David Laws
October 12, 2006

Title: Lunch with Bob and Jay
Author: Lars Lunn
Created: October 26, 2007
Cataloguer:
Copyright:

Story:
In December 1957 I was looking for a job in the Bay Area and went for an interview at Stanford Research Institute. They did not have any openings but the guy I talked to told me that he had heard about a new company started at Charleston Road, and suggested I tried to go there.

I drove down to Charleston and arrived just at 12:00 noon. I remember sitting in the car and contemplating if I should go for a hamburger and come back at 1:00 p.m or go in? I decided to go in and in the door met two guys on their way out who asked what I wanted? I told them I was looking for a job and they said OK, come along and have lunch!. It was Bob Noyce and Jay Last and we went to some restaurant on El Camino and talked about Europe, they had never been there and how I liked the USA, About skiing and life in general. They

looked at my papers that were all in Danish or Latin, and were incomprehensible to them, and on return to Charleston Road they said, OK, You are hired!

This was the first and only time I have had the feeling of being evaluated solely on my own behaviour. Of course this being America, after three month they could have said OK, You are fired!

I stayed for 3 years, building the crystal-grower with Jack Clifton and working for Sheldon Roberts. During the next two years I grew all the crystals that were used for production and different research projects, of all orientations, resistivity and type

October 26, 2007
Lars Lunn
Entered By: David Laws
October 26, 2007

Title: Betty couldn't get into the car
Author: Lars Lunn
Created: October 26, 2007
Cataloguer:
Copyright:

Story:
In 1958/1959 some friends at Fairchild Research on Charleston Road, Shirley Beson, Gary Trip, Otto Leistiko, Nancy Johnston, Bob Noyce and others started a Bottichelli Club, for friends of classical music, where we played records that the others should guess what was. Beethoven symphonies played on piano for four hands, violin sonatas played on harmonicas or unknown music by well known composers and similar oddities.

One Botichelli evening at my house on the La Honda Road above Woodside Nancy brought her new Sprite, a small English sport car and when Bob saw it upon leaving late at night he asked if he could try it out and bring to work next morning. That was OK with Nancy but next morning I had a call from Bob's wife Betty, who said that Bob had taken her car to work or to a meeting and left the Sprite for her, which was fine, except that she was 7 months pregnant and could not in any way get into the car.

October 26, 2007
Lars Lunn
Entered By: David Laws
October 26, 2007

Title: A long skinny Englishman
Author: Lars Lunn
Created: October 27, 2007
Cataloguer:
Copyright:

Story:

Sometime in the summer of 1958 Jay Last came through the Research Laboratory on Charleston Road with a long skinny Englishman in white T-shirt, white shorts, white socks and tennis-shoes. This was in the days were we all dressed in white shirts and tie, so it made quite an impression. The person turned out to be David James, a young PhD from England, the "Brain Drain" was in full swing, on his way through North, Central and South America by Jeep. He had heard about Fairchild Semiconductor and would like a job when he came back from his trip some month or years in the future.
We went out to lunch and the conclusion was that he could have a job when he returned at an unspecified time, and nobody expected to se David again - but he turned up some month later to claim his job. He had got into trouble with the car papers somewhere between Columbia and Ecuador and was forced to give the Jeep to the local military at a big ceremony and get out of the country.

David started Signetics some years later with Mark Weisenstern. They sent the proposal to the Senior Partner in a large financial institution and did not hear a word back. When Dave called the firm to inquire if they had received the letter, it turned out that they had addressed it to a partner, that had been dead for 25 years. Dave got a live partner to contact and they got the funding.
Dave James was the inspiration for my own trip down the Pan American Highway in 1961. Coming from Europe I was not to happy with two weeks vacation and 6 paid holidays, so I went to Bob Noyce and asked for a year leave of absence for the trip and what he thought about the idea? He said: "Do it, I wish I could go with you. Do it now, before you know it you get married and have kids and can't get anywhere. I will give you a job when you return. Have a fantastic trip!" I did, except that Dave had forgotten to tell me that there is no Pan American Highway on the other side of the Panama Canal and it was very expensive to ship the car by boat to Columbia. So I turned around, drove back to California and went to work at Amelco Semiconductor, started by Last, Hoerni and Roberts.

27 October 2007
Lars Lunn
Entered By: David Laws
October 27, 2007

Title: I wasn't spending enough money
Author: Tony Macaluso
Created: October 3, 2007
Cataloguer:
Copyright:

Story:
One of the most memorable Fairchild stories that I remember is when I first had the oppportunity to embark on a very rewarding experiance of becoming a Fairchild field salesman during the early 60's. After being trained in practically every dept with the exception of purchasing and production, I was told that if I was to get anywhere in the company, I had to work as a field salesman for at least 2 years.

During my tenure as a rookie, I was turning in $15 dollars, a week in expenses. My mentor, the late Jim Martin, called me in his office and told me that I wasn't spending enough money and that I had to be taking a customer and or potential customer to lunch every day. Fast food places and eating alone to save the company money was unacceptable. As a result, the routine changed immediately - and so did my weight!

Regards, Tony Macaluso
Entered By: David Laws
October 12, 2007

Title: My Fairchild Stories
Author: Tom Maher
Created: October 6, 2007
Cataloguer:
Copyright:

Story:
I came to Fairchild in the early 1960's when integrated circuits were first starting. I was the day supervisor for manufacturing the wafers. Roger Smullen and Chuck Smith were our Process Engineers and without them we would not have been able to fabricate the I. C. Wafers. They were both brilliant and worked with us (hands on) to solve any and every problem that we incurred.

Milt Meyers and I were both experienced supervisors before coming to Fairchild and we both were producers. We could make think happen sometimes too often. One time I shipped some parts and by-passed the final QA inspection because the angry customer was in the lobby waiting for his parts.

About a day later, Charlie Sporck appeared on the factory floor and he placed his big foot right on the center of my papers on my desk where I was sitting. He said. "You skipped final QA inspection and made a shipment. If you do that again, you are gone". I got the message load and clear.

Another time when I was in the I. C. Clean Room, I wasn't wearing my safety glasses. Charlie Sporck came in to the Clean Room and got into my face and said, "Do you like working here", and I said 'Yes", Then Charlie said, "You will wear your safety glasses as required or you are gone." A few day's latter I looked into the Clean Room and Charlie Sporck was in the Clean Room without wearing his safety glasses. I went to him and said, "Don't you have to wear safety glasses?" Charlie just yelled bad words at the situation and at himself.

We were able, with everyone's help to get the I. C. product running at high volume, low cost, and on schedule. At this point we were beginning to learn that this was the Fairchild philosophy. The Fairchild Plant was divided up so that each product had its own assembly line, own staff, and own objectives. Each product line was a separate operation and it had to made money or that product management was gone.

We were taught by the Fairchild management how to make product and make a profit. Now if you could not make your commitments and make a profit, you were gone. Most of us were Production Performers but we were not skilled at making a profit until we worked at Fairchild.

After I left Fairchild I found out that Fairchild was called the the Profit Academy School that was teaching their employees how to manufacture the products and how to make money. All the original Fairchild Management should be very proud of this reputation.

One other funny humorous moment that I witnessed a few years later when I was working for Caltex (which made watches and games - which was owned by Fairchild). I was traveling to Singapore with Don Brown (CEO of Caltex/Fairchild) and we were having a meal in a restaurant with Wilf Corrigan who was the CEO of Fairchild after Charlie Sporck went to start National Semiconductor. As we sat at the table Jerry Sanders (CEO AMD) came up to the table, stood at attention and said to Corrigan, "I want to thank you again for firing me at Fairchild". Wilf Corrigan answered: It's okay Jerry - you were no damn good anyway. There were no hard feelings - both guys were very successful. They were both great leaders and CEO's.

I feel years later I went to work again for Charlie Sporck at National Semiconductor as a Production Mgr. This should conclude that I was impressed working for Charlie Sporck and I also admired him. After working at National in Sunnyvale for a few months, I was asked by Charlie to go and manage a transistor plant in Danbury, Conn. that National had purchased. I packed up and went to the airport and was surprised that Charlie was flying back with me. When we arrived in Conn. Charlie wanted to help me with all my bags and one was a golf bag. I didn't want Charlie to see this bag for he probably wouldn't appreciate it. He picked up the golf bag and carried it without a word. Now you cannot say that Charlie was always just a mean boss. Anyway I didn't have time to touch the golf clubs while in Connecticut.

TOM MAHER (10/6/2007
Entered By: David Laws
October 12, 2007

Title: I remember when
Author: Ted Malcolm
Created: October 4, 2007
Cataloguer:
Copyright:

Story:
I remember when:

Working at Continental Device, a semiconductor spin off from Hughes Semi, in 1961 thru 1965. When VP Jim Hines called a mgt. meeting and announced that we were no longer to gather at a local watering hole for lunch or after work. The reason given was because of what he had learned, about Fairchild, during a recent visit up north to the Wagon Wheel restaurant. At that time Fairchild was the enemy up north and the "wheel" was their local watering hole. We were using the alloy process with 1 1/8 wafers which did not yield many DO7 size die. The planar process began to be used after obtaining a license from Fairchild.

Being interviewed by plant mgr. Fred Bialeck in 1965 and being shown what he referred to as the most important piece of paper in his office. On it were the names of his key people and the areas of the factory where they had experience. No wonder they called it " the academy".

My first day in the San Rafael plant and attending a meeting, that very day, regarding the union push to represent the workers. We were instructed in what to do and not to do. During the next few years they tried twice again without success.

Product Engineer Ralph Perileoni coming from GE and bringing the DO35 process with him.

Hearing the sound of the cleats on plant mgr. Chuck Smiths shoes as he walked thru the building.

The DO35 final sealing process going from single head sealers, to 10 head sealers, to Dix sealers, to belt furnace sealers and back to Dix again. Going from the 10 head sealers to the Dix process provided a significant increase in productivity. Furnace seal, although very productive, required too much nitrogen.

Packaging engineer Larry Punte's table of diode physical dimensions the DO7, GMD, GND, GPD and finally what he called the GIBD (glass ity bity diode). In the dimensions column he had entered "it was too small to see, you had to feel for it".

He informed our DO7 whisker lead mfgr. that we were building a DO7 whisker lead welder and the price came down. We did build the welder years later and I think it is still running today.

The very first Semicon show at the San Mateo fairgrounds. It only occupied a part of one of the many buildings. Dick "Shifty" McSheffry was the greeter at the door.

Plant manager Dave Marriots concern regarding a possible foreign material, graphite particles, problem when the product engineers came to him wanting to convert to the Dix sealing process. The Dix process employed graphite plates that could sluff off graphite particles, some of which could end up inside some of the diodes. The Dix process was put into production starting with 4 inch boats and eventually to 8 inches. His concern proved justified and the graphite particles did create intermittent shorts that plagued us for years after. Years later a Cebu process engineer made a simple change to the Dix process to trap the loose particle in the molten glass and up went the yield.

Plant mgr. George Wells introducing Bill Kirkham as the new plant manager at an exempt meeting. He said that "Bill even looked like a diode".

The "high reliability" programs with all the associated burn in ovens.

Engineering manager, Bram Kools office and all the purchase orders stacked on the floor behind his desk. A personal visit was required to get your PO moved from the floor to the desk. If you did not need it bad enough to speak to him you probably did not need it.

The many times the support shops were moved to make way for the new wafer fab areas. Building new wafer fabs was like a giant checker game. Move this one to fit that one in, etc. etc.....

The day that diode product mgr. Karl Stahl announced the production acceptance of the first IN4148 automated test and finish line in Cebu. It was part of a group of three and became the model for future test and finish capacity growth.

Attending my first Diode operations meeting in Cebu and sensing the enthusiasm with which they approached tasks. A fellow visitor from Mountain View and I left the room amazed and in awe. Neither of us had ever experienced anything like it before. The room was electric.

Cebu plant mgr. Y I Lees different colored hats to monitor workers movements on the production floor. The production operators, product handlers and QA workers all wore different colored hats. In a large open production area a supervisor could easily observe workers who should be at their work stations and not up moving around. Workers who did not meet the required production quotas were given a yellow hat to wear.
Returning to San Rafael after spending 15 months working in Cebu. It was December 20 1987 and the factory was like a ghost town. The sale to National had been completed, all of the production equipment was gone and all but about a dozen workers had been transferred or laid off. The production floor and office spaces were piled with old desks. It was like viewing the body of a dead friend of 23 years.

I have to add that it was a great experience working in a very dynamic industry with so many great people. My nightly "things to do tomorrow lists" often were tossed due to a more pressing emergency. Drop this, do that. I did get a lot of satisfaction out of providing the production floor with the tools and equipment to produce the product.

Entered By: Ted Malcolm
October 4, 2007

Title: In the beginning… there was Widlar!
Author: Joe Malone
Created: August 8, 2007

Cataloguer:
Copyright:

Story:

In the beginning... there was Widlar!

(The hiring of Bob Widlar - circa 1964)

By Joe Malone, Personnel Manager
Fairchild Semiconductor Division, Mountain View Complex
Fairchild Camera and Instrument Corporation

(As remembered in 2007)

I believe the year was 1964. It seems to me it was springtime and either a Thursday or Friday. A "normal" day at Fairchild although no days were "normal." The "unusual" was usual. That was what made working there terrific even for the administrative types whose nominal task it was to maintain some semblance of order. Planning was impossible so you just got accustomed to flowing with whatever current was generated each day by the constant noise of the squeaky wheels in your space.

On this particular morning, I was visited in my office on Whisman Road very early (and unexpectedly) by Bob Graham who was Fairchild's Product Marketing Manager. Bob, along with Don Valentine the National Sales Manager, reported to the Marketing Director, Tom Bay. They essentially were the Mr. Inside and Outside of Tom's organization. Neither one had much use (need?) for the Personnel Department and therefore it was unusual for Bob to darken my door. Of the two however, Bob was by far the more out-reaching and cooperative particularly when he needed something. Such was the case this day.

Bob had in tow a scruffy, curly haired little fellow with impish eyes that simultaneously smiled and bored holes in you. He was clearly self-confident bordering on arrogant, but outgoing and friendly at the same time. He was introduced to me as Bob Widlar a young design engineer currently working at Ball Brothers Research in Boulder, Colorado. (I'm going to shift to surnames to avoid confusion of Bobs) Graham had sourced him either directly or through one of the Field Sales guys or perhaps through an FAE. Essentially, Widlar was a brilliant circuit designer who used Fairchild products at Ball Bros. I was impressed that Graham had the "stones" to recruit him out of a customer's house. In any event it was clear that Graham "owned" him now and felt responsible for his welfare at least for the day. This was a special guy.

Graham provided me with a courtesy introduction and informed me that he had arranged for Widlar to spend the day with John Hulme, Murray Siegel, Maurice O'Shea and Vic Grinich one of the company's founders who, I believe, was running the Applications Engineering group at that time. He let me know that John Hulme, who was the Manager of Integrated Circuits Applications, was the targeted hiring supervisor and I was to aid and abet John in any way possible to see that Widlar joined Fairchild. They then disappeared and I saw no signs of them until late in the afternoon. I simply was on standby to assist John.

To add a little color to the story, it appeared that Widlar was on vacation that day and driving a big, heavy, red Pontiac/Oldsmobile (?) convertible with the top permanently down from Colorado to Tijuana/Rosarita Beach/Ensenada Mexico. Mexico was later to become Bob's "paradise." He lived there off and on and I believe died there. He's probably buried there or his ashes spread along some remote Mexican beach. Graham had somehow snagged him and convinced him to plan (Widlar plan?) his trip such that he could spend a day at Fairchild in Mt. View. Widlar had agreed to eight hours maximum. Graham knew he had a narrow window with which to work and,

master-manipulator that he was, made every minute count. We needed to "close the deal" by sundown.

It helps also to understand that John Hulme was a tall, thin, prematurely gray haired Mormon. Shy to a fault, he was soft-spoken and well mannered - a personality profile that was diametrically the opposite of that which we all later came to know as classic "Widlar." This was a proposed marriage of opposites. Only Graham had the genius to see the synergy. In retrospect, I don't believe John was convinced that it was that good a match but like so many managers in those days, he had a need for a Linear Circuit Designer and Widlar was clearly that - in spades! (Now THAT, in hindsight, is a massive understatement.)

Sometime late in the afternoon, John Hulme and Bob Widlar appeared at my door. We put Widlar in my office while John and I huddled in the hallway outside. John announced that he wanted to hire Bob and (ever the pristine manager) indemnified that he had an appropriately approved personnel requisition somewhere in my department. We discussed the magnitude of the offer briefly. John stated that Bob was currently earning (gulp!) $9000/yr and he was comfortable offering him $10,000/yr. but - NOT A PENNY MORE! John was not comfortable extending the offer and asked me to close the deal. Widlar was driving to Southern California immediately upon leaving the premises and both Hulme and Graham wanted him "closed" today!

I then joined Widlar in my office and the dancing began. He knew where we were going and decided to enjoy the ride. I poked around in his early life and discovered that his father ran a radio/TV repair shop in the Cleveland, Ohio area. He learned electronics from the ground up at his father's knee. For some reason that I can't recall, he chose to join the Air Force instead of going to college. Somehow he got stationed in Colorado and was able to attend the University of Colorado in parallel with his military service. I believe he finished college with a BSEE in three years (3.9999 GPA) and met his service obligation at the same time. Ball Bros. was his first and only fulltime professional civilian employment.

At some point, I (naively) asked if he had thought to bring along a resume. In response, he casually tossed a copy of his transcript across my desk. Ever the poker player, I studied it carefully and noticed that it showed ALL "A's" except for one lonely "C" - that being in Colorado History. When I inquired about the obvious aberration, he replied that Colorado History was required to graduate. He said the instructor, on the first day of class, asked the class to take out a blank paper and draw an outline of Colorado. Widlar's response to this request was to write on the paper, (sic) "The map is on the wall behind you, you dumb SOB!" He then smilingly admitted that the Professor never seemed to warm up to him and simply gave him a passing grade. My first clue that this was a different dude?

We then moved into the negotiations. He verified what John had already told me about his current yearly salary. I responded that John very much wanted him to join his group and was prepared to offer him an increase to $10K/yr. His reaction was a blank stare. The silence was palpable. It was one of those "whose going to blink first" moments. Finally, he spoke. "I won't come for less than $12K," he said. Now it was my turn to stare while my mind was whirling. Is this guy playing me? (Of course he was) Do I dare stonewall him and risk the wrath of Bob Graham if I lose him? What to do?

I broke the silence by launching into a totally irrelevant and wandering discourse on Fairchild; John Hulme, what a trusted guy he was; how if he was as good as he thought he was he'd be making $12K in no time; blah, blah, blah. I was pouring out platitudes non-stop. Interestingly, I don't recall any talk of equity or stock options of any kind. I guess not at that level at that time. Anyway, he was entirely cash motivated then. The equity thirst came much later.

Speaking of thirst, it was getting on to 5 o'clock and he interrupted my babbling by asking where the nearest "watering hole" was. I acquainted him with Walker's Wagon Wheel bar/restaurant just down Whisman Road at the intersection of Middlefield Road. He abruptly ended our meeting by

asking me how long I intended to be in my office. I said "As long as necessary, why?" He then stood up to leave and committed to me that I would get a phone call with his decision "after six beers." (Somehow I sensed that wouldn't be long. I was right!) We parted ways amicably with much the same affable, smiling eyes I had seen that morning.

Roughly, an hour later, my phone rang. Widlar was on a pay phone at "The Wheel." (No cell phones then) He graciously accepted our offer as originally stated; asked me to put it in writing and mail it to his home in Colorado; committed to give notice when he returned from vacation; said, "Adios, Amigo!" and left for south of the border. I called John Hulme who was sitting in his office on tenterhooks. I then packed up and went home. Little did I know or even have a clue what this little elf was going to produce or the impact he was going to have on the worldwide semiconductor industry. His name is synonymous with Operational Amplifiers and innumerable other Linear Integrated Circuits.

Our paths crossed many times over the next 20 years. I "processed" him out when he left the company with his counterpart, Dave Talbert to join what was then a struggling Molectro in 1965. Molectro was purchased shortly after to establish a West Coast operation for National Semiconductor then based in Connecticut. Talbert was the "Process Genius" that could manufacture anything Widlar designed. Together they were unbeatable either at work or play. It is my opinion that they were a major attraction when Charlie Sporck and his core team left FSC in 1967 to resurrect National. Linear products generated a steady (obscene?) gross profit for NSC throughout its history while the other product lines "eked" out marginal results if any at all.

Widlar was no longer with National when I joined the company in 1972. He was living in Mexico. But we later retained him as a design/layout consultant. It was indeed comforting and a delight to see him wandering around the campus with his smiling eyes and a Styrofoam cup in his hand. No one dared ask what was in the cup. Bob was an amazing individual! There are more "Widlar" stories around than can possibly be true. But this one is mine and I've obviously carried it around for over 40 years. It's interesting how a single day can remain this clear among all of the cobwebs of other memorable events.

In closing, in case there remains any confusion as to who the hero is in this tale - it's Bob Graham. John Hulme hosted Widlar all day and made the easy decision to offer him a job. I may have "closed' on him but Graham was the key ingredient. He "sourced" Widlar and convinced him to stop by on his way to Mexico. He set up and orchestrated a smooth process that the rest of us simply implemented. He made a major impact on the industry by introducing Bob Widlar into it. This was not his only contribution to the industry but arguably one of his greatest. I wish he were here to enjoy the Fairchild 50th reunion this fall.

RIP, Robert - Both of you.

Entered By: David Laws
August 8, 2007

Title: A heart-warming scene of busy little bees
Author: Joe Malone
Created: August 17, 2007
Cataloguer:
Copyright:

Story:
When I ran the Whisman Road personnel department, every Monday was an adventure as "strangers" would show up in one of the various lobbies claiming to be reporting to duty "as ordered." As I said in the Widlar piece - One of the enjoyments of the job was the scramble to "Git It Done!"

One of my favorite stories was when I arrived at work one Monday (one of two days a week when we hired large groups of assemblers and allocated them to appropriate product groups) and my people advised me that Jack Gates and Roger Smullen had swooped into my employment lobby and unilaterally conscripted 50 new hires sitting there waiting to be processed. I found them all happily sitting in the cafeteria straightening leads on MicroLogic packages that had been returned to them. (by QA?) Jack and Roger were busy serving up coffee and doughnuts - smiling away the morning. A heart-warming scene of busy little bees as contrasted to the hornet's nest in my lobby where other Line Supervisors were demanding their promised new hires

Entered By: David Laws
August 20, 2007

Title: Leo proposed flipping a coin
Author: C. Hugh Mays
Created: November 17, 2007
Cataloguer:
Copyright:

Story:
I was recruited by Bob Seeds in 1966 to start a computer aided design group at the Research Lab in Palo Alto. One project that evolved, after pulling together a top notch group, was a computer graphic input interface for design of integrated circuits. Since what we wanted pushed the state of the art we ordered units from two different companies. When the units arrived they did not meet our specifications. One company redesigned the unit to meet our specifications and the other refused and argued the specification was vague. A pissing contest ensued which culminated in a meeting with the president of the vender company, his technical staff, myself and my staff and Leo Dwork. The argument continued for some time. We got our differences down to $20,000 and got stuck. Leo proposed flipping a coin. The president agreed. Fairchild lost.

Being a relatively fresh idealistic Ph.D. I was shocked at Leo's "solution". As I became more seasoned in the business environment I saw this as a creative solution which probably saved considerable money. So Leo, if you are still around this is a belated (about 37 years) appreciation of your creativity and ability to see the big picture.

C. Hugh Mays, Ph.D.
Entered By: David Laws
November 17, 2007

Title: If Bob Noyce had purchased four lenses would the Planar process and the IC have been invented a year earlier?
Author: Gordon Moore
Created:March 3, 1995
Cataloguer:
Copyright:

Story:
The following story is abstracted from Rob Walker's 1995 interview with Gordon Moore posted in text and video on Stanford University's "Silicon Genesis" website at:
http://silicongenesis.stanford.edu/complete_listing.html

It is also included on the anthology DVD "The Fairchild Chronicles - A History of the company that gave birth to Silicon Valley" available from:

http://www.thesilicongenesiscollection.com/detail.cfm?productID=46C413CC-E69A-E1B9-0EFFF9F651D4A6B2
"When Fairchild started, we split the major processes that had to be developed among the participants. Bob Noyce had responsibility for setting up the lithography capability. He went to San Francisco to a large camera store and dug through their supply of 16mm movie camera lenses and picked out the three that were best matched in so far as focal length was concerned. Those were the optics in the step, and, repeat cameras we built to make the first transistor structures.

While we were setting up the initial equipment Jean Hoerni was writing in his notebook and coming up with ideas of things to try, and he came up with a proposal. Instead of making a "mesa," which exposes the sensitive area of the transistor to the outside world, one should just do more of these diffusions oxide mask diffusions and leave the oxide over the top of the junction, the sensitive part. Well, that was something that previously had been considered a bad idea because Bell Labs' conventional wisdom was that the oxide was dirty and you wanted to get rid of it.

But we couldn't try Jean's idea right away because it took four index masking operations in order to make the structure he was proposing. And Bob Noyce had only bought three lenses!"

Editor's note: Early in 1959 while seeking a solution to a reliability problem with the mesa process Jean Hoerni revived his dormant idea. A fourth lens was procured and the Planar process was born.

Entered By: David Laws
January 8, 2007

Title: Notes on early work on Monolithic ICs at Fairchild
Author: Robert H. Norman
Created: ugust 9, 2007
Cataloguer:
Copyright:

Story:

Notes from Bob Norman, circuit designer on the first Fairchild ICs in an e-mail to early Fairchildren including Don Farina, Jay Last, Gordon Moore, and Arjun Saxena in August 2007

[How Bob can remember this stuff after nearly 50 years boggles my mind - editor]

Notes on early work on Monolithic ICs at Fairchild Semiconductor (Rev A)

Ref: a) IEEE Solid State Circuits Society News, Vol. 12, No.2, Spring 2007

b) History of Semiconductor Engineering p.136-137

I would like to make the following contribution to our understanding of the early work on monolithic integrated circuits.

Purpose:

The purpose of this document is to clear up some confusion in the published literature. I further hope to affirm the vital role of the IRE in the development of ICs. I also hope to give credit to the shoulders we stood on.

Background:

The development of modern (monolithic) IC technology was an intrinsic consequence of the conjunction of two rapidly moving technology streams:

* The transistorization of digital computers.

* Planar semiconductor technology.

The transistorization of digital computers which began in 1953, with the use of the Type "A" Point Contact Transistors, progressed to the successful production for the Army and the Navy by Sperry Gyroscope Company of reliable, ruggedized, transistorized computers, using thousands of transistors and core, drum, and quartz delay line memory in 1957.

Static logic was most common, chains of Gates driven by and driving Flip-Flops, logic states indicated by DC voltage levels at the terminals. Flip-Flops were usually capable of five levels of AND and OR gating. In practice, two levels of gating were sufficient. Lumped constant delay lines were used in flip-flops to avoid race conditions.

Sperry Gyroscope was preeminent in instrument servos and analog computers. (Listening to Servo Systems running in the lab until they quit was my introduction to "test to failure" (beyond banging radar and bombing equipment on steel tables on the seaplane tender before flying with them)) Sperry started a digital computer development group in their Advanced Weapons Development Department. I was one of a small group of summer employees hired to work in this group as an undergraduate in 1953. When I interviewed I asked what Sperry was doing with transistors. I was their answer.

Billy Law, a fellow student at Oklahoma A&M won an AIEE student paper competition with a paper called "The Transistor", a report on the November 1952 Proceedings of the IRE which was all about the transistor. I also won with my paper, "The Application of Matrix Algebra to Circuit Analysis". Billy and I journeyed to Kansas State together to present our papers in the regional competition there. I read Billy's paper.

I became the transistor person in the Digital Computer Development Section in the Advanced Weapons System Department. The transistor available at the time was the type "A" point contact transistor from Western Electric. The available literature consisted of the aforementioned November '52 proceedings of the IRE, and a four inch thick tome called, "The Transistor", produced by Bell Labs. It included papers by many who would become well-known as the leading engineers of the transistor revolution. That summer was spent duplicating some of the Digital work reported, building and using test jigs used to characterize our transistors and helping on the first Sperry digital computer, SPEEDAC, then under development. This computer used vacuum tubes for Gates and Registers implementing Static Logic. Its memory was 2000, 18 Bit, words stored on a rotating magnetic drum. Input/Output was a Flexowriter with a punched paper tape I/O.

The rugged computers delivered to the military in 1957 used the same static logic organization as SPEEDAC implemented using RCTL (Resistance Coupled Transistor Logic (a Sperry invention)) with DCTL (Direct Coupled Transistor Logic) used when needed for high speed I/O.

It should be remembered that at this time small signal transistors consisted of, in Germanium, the General Electric 2N43A Alloy Junction transistor, and the Philco 2N240 surface barrier transistor. Both of these were suitable for -55° C. to plus 71° C. military service requirements. A little appreciated property of the 2N240 was its intrinsic base resistance. This limited current "hogging" which was a problem for Bell Labs in their attempt to develop the TRADIC, a DCTL computer using the 2N43A. The good results with the 2N240 led to the incorporation of an extrinsic, current limiting resistor in the base of each transistor used in Micrologic.

Military aircraft requirements at -55° C. to +125° C. dictated the use of silicon transistors which were manufactured by Texas Instruments as grown junction bars and newcomer Fairchild semiconductor as Mesa then Planar transistor devices. Early transistor work at Sperry focused on emulating the SPEEDAC flip-flop/gate organization. Point contact transistors at the time were unsuitable for this logic. Junction transistors at this time were mostly the promotion of nonexistent devices. Early available "reliable" transistors were the GE 2N43A germanium alloy junction and the Texas Instruments 2N914 grown junction transistors neither were suitable for logic circuits which allow the transistor to saturate because of minority carrier storage, except for very low-speed applications. A variety of circuit techniques were developed which used extra components (and extra power) to keep transistors out of saturation. One of the significant efforts was the development of of flip-flops using complementary transistors (NPN-PNP) at MIT for missile and space applications. A very useful Proceedings of the IRE paper at the time described a graphical methodology for designing vacuum tube flip-flops which included compensation for component and power supply variation. Analysis of transistor circuitry using an adaptation of this methodology led to the appreciation of the power savings (and reliability) of using 1% film resistors instead of the composition resistors commonly used.

Many papers of this period involved the prediction and measurement of speed factors in transistor logic circuitry. A great deal of study went into the transistor and circuit parameters important to predicting transistor speed. An alternative approach was to test a number of inverters or gated inverters in cascade and measure the propagation of a waveform through the cascade. (In configurations where minority carrier storage was important, a wave could disappear as it propagated through the cascade.) It was observed that the propagation delay through the cascade doubled over the temperature range -55 to plus 71° C. for Germanium and -55 to plus 125° C. for Silicon.

Higher speed logic circuits used a variety of techniques to keep transistors out of saturation and avoid minority carrier storage time which delayed transistor turn-off. Keeping the transistor out of saturation involved the keeping collector voltage higher than VCE(SAT), the collector to emitter saturation voltage. This increased the "ON" collector voltage, increasing the power dissipation at the collector and in the input circuits of the next logic stages. A typical gate of this type dissipated 3/8 Watt per gate. Since a typical small computer might employ 2000 such gates it would consume 750 Watts. The cost in take off weight to generate the power would be 8# per watt, and in cooling to remove the heat, 21# per watt.

The transistors shown in References a) and b), the "Noyce patent application", and "The world's first integrated circuit. . ." showed a circular base metallization. This would have been used to minimize the equivalent base input resistance to maximize transistor speed. It also would maximize minority carrier storage and its deleterious effect on speed leading to the necessity of clamping described above.

As with fan-in/fan-out, logic speed/power dissipation, were issues the Micrologic development program addressed so as to best meet end user requirements. The target was a 1 MHz clock speed over the -55 to +125° C. temperature range. Since the military computers at this time operated at 200 kHz to 500 kHz over a -55° C. to +71°C temperature range this seemed like a good choice.

The high VCE(Sat) of the grown junction structure resulted in high power dissipation of logic circuits using these transistors. The newer Mesa and planar transistors were most compatible with the Direct Coupled Transistor Logic which used the minimum number of components and component types. This logic structure however exacerbated any costs or reliability issues with the individual transistors. Since by then, the costs of delivered reliable military equipment amounted to $60 per transistor not including the costs of the transistors, an increase in transistor count was unwelcome. On the other hand, the development of monolithic ICs, and the elaborate reliability improvement program undertaken as part of the development of Micrologic, seemed to

change the metric from per transistor to per chip, per IC. This came about partly because the materials and processes used to fabricate ICs were the same as those used to fabricate the individual transistors with the exception of the isolation diffusion.

Vitally important to the successful development of transistorized digital logic circuitry was the concept of "good enough", the ability to expand "necessary" to "necessary and sufficient" when describing the development task. In the beginning, with the type "A" point contact transistor in 1953, and with rapidly improving transistor technology through the next few years, logic circuits were specified as being capable of unlimited "fan-- out", that is, load driving capability and "unlimited" speed. This was considered a reasonable request since vacuum tube logic was "capable of such performance". In about 1955 at Sperry Gyroscope company, an investigation was launched into replacing the vacuum tubes in the MSG-5 digital computer with transistors. The MSG-5 implemented the National Bureau of Standards DYSEAC, dynamic logic using the rugged pencil tubes developed for VT Fuses, during the war. These modules were capable of "infinite" fan-out, load driving capability, and fan-in, input gating capability. A study of the actual Fan-out and Fan-in used in the computer revealed that a fan-in of two with a standard deviation of two met 95% of the needs of the computer, similarly a fan -- out of two with a standard deviation of two met 95% of the computer requirement except for a need of a fan -- out of 16, corresponding to the 16-bit word length of the computer.

With respect to speed there were two principal thrusts. As above, the clock speed requirements for digital computers and tactical military systems were quite modest, 300 kHz or lower. The applications were multiple digital servos, and digital signal/image processing, all in real time. Minimum power was the requirement.

Manufacturers of commercial data processing computers, IBM, Remington Rand and Control Data were constantly pushing the speed envelope at this time. Unlike the military applications reliability was less important than performance. An interesting Proceedings IRE paper discussed purposely introducing faults into a digital computer to maintain the skill of the maintenance personnel in finding and fixing them. These computers performed batch processing. A complete job was loaded into the computer on punched cards or punched paper tape, the computations performed and the results printed out in punched or printed form. The first actual job performed by SPEEDAC, for example, was Data Reduction of I/O measurements on the surface barrier transistor, 2N240, used in the design of computers. In that case the computer replaced the efforts of three people operating rotary electromechanical calculators. Manual effort was required punching the paper tape with the raw data, but far less than when manually performing the mean and variance calculations.

From this research, design requirements, or design rules were developed for transistor logic circuitry. The high purity and minimal surface effects on planar junctions facilitated the mathematical circuit design of Micrologic using the Ebers and Moll equations.

These later became the design basis for the Micrologic Element family, that is, fan-in and fan-out of five with provision of a Buffer Element for high fan-out requirements and a Gate Expanders for high fan-in requirements. These were the same rules which had been successfully employed in the development and delivery of several military computers as described above.

The techniques employed were successfully mapped into what became an extraordinarily reliable new semiconductor technology in 1959, as described at ISSCC in 1960. On account of its reliability and producibility this technology was chosen by MIT Instrumentation Lab for Apollo, and by the DOD for substantial use in digital communications hardware.

The name of this technology was "Micrologic", and it's improved descendent, "R13 Milliwatt Logic". What follows below are descriptions of the engineering choices made in the development of these first successfully manufactured and deployed monolithic digital integrated circuits.

First the use of the term "monolithic", (one rock) was an important discriminator in the '59, '60 time frame. Westinghouse had coined the term "molecular electronics" in the late '50s to describe super-transistor functions performed in a single piece of semiconductor material. An example was a gate controlled four layer switch which functioned like a thyratron in power control applications, (sometimes called a "thyristor"). This term was meant to describe a particular approach to super transistor functionality. As a generic term it was quickly superseded by the term, "integrated circuit". While in today's terminology "integrated circuits" imply, for digital electronics, one chip per package, in the late '50s, early '60s, the term included Sippican's cordwood modules and a variety of "chip and wire" and hybrid fabrication techniques, as well as monolithic solutions. What was attractive (and later proved important) about the monolithic concept was that the technologies involved, though sophisticated, were few in number and consistent with transistor manufacturing techniques. Thus manufacturing methods which improved transistor reliability were directly applicable to monolithic integrated circuits and vice versa.

The invention of the planar transistor fabrication process by Jean Hoerni, though not disclosed until years later, set the stage for the successful development of monolithic ICs and Micrologic. As part of the transistor fabrication process, holes were etched in the oxide covering the base and emitter regions of each transistor and aluminum contacts alloyed in. Each wafer was separated into individual transistor die which were in turn attached to TO-5 (large) or TO-18 (small) header. Gold wires were then thermal compression bonded to the base and emitter regions resulting in a quite reliable and manufacturable transistor structure.

At the outset of the Micrologic development program, the reliability of Fairchild transistors was 10,000 hour MTBF as measured by Jay Farley, Fairchild's reliability and quality assurance manager. At the time this was considered to be the industry's best.

Packaging

At the inception of the Micrologic program, Fairchild was delivering most of their transistors in three lead TO-5 packages. One lead was attached to the header. The transistor die or chip was soldered to the header. The other two leads pass through the header using glass to metal seals similar to vacuum tube techniques. Gold leads were themo-compression bonded to exposed metallized areas of the chip and welded to the post coming through the header. A cap was welded to the header, hermetically sealing the transistor within the package, a rugged assembly.

At that time Fairchild was also delivering high-performance transistors in the smaller TO-18 package. While Texas Instruments, the other silicon transistor manufacturer was delivering transistors in solder sealed packages, they sometimes opened up at high temperatures and the hermetic welded package was preferred. Reliability also governed the choice between a rectangular package seal and a round one.

The eight lead TO-5 hermetic package was chosen for Micrologic and later, Milliwatt logic. Some work continued with the eight lead TO-18 package, as witness the famous "Life Magazine" cover, "Smaller than the "D" on the Dime".

Reliability

From the outset, all Micrologic was put on life test at 125° C., operating in a circulating loop, after thermal shock test. This had been the same regimen followed at Sperry with transistors and logic circuits.

Two decisions made by the founders of Fairchild Semiconductor, probably drove the whole semiconductor revolution and the incredible development of "Silicon Valley" and other "Silicon Xs" contribution to the world we live in.

The first was that Fairchild would not sell products it did not have, while that seems like a no-brainer today, it was not in 1959. Most transistor companies at that time would take orders for transistors that were not yet successfully produced. When Don Farina ordered Fairchild 2N696 transistors to drive high-performance communication cables for an airborne electronic countermeasures system, they were delivered on schedule - a remarkable event in 1959. And they worked! A consequence of this requirement was that permission to deliver the "Solid State Micrologic Elements" paper at the '60 ISSCC was withheld until Micrologic parts were successfully produced in manufacturing.

The second basic decision was that reliability was important. Fairchild transistors had already qualified for the Minuteman ICBM. An IBM paper appeared in the Proceedings of the IRE: about October '59 describing their work on "test to failure". Vic Grinich, V.P. Engineering at Fairchild Semiconductor, encouraged us to subject Micrologic to a test to failure program. Because of the consistency among the processes, almost every thing we learned in Micrologic was directly applicable to Fairchild's transistor products. The first results were to reject ideas of etching and back filling the semiconductor die to achieve isolation among active regions. All parts, for example, were centrifuged until all failed and all of the failures examined. This led to the establishment of centrifuge techniques to confidently weed out weak lead bonds without injuring good bonds, and so forth. One test unintentionally damaged good ICs. Finished ICs were subjected to the same "detergent bomb" gross leak test used on transistors. In the case of transistors, any detergent entering the TO-5 can would be immediately detected as increased collector leakage. In the case of Micrologic, any detergent residue in the can could chemically remove interconnects some time after the test had been performed, introducing a latent defect. The solution was to switch to a Helium gross leak test. The net result of the time and resources spent on the Micrologic test to failure was a demonstrated Micrologic reliability of 100 Million hours MTBF and reliability improvements across the product line, which used the same manufacturing processes.

Entered By: avid Laws
August 12, 2007

Title: Bob Norman's Fairchild memories
Author: Robert H. Norman
Created: September 3, 2007
Cataloguer:
Copyright:

Story:
I joined Fairchild in August '59. Ed Baldwin was General Manager. I reported to Vic Grinich, V.P. Engineering, as Head of his newly formed Device Evaluation Section. I was offered my choice of that position or Head of the Applications Engineering Section (which was taken by Bob Shultz in a few months later when he joined Fairchild).

My job was to do electrical engineering evaluation of new semiconductor products coming out of Semiconductor Development. I was told that I would do the engineering of Fairchild's new integrated circuits whether I took Device Evaluation or Applications. Vic said he'd rather I worked on the Device Evaluation side. I started at 844 Charleston as employee number 592, (we were all there then). Then Fairchild got the Tahoe Way building behind 844 Charleston and moved me there with Don Farina, Helmut Wolf and Isy Haas. (In A few months later, Isy moved back to Jay Last group). At the time Lionel Kattner worked for Jay, as did Jim Nall, C. T. (Tom) Sah and others. Our group was to perform engineering evaluation of the devices they developed. All R&D devices were fabricated on Murray Siegel's Pilot Line. Murray was offered the chance to transfer to manufacturing and decided in favor of R&D.

With respect to an integrated circuit product line, we recommended the development of a compatible set of digital integrated circuits which could be interconnected to build digital computers without other components. This was essentially the same recommendation I had made when I interviewed at Fairchild a couple of months earlier. At that time I had also recommended DCTL. While DCTL was unpopular with system designers because it used an expensive and often unreliable component, just the opposite would be the case for a semiconductor manufacturer of integrated circuits because they could be fabricated totally with "well-known" semiconductor technology. When I started work in Fairchild, Isy Haas had built a DCTL flip-flop in a multi-lead TO-5 package with discrete transistors using the chip and wire techniques that Fairchild was using to build analog circuits. Isy used pencil lines on the ceramic substrate to implement load resistors.

Fairchild did not appreciate the role of base resistance in controlling "current hogging" in that configuration. The photo of the "first Fairchild monolithic integrated circuit" was not of any Micrologic or Milliwatt Logic Chips. The circular design of the based metallization shown was to minimize base resistance and maximize unsaturated speed.

I can't resolve the issue of when the first working Micrologic chip came off the manufacturing line. I do know I was in suspense because Vic had said I could not present the paper at the Solid-State Circuits Conference unless we had working parts and when we had I did. Vic and I discussed as an alternative, introducing the DCTL transistor which I should have supported but I was concerned about dilution of the Micrologic effort.

I've never forgotten the incredible experience of working with Jay and his people as we solved one problem after another to make Micrologic work For example, shaping the base region of the transistor to increase the intrinsic base resistance led to the "overlap diode" problem during that time. Jay got the name "Mr. Micro" from John Hall at that time and I got the name "Mr. Logic". One of the biggest breaks early on was to learn of the conformity of the small geometry 1210 transistor to the Ebers and Moll model. In their original paper Ebers and Moll suggested that their model would only work with alloy junction transistors with similar forward and reverse current gain, alpha. The Mesa/Planar transistor had an inverse current gain I think, of 0.4 or less, yet as Don Farina determined over several decades of current the 1210 small geometry planar transistor fit th Ebers and Moll model making it easier to do a robust circuit design on Micrologic that gave us the wide temperature range and high voltage margin operation we required.

While I was an expert (as much as there was then) in the design of robust transistor logic circuitry and computers, and had been grading papers for my friend Jerome Fishel's transistor course at Adelphi for years. I was a babe in the woods with respect to transistor development and fabrication.

In a carry over from my practices at Sperry, every part we got was subjected to voltage margin testing, thermal shock, and 125° C. operating life test in the form of a continuous recirculating loop. The life test results included in my Solid State Circuits Conference paper came from those tests.

The first parts which we chemically isolated and back-filled with plastic did not survive the thermal shock tests because of the differential expansion and contraction of the plastic.

Once again Vic Grinich' encouragement to perform the test to failure on Micrologic which was described by IBM in the Proceedings of the IRE paper published ca 10/59, validated and formalized much of the reliability and quality assurance test regimen Fairchild was already using and led to the discovery of problems such as "purple plague" and tweezer scratches which were resolved.

Our Device Evaluation activities include evaluating Tunnel Diodes, Power Transistors and later C. T. (Tom) Sah's Surface Controlled Tetrode (SCT). The anomalous behavior of the PNP power

transistors, we discovered accidentally, was called by light emission from the junction. We observed this on uncapped Transistors. We used this phenomenon to build light arrays which Fairchild Camera used to expose coded patterns on their satellite photographs. The light emission phenomenon led to the formation of the Light Emission section under Gordon headed by Irv Solt which became over time the light emitting diode industry. Tom Sah, investigating the PNP transistor channeling problem constructed the Surface Controlled Tetrode which we evaluated. We learned of the drift in the threshold voltage, whereupon Tom constructed the Surface Controlled diode to study the problem. This was the first MOS transistor.

Tom did solve the drift problem. When Howard Bobb, Phil Ferguson and I left Fairchild to start GM-e in July '63, Fairchild was producing and shipping MOS devices as analog switches. They had the Field Effect transistor attribute of "0" offset voltage and the additional attribute that the output was isolated from the input. Isolating multiples of MOS transistors was much simpler than isolating bipolar transistors. The weakness with respect to bipolar transistors, as I described it to Gordon Moore in response to his question early in 1963 was that MOS operated at very low current necessitating high resistance in an integrated circuit. At a typical diffused resistance of 125 ohms per square, this would result in large areas being consumed by resistors with attendant speed degradation due to the associated parasitic capacitance.

It is also important to note that at this time Phil Ferguson in R&D was out producing manufacturing of Micrologic and Milliwatt Logic having changed to epitaxial isolation in place of double diffused.

Responding to your question about different names, I was never a member of Jay's group. His was Device Development under Gordon Moore, VP R&D, mine, was Device Evaluation under Vic Grinich, VP Engineering.

As far people, Don Farina has a much better memory than I. Orville Baker came from IBM, Dick Anderson and Howard Bogert from Stanford, Dick Crippen from Philco Western Development Lab, Bill Scism from Lockheed.... I know I'm missing someone. Al Wesowolowski was a retired Navy Chief and ran the Lab and was also our Safety Officer. My secretary's name was Linda who Dick Anderson asked my permission to date (they eventually married).

Don Farina probably remembers the names of all technicians we had doing the testing in the lab, I don't even remember the name of the woman I promoted to Lead Girl, over the objections of Personnel, who was immediately shunned by the rest of the lab. I finally rescinded the promotion much to her relief and mine.

Our approach to Micrologic testing was a radical departure from that of any sensible semiconductor engineer. The result was essentially double testing, the first to discern the device parameters important to semiconductor fabrication, the second, testing to the specs important to the computer designer, Fan-In, Fan-Out and speed. Bill Hafner developed the first Micrologic production tester, the precursor to the Sentry line of Fairchild testers. This tested both device parameters and functional parameters

Howard Bobb and I moved over to Fairchild Space and Defense Systems in '62 with Mike Moscarella and Dick Rabin to do applications of Micrologic and other Fairchild products. The Semiconductor Static RAM was invented there. (The first 9 Bit parts were developed by Don Farina and built on the Pilot Line at Fairchild R&D.) Using the methods developed by Bernie Widrow and Gene Franklin of Stanford, an adaptive single axis flight control was built with Micrologic and successfully flown into space on the X-5 Rocket Plane.

The rest, as they say, is history.

Note from Don Farina 9.3.07

Hi Bob, You did it again! Your memory is unbelievable. I remember everything you mentioned but only after you just chronicled it. A few other contributors come to mind and should not be forgotten: Engineers Richard Craig who was silent but did so much to make the pilot line work, Frank Wanlass and Warren Wheeler. And we can't forget Cozy Swan, Judy Dunckleberger, Eva Tallant and Jane Hudnall. They did all the work. We just sat there to think and write reports for staff meetings.

Good work Bob, Best regards, Don Farina

Entered By: David Laws
September 3, 2007

Title: SAM - the first semiconductor memory system product
Author: Mel Phelps
Created: July 26, 2007
Cataloguer:
Copyright:

Story:
The first semiconductor memory system product was developed, I believe, on Gordon Moore's R&D budget in a skunk works off-site on Charleston Rd in Mountain View called Fairchild Memory Products. That's where I disappeared to between 1965 and 1968. Fairchild Memory Products was set up with a means of developing revenue by producing its own ferrite core memory products while the SAM (Semiconductor Advanced Memory) product was being developed. Jack Schmidt, Harley Perkins and Mel Phelps were the perpetrators. My part was conditioning the market for them and building a sales force separate from Fairchild's.

The SAM was a hybrid 256 bit memory using PMOS storage cells and bipolar peripheral (to the chip) buffer transistors for driving the yet unknown impedances we were likely to encounter. We developed a very tentative market for it the same way we did the original Micrologic family - with military/aerospace customers who were the only ones with budgets able to buy such curiosities. Some of you may remember I was laid up for a while right in the middle of this project (1967) after my encounter with the Portola Valley horse. Although SAM did not set the world on fire it did succeed as the prototype test vehicle to show that there was a market there.
A little startup used that information to start a company named Intel.

Fairchild Memory Products was sold to Data Products, which seemed quite pleased to have a ferrite core manufacturing capability at the time - not knowing that the world was about to change significantly in their field. After recovering from the horse thing I moved on to a company called Fabritek in Minneapolis populated with former Univac engineers who unfortunately believed in plated wire technology when I believed in semiconductor technology. The founders of Intel exchanged engineering teams with Fabritek for a while but it fizzled after a bit. A big opportunity lost for Fabritek which could have easily merged to the benefit of both at that time.

[According to the FCI Annual Report for 1968 a later version of the SAM module was developed for Burroughs Corporation - see Related Event note to right]

Entered By: David Laws
September 23, 2007

Title: Diodes to DRAMs - Memories of San Rafael and beyond
Author: Betty Prince
Created: April 2, 2007
Cataloguer:

Copyright:

Story:
Some of my best stories come from my Fairchild days, however, I'm not sure we shouldn't wait another 20-30 years before telling some of them publicly! I worked at Fairchild San Rafael in diodes and in linear from 1972 - 1975 while George Wells was plant manager. (somewhere I still have an old "I'm with George" button something we all wore to oppose a unionization attempt). Wilf Corrigan was George's boss and my favorite memory of Wilf was the meeting where he reassured us all that diodes and transistors would always be with us since these newfangled integrated circuits would never work. It was only a short time later that he left to form LSI Logic and took George Wells with him.

At San Rafael, I was a reliability engineer for diodes and LIC, and then a product engineer for the monolithic diode arrays during which time I also supervised the glass shop in the Palo Alto Labs (back then if your product went through a process, you handled the process). I installed the first plasma etchers in San Rafael and designed and cut the ruby for Fairchild's first 32 diode array (you could see every one of the diodes with your naked eye). In late 1975 I transferred to Mountain View into power transistor process engineering, then left in 1976 to work for RCA where I brought up the CMOS 1802 microprocessor as product engineer. (maybe you will have an RCA re-union sometime). I was the first female engineer in San Rafael, but not the first in Fairchild as Faith Lee was already in the South Portland facility.

I am going to go briefly through others that I recall from those early days in San Rafael to put them on your radar even though I don't know where most of them are. I have added a few comments and links for the ones I have kept up with.

Q&A manager was Alex Danks - a great man and my own first mentor in the industry. Alex kept a picture of a huge gorilla face on the back of his office door to remind him that only the tough survive. At the time everyone being seasoned for higher management had to spend some time in Fairchild Hong Kong. I remember that Alex adamantly did not want to go to Hong Kong and died after being there a short time. He had married his engineering aide, a bright lady named Judy, who was in finance last I heard of her.

Product Engineering Managers were Ron Burley and John Brown - both of whom I have lost track of, although a resume for Ron come through when I was working for Philips in Eindhoven NL about 15 years ago.

Sales Manager was Perry Constantine who also left Fairchild to work with LSI Logic and a few years ago founded Silicon Access Networks, an embedded DRAM company in San Jose, which has since gone out of business. I believe he is now CEO of IPInfusion.http://www.ipinfusion.com/company/company_team_constantine.html" target="_blank"> http://www.ipinfusion.com/company/company_team_constantine.html

Production Manager for Diodes was Mike Parodi, who until recently was CEO of Tegal in San Rafael.
http://compoundsemiconductor.net/articles/news/7/6/24/1" target="_blank">https://exchange.computerhistory.org/exchweb/bin/redir.asp?URL=http://compoundsemiconductor.net/articles/news/7/6/24/1
http://www.findarticles.com/p/articles/mi_m0EIN/is_2005_March_3/ai_n11839770" target="_blank">https://exchange.computerhistory.org/exchweb/bin/redir.asp?URL=http://www.findarticles.com/p/articles/mi_m0EIN/is_2005_March_3/ai_n11839770

Reliability Manager was Harry Spence who recently retired from Microsemi Corporation where he was the Director of Quality Assurance. He was on the JEDEC Board and chairman of the JEDEC JC-13 committee when he retired. Harry was VERY tall with shocking red hair and unnerving in his ability to peer over the Herman Miller dividers into the cubicles as he walked by. When I first

met Harry, he and his wife and children had just returned from a stint in the Peace Corps in South America and had driven all the way from the tip of South America to San Rafael in his Land Rover. Harry is located in Truckee, California.

Harry has been a member of the FSEA Board of Directors for six years and is presently the Chairman of the Board. As an FSEA Regional Director, Harry supports schools in the North Bay. He is available to speak at schools or businesses to help start clubs. He is willing to provide workshops for mentors and teachers and conduct assemblies at the schools to interest the students in FSEA. Harry can be reached by e-mail atmailto:hbspence@pacbell.net or by telephone at (415) 899-1072. ")

Production Supervisor for Diodes was Helen Owens, a beautiful competent woman whom I remember most for carrying a production worker, who had acid explode in her face, to the shower and holding her under the shower in complete disregard for any acid she got on herself.

Fab Supervisor for Diodes was John Cox. I most remember John for coming in early every morning to vacuum the tops of the oxidation furnaces because he "just had a feeling" that it improved the yield. We didn't have clean rooms in those days and in fact in 1972 had just stopped the operators from eating potato chips while working because the salt seemed to hurt the yield. The last time I saw John was in 1985 and he was working for Motorola (now Freescale) in Austin. John was also a hero of sorts. He was raising a daughter of a Vietnam buddy who showed up at John's door one day dieing of cancer and handed his half Vietnamese baby daughter to John to raise. You never met a more dedicated Father.

Children were not banned from fabs back then. I used to pick my kids up from school and take them back to work with me where they laid on the floor by the TEOS furnace or plasma etcher, etc. and did homework while I worked on the process. They knew wafers were silicon before they knew they were cookies.

Production Manager for LIC was Manny Fernandez who later left Fairchild for Gartner Dataquest where he distinguished himself as CEO and a visionary. Back in the San Rafael diode days when Manny was unhappy he would take his shoe off and bang it on the desk ala Comrade Gorbachev. (pardon if you are too young to understand this reference).
http://www.gartner.com/5_about/press_releases/2001/pr20010905a.html"
target="_blank">https://exchange.computerhistory.org/exchweb/bin/redir.asp?URL=http://www.gartner.com/5_about/press_releases/2001/pr20010905a.html

Manufacturing Manager was Jim Healy and his wife Gretchen was secretary for the Q&A Department.

I have one other story of Fairchild for now and it is my story. When I first went to interview at Fairchild, I was just out of the U. Berkeley graduate school, already had a good job offer from the Atomic Energy Commission and was just waiting the six weeks for my security clearance to come through. I talked with Alex Danks. He offered me the job and promised me that this was an industry that would "expect the
impossible of me day before yesterday but that I would never be bored". That challenge caught my imagination then and that promise was true.

In the 35 years since then, this has been one of the most exciting industries ever. It gave me the continuing intellectual challenge of an exciting technology. It sent me around the world marketing early DRAMs to Asia and Europe and let me see some of the earliest of the new systems that would change our world. It sent my children and I to Europe where they graduated from High School. It gave my 6 year old son his first computer - a simple board using the RCA1802 processor which input in binary and output in hex and hooked him for life on technology.

In my journey through this industry, I have seen the information technology resulting from our efforts change the world. Access to information for everyone has opened up closed societies and banished dictatorships. It has given new definition to democracy. It has sent us and our machines through the solar system and opened other worlds for our exploration. It allows me to daily look down on my house from the skies and watch the storms approach. It gave us medical equipment and procedures to enhance life beyond anything our parents could have imagined. It banished the outdated information from a set of encyclopedia and allows instant answers to the eternal questions of why, what , how, when and who. We have lived in exciting times. The best are yet to come and we have participated in bringing this into being.

I'm sure you feel the same way about our industry or you wouldn't be working on the Computer Museum. Thank you for the efforts to preserve our story.

Cheers, Betty Prince

Entered By: David Laws
April 2, 2007

Title: My fondest memory at Fairchild
Author: Kris Rallapalli
Created: August 17, 2007
Cataloguer:
Copyright:

Story:
This was my fondest memory at Fairchild:

I was working for Lowell in the bipolar logic group supporting "Macrologic" stuff when I became a US citizen. When I mentioned a sentimental thing that happened to me personally, my group organized a celebration where I got a toy Chevrolet, hot dog and baseball as gifts - true Americana :-)

This is the sentimental story I told in sincerity to our then secretary Diane ....

We used to joke always that our daughter Emmy was the real American because she was born in the US. She was about 4 years old. Phil and I applied for US citizenship and waiting for the paperwork etc. Emmy was really enthusiastic that we are becoming Americans ... we were supposed to go to SFO for swearing in ceremony with our witnesses. But as the eventually day approaching Emmy was not so enthusiastic and truly worried. We didn't pay much attention, we went with our friends to SFO the night before stayed in the city and had nice dinner. Next day we came home after the ceremony as US citizens. We used to live in a Eichler home with an atrium. As we opened the front door and entered the atrium, there comes Emmy with happy tears in her eyes and yelling "dad, you didn't change, you didn't change" and jumps into my arms. I didn't understand, when she settled down, we found out that she was really glad that we are going to be Americans, but in her little mind she realized that she loved Dad the way he is, and worried that by converting to American, the skin color and personality will change :-) that was a great worry in her imagination. She was so happy that her Dad was the SAME as before to her great relief. I am not very sentimental, but that brought tears of joy in my eyes. Bless the innocence and true love. When I told this story to Diane next morning, she was so moved and felt compelled to arrange a celebration on the spot. I will not forget that moment as long as I have my senses.

Entered By: David Laws
August 20, 2007

Title: Three Fairchild Tales
Author: John C. Reinhardt
Created: October 4, 2007
Cataloguer:
Copyright:

Story:

About 1964-1965 when Xerox machines were large and expensive, the entire Applications lab on the top floor of 313 Fairchild Drive shared one machine. Because it was necessary to spread the cost of copies to the appropriate departments, there was a sheet of paper for users to note the number of copies made, department, date, etc. Compliance was spotty, so I posted a sign that read "Please Sign the Log."

The following Monday when we came in to work, we discovered the sign nailed to a large, dirty, rotting log set atop the Xerox machine. Termites spilled out of the log and crawled throughout the room and into the copier. We all knew whose work we were viewing.

When I confronted Bob Widlar, he said "I was merely trying to make it easier for everyone to understand."

* * *

Later, a group of us developed the TO-92 Tester. The hours were long and the stress was high -- the normal Fairchild work environment. One of my project engineers, Carlos Sobrato, was an intense Argentine who expressed himself freely. A number of other project engineers came into my office one afternoon and requested that I get Carlos out of the building so they could get some work done.

I called Carlos into my office and suggested we go down to the Wagon Wheel for some refreshment. On the way over I asked Carlos what was bothering him. He told me that he thought the engineer who designed the ua 702 was less than competent.

The first person I saw upon entering the Wheel was Bob Widlar (designer of the 702) sitting at one of the tables on the right. I took Carlos over to meet Widlar, and in the course of the introduction explained to Bob that Carlos thought the 702 could be improved. Then I bought them a round of beer and went over to the bar to stay clear of any impending fireworks.

An hour or so later I returned to the table where I had left Bob and Carlos discussing linear circuits. Empty beer bottles littered the table except for the white table cloth which they had covered with circuits. Bob and Carlos were arm wrestling. When I asked what they were doing, they replied that they were attempting to establish who was the best circuit designer.

* * *

We were given an impossible schedule in which to design and build the TO-92 Tester. Worse yet, we were told that Sherman Fairchild would be visiting Mountain View to give the whole program an extravagant send-off, including a formal party at the Fairmont Hotel in San Francisco.

We were nowhere near having the tester completed. This was a very large sophisticated system taking up lots of floor space that could test 60,000 devices per hour. Devices were sent through multi-probing test heads, after which they were tossed into a number of separate bins, each with its own test specs. We referred to the handler device translation as "The Big Screw."

Since various sections and aspects of the system were unfinished and did not yet work together, I instructed the hardware engineers to close up the panels on the system and arranged for enough

software to be cobbled together to send devices through the test heads (that weren't yet testing) and pop devices randomly into various bins. This system made lots of noise and there was a convincing array of blinking lights. It looked quite impressive.

The big day arrived! Wilf Corrigan and his crew led Sherman Fairchild and Walter Burke into the demonstration area. Sherman sat on a high stool and listened to our explanation of the system and asked the right questions. We sent the system through its paces. Later, as the group was leaving the test section through the manufacturing area, Wilf Corrigan attempted to elicit comment from Sherman Fairchild concerning the test demonstration. Sherman's response was "It was on the floor."

We may have fooled Wilf, but we hadn't fooled Sherman. Sherman Fairchild was really a very good engineer.

John C. Reinhardt

Entered By: David Laws
October 12, 2007

Title: "How do I get a job with these guys?"
Author: W.J. Sanders III
Created: October 18, 2002
Cataloguer:
Copyright:

Story:

The following story is abstracted from Rob Walker's 2002 interview with co-founder and former Chairman and CEO of Advanced Micro Devices, W.J Sanders III, posted in text and video on Stanford University's "Silicon Genesis" website at:
http://silicongenesis.stanford.edu/complete_listing.html

"In1958 I went to work for Douglas Aircraft Company developing, the air conditioning control system for the DC8. I was designing a power supply around Motorola components so I contacted Motorola and they sent over a sales engineer. I'll never forget that. He came over. He had beautiful clothing on. He was well groomed. He didn't know a damn thing about his product line, but he offered to take me to lunch. He drove in a new car and took me a better lunch than I could afford as an engineer at Douglas Aircraft Company.

I decided then and there that I had been in the wrong end of engineering so I applied for a job shortly thereafter at Motorola as a Sales Engineer, looking forward to the day I could have a nice car, good clothes, and more money. Well, it turns out that Motorola thought I was a little young, so they hired me on as an Applications Engineer. I was quite successful so they moved me quickly into a sales position in Chicago and Northern Illinois

Then a company named Fairchild, which I hardly new anything about, whereas Motorola was a household name in Chicago, contacted me to interview me. They'd like to have me join their company or at least talk about it. Well I had no interest in leaving Motorola for a company named Fairchild in Northern California. But I agreed to an interview on a proviso that it could be over a weekend. My plan quite simply was to spend a weekend in California after a brief interview.

Well, you know, sometimes reality mugs you. I got out there and I was frankly blown away by the caliber of the people, just some incredibly great people. The sales manager was a guy named Don Rogers, marketing manager was a guy named Tom Bay. These guys were super smart guys, and they introduced me to another feisty guy called John Reddy, who was running the

diode operation, who just couldn't tell me enough about how great this company was. And he didn't have to tell me, I figured it out.

And then I met Bob Noyce and my world changed. This was the smartest man I'd ever met in my life. He was congenial. He was engaging. He was just so smart and we talked about the things they were doing and I thought to myself gosh, I just really have to go to work for this company. So that was the end of my playing around in California for the weekend, instead I went into my mode of how do I get a job with these guys?"

Entered By: David Laws
January 8, 2007

Title: "That's not good enough for the consumer market."
Author: Pete Secor
Created: August 8, 2008
Cataloguer:
Copyright:

Story:
I worked for Fairchild from 72 to 77 under Greg Reyes, first in Mountain View on transistors, then in Palo Alto on opto. Greg wasn't one of Hogan's Heros, but he followed them closely from Motorola, and he was old-school. Tough, eloquent, and smart as a whip--he knew the yields better than the engineers. My favorite story is an episode I didn't personally see. We were working on the first LED watch and after months, presented him with a prototype. He looked at it and fooled with it a moment, and then hurled it against the wall. It broke. "Keep working, guys. That's not good enough for the consumer market."

Entered By: David Laws
August 11, 2008

Title: "How would you like to go to Italy?"
Author: Harry Sello
Created: November 18, 2007
Cataloguer:
Copyright:

Story:
On a bright, sunny Saturday during late November 1960, I responded to a knock on my door at my home in Palo Alto, California. There stood Bob Noyce with a smiley, cheery "Hello" and asked "Can I come in?" Recovering from my surprise, I said "Of course!"
He asked; "What are you up to?" There I was in a choking gray cloud of cement dust and I explained that -- I'm buffing my cement floor in preparation for replacing my old linoleum tiles with new vinyl tiles. "Are those better", he asked in typical Noyce fashion. I launched into a detailed explanation of how it was necessary to improve the heat transfer of the radiant hot water heated floors, typical of Eichler house construction. Bob chuckled in his inimitable fashion -- "What a mess. How can I help ". He instead seized the buffing machine from my hands and announced; "I'll buff -- you pry up the tiles."

By then I had recovered enough to ask Bob, "Why are you here?" Interrupting the buffing he replied; "How would you like to go to Italy?" I barely stammered out a "To do what?" He explained; "We are now partners in SGS, along with Olivetti and Telettra, in a Joint Venture factory, to produce Fairchild silicon diffused transistors to be marketed in Europe." As I reeled from the idea, he delivered the knockout blow, which was -- "I want you to run the show as Operations Manager. You've got this next month of December to go over there to prepare the set-

up for you to start full time on January 1, 1961". He asked, almost as an after thought, "Do you want to do it?" I choked out a weak "Yes, of course" and stammered "but what will I do with my unfinished floors?" He smiled, and replied "Don't worry about them. I'll take care of them."

I went -- and he did.

Entered By: David Laws
November 18, 2007

Title: Meet Murray Siegel
Author: Elliott Sopkin
Created: October 31, 2007
Cataloguer:
Copyright:

Story:
Murray Siegel was a senior applications engineer wearing badge number 9 - that's eight founders of Fairchild Semiconductor and then Murray. He was serious, focused and really didn't like interruptions.

It was the summer of 1965. I'd been working at Fairchild a few months in the public relations department reporting to a guy named Dick Molay, who reported to Gene McClenning, who reported to Don Valentine, director of marketing.

My job was helping engineers write and prepare magazine articles and then getting the articles published in one of the several trade journals that were beginning to dot our industry. These magazines produced a lot of visiting editors and reporters, and I often greeted our guests, took them to lunch and shepherded them around to chat with the engineers and marketing people. I was to handle a planned visit by George Rostky.

Rostky, may his encyclopedic soul rest in peace, was well on his way to becoming a super star in the ever-expanding cadre of electronic-magazine editors and writers. He was chief of EEE magazine and was coming to Fairchild to talk about linears.

Molay and I outlined the agenda we wanted to push and I made appointments with folks like Jack Gifford, Murray Siegel and a couple of applications types.

Came the appointed day and the first couple of interviews were a breeze. We then walked into Murray's office, where I had, of course, carefully planted a recent issue of George's publication.

"I am pleased to see you read our magazine," said George.

"I would never read that piece of shit," said Murray, "Sopkin said it had to be in plain view and there it is."

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Entered By: David Laws
October 31, 2007

Title: "Tell your friend Herbie to buy American"
Author: Elliott Sopkin
Created: December 17, 2007
Cataloguer:

Copyright:

Story:
Herb Sosnick was a marketing services, account type at Fairchild Mountain View in the mid -60s. His job was to service a couple of product lines with brochures, ads and other marketing stuff. He was in his mid-to-late twenties, was a bit of a player and loved the ladies.

One day Herb bought himself a fine Porsche car. It was parked behind the Whisman building, adjacent to our offices at 313 Fairchild Drive. Herb was going to give me a lift home. As we walked out Dr. Robert Noyce also was walking out.

"What do you think of my new machine Bobbie," asked Herb. (Herb had a way of being a bit extra-friendly with certain people.)

Noyce didn't say a word. Actually, he barely looked up from staring at his shoes. He got into what I remember as being a several-years-old Mercury-looking car, slammed the gas to the floor and with gravel flying spun out of the parking lot.

A couple of days later I ran into Dr. Noyce in the hall. He didn't look up, but said: "Tell your friend Herbie to buy American."

Entered By: David Laws
December 17, 2007

Title: "When I arrived at the Fairchild Whisman Road facility, they didn't know me from Adam."
Author: Charlie Sporck
Created: February 21, 2007
Cataloguer:
Copyright:

Story:
The following story is abstracted from Rob Walker's 2000 interview with Charlie Sporck posted in text and video on Stanford University's "Silicon Genesis" website at:
http://silicongenesis.stanford.edu/complete_listing.html
"There's an interesting story that relates to the kind of atmosphere that existed in the semiconductor business at the beginning, and that is how I interviewed at Fairchild.

I had answered an ad and they called me down to an interview in New York City. It was a hot, hot day in August 1959 and the interview was in a hotel room. I get up there and I'm perspiring because it's hotter than hell. I walk in and there are these two guys sitting around this table with all sorts of alcohol stacked up. It was around eleven o'clock in the morning and they were in great shape.

One was the HR VP and the other was the VP of Manufacturing. We interviewed and I hit it off with these guys and we went to lunch. They got further bombed, and they gave me a job offer. I was making seventy-two hundred dollars a year. They offered me thirteen thousand. I accepted on the spot. That weekend I went home, told my wife. She was amazed that I'd want to leave the East Coast but we sold the house, packed up the kids and drove to California.

When I arrived at the Fairchild Whisman Road facility, they didn't know me from Adam. They'd lost track of the fact that they'd offered me a job. And it was some time before I finally got a hold of Grady (the HR guy?) and went over with him just exactly what had happened. When they finally recognized that they had given me a job offer they put me on the payroll. They then put me in a room along with the other guy that they'd hired for the same job.

Now can you picture this? Two production managers in the same office with one general foreman - I mean just complete chaos. There was no understanding [at Fairchild at that time] of how to manage a manufacturing organization, well, any kind of an organization. That's probably one of the reasons why the organization was so flexible, because it didn't have structure. But for a guy from GE who had been there at GE for nine years it was a hell of a shock.

I was only there a couple of weeks and the other guy disappeared, and I think he just got disgusted and quit. I didn't have any choice. I'd cut the limb off behind me so I had to stick it out. Actually, it was very fortunate that I did."

Entered By: David Laws
January 8, 2007

Title: My Best Day at Fairchild
Author: Andy Swank
Created: January 24, 2007
Cataloguer:
Copyright:

Story:
I am flattered that any of "my stories" would warrant a posting on the History of Fairchild Page, ... of course with 8 years I have many stories. Following are a some hiring related stories that I will never forget.
My Best Day at Fairchild was the day John Sussenberger hired me to start on March 15, 1965. And my next best day was when Jerry Sanders hired me away in November 1972 (And after almost 8 years I resigned to John Sussenberger!) Jerry Sanders met me when I was the Korea factory controller and I gave him a brief of doing manufacturing in Korea - the costs, the timeliness, the goods and the bads. When AMD had their IPO in 1972 Jerry invested half the proceeds into a new AMD Penang factory and hired me to look after his big buck investment.

The smartest guy I ever hired was Ari Korthamar. I had to give him 12 days of leave when he flew to Israel to blow up bridges as a demolition Army Captain in Israel Army during the 1967 7 day war. When I was college recruiting I asked Ari, "You are a 22 year old graduate, what do you consider your most significant accomplishment?"

Ari's reply: "I was the first Jew to get full scholarship to the University of Santa Clara, a Jesuit school, and get 2 degrees in 3 years with an A GPA!"

I replied: "You are hired."

He later went back to school for patent law degree and invented some of the gross and fine leak test equipment.

Another really smart new hire was Nancy Swann (Bohnet). In 1966 I was unsuccessful in getting my Quality Control inspector jobs upgraded to a higher pay code. So I went to Alice Washburn in HR and I took the Wunderlick IQ indicator test. I scored 138 and then joked with Alice that when she was testing new-hires, if any beat my score, could she assign them to a QC position.

The first one to beat me was Nancy Swann! I put her into the Mask Making QC inspector's job and she started her climb of multi promotions. And she deserved them!

Andy Swank
San Diego

Entered By: David Laws
January 24, 2007

Title: "I went to San Rafael and stayed there for the better part of four years."
Author: Bob Swanson
Created: March 11, 2006
Cataloguer:
Copyright:

Story:
The following story is abstracted from Rob Walker's 2006 interview with founder and CEO of Linear technology Bob Swanson, posted in text and video on Stanford University's "Silicon Genesis" website at: http://silicongenesis.stanford.edu/complete_listing.html
"I worked at Transitron for almost four years from1960. I was in my fourth year at Transitron working on a PNP mesa structure transistor - this was the hot stuff then. I was trying to second source a Fairchild product. Fairchild, of course, was now a bright star on the West Coast and a friend of mine gave me an article that Fairchild had announced this thing called the planar process. It was like we're dead.

I had offers from Raytheon, I had offers from Sylvania and companies like that. I was almost going to go work (for RCA) in Somerville, New Jersey. My wife and I are both East Coast people, both parochial New Englanders. I'd never been further west than Chicago once in my life.

Then a guy named Fred Bialek called me from Fairchild, San Rafael one Thursday night and said, "Hey listen, we've got a job out here. You ought to come out and interview. A lot of your colleagues are already out here. They say that you're a good guy so why don't you come out?" I said, "I've been stalling Raytheon and Sylvania for about three months now and I got to take this offer." And he said, "Well if you've been stalling them for three months, why can't you stall them for another weekend?" I mean, this is the beginning of these aggressive people from Fairchild who could turn no into a yes in a short period of time.

I said to Fred, "Look, you know, I'm finishing up a class at Northeastern on Friday nights. I don't know how I can do it." And he pulled out his planner and he said, "Hey there's a plane at 10:30. You can be here at 2:00 in the morning." And he said what have you got to lose? You've never seen San Francisco. It was like there's no, no to this question.

So that's what happened. I went out and interviewed. I was excited about the Bay Area. It was almost like a new country to me. I remember driving over the Golden Gate Bridge at two in the morning. I thought I was in Japan or some place like that. Didn't even seem like America to me. So we had great interviews and we went to Chinatown that night for dinner, another exciting place. The next day they took me to Sam's in Tiburon on a beautiful Sunday morning. And so I got home and my future wife picked me up and she said well what are we going to do? I said well I guess we're going to Somerville. She says well is that the best job? I said no, no, no. The best job is in California but we're not going to go to California are we? And she said why not? And I said, you'd go to California? The rest is history. So my wife, of course, takes a lot of credit for what's happened to my career.

I went to San Rafael and stayed there for the better part of four years. Fred was this young guy who'd taken over the diode plant and by the time I got there, they were already kicking butt. And by the time he left with the group that took over National, they were the number one diode producer in the world. And that's where I worked for the better part of four years."

Entered By: David Laws
January 8, 2007

Title: Applications, MSI, and LSI at Fairchild Semiconductor
Author: Bob Ulrickson
Created: September 4, 2007
Cataloguer:

Story:
I witnessed three significant happenings at Fairchild Semiconductor during the period 1966 to 1973. The first was the transformation of the innovative Applications Department; the second, the genesis and fruition of the Medium Scale Integration (MSI) circuit family; and the third, Fairchild's early innovations in Large Scale Integration (LSI), followed by the devolution of LSI to other Silicon Valley semiconductor firms.

A Story of Applications

John Hulme hired me in 1966 to supervise the Systems Engineering group within his Applications Department. I had been working at Lockheed Missiles & Space on aerospace telemetry systems with some other future Fairchildren -- Jim Kubinec and Tony Holbrook. Kubinec preceded me to Fairchild, made me aware of the opportunity in Applications, and he steered Holbrook to Fairchild when I gave him a heads up that Tony had resigned and was leaving my group at Lockheed for Philco-Ford Aerospace. By switching from aerospace to the semiconductor industry Holbrook eventually rose to the presidency of AMD.

"Applications" under John Hulme was housed at 313 Fairchild Drive in Mt View. The name "Applications" always seemed to me a misnomer, because the several engineering teams it comprised were in fact the Engineering Department for all the various product lines. I assumed that the name came from "applying" semiconductor technology to the design of various products. The product design teams included Discretes (transistors & diodes), Digital, Linear, MOS, & Hybrids. Digital design teams were engaged in designing bipolar products at the gate and flip-flop level in RTL, DTL, TTL, CTL and ECL circuit forms. The current level of complexity in 1966 was dual to quad logic gates and flip-flops packaged in ceramic 14-pin dual in-line packages (DIP) plus serial shift registers in MOS. I recall working with Dick Crippen, Bill Sievers, Jim Kubinec, Sven Simonsen, Henry Blume, Lee Boysel, and numerous other talented integrated circuit designers.

One of the first assignments Hulme gave me was to compile Applications' contribution to the 5 year plan called Fairchild '71. It gave me a good overview of Applications' mission and its people. There was a lot of talent there.

Systems Engineering was a new experiment, staffed initially by John Nichols, Clive Ghest, and Orville Lykins. Our charter included studying electronic systems and providing direction for new generations of semiconductor products to sell to customers in electronic systems markets. As it happened, that charter presaged Fairchild's bipolar digital product line and led in a few years to a new kind of Applications Department. When I arrived on the scene, Nichols and Ghest had already begun to conceive a next generation of digital products at a complexity level above gates and flip-flops. These became known as MSI (Medium Scale Integration) which within a few years became the largest selling, and most profitable products Fairchild had ever known -- A major success story for Fairchild (See "The MSI Story" below).

After 1968, the engineering design groups within John Hulme's Applications Department became a part of the divisional product groups under Hogan's heroes. Hulme took a few key applications guys, including Nichols and Derek Bray to R&D to form a liaison group to assist Fairchild's other divisions around the country with the use of semiconductor products. I had just returned from a sojourn to R&D and back to Mt. View as part of Bob Schreiner's Custom Micromatrix Arrays

department (See "The LSI Story below). I was given the opportunity to re-organize a New Applications department as a part of the Marketing and Sales organization under John Duffy.

The first decision I faced was where to locate the new Systems and Applications Engineering Department. The new building 20 was filling up with mahogany row, marketing, and support organizations in addition to the CMA CAD facility, production facility, and engineering groups. I opted to move Applications to the basement where we had a reasonable chance of stability in the long term, mainly because nobody else wanted to be in the basement. It was perfect for us techies.

Our new charter included four basic functions: Product Planning, Product Support, Systems Analysis, and Customer Support. We were about 55 engineers, technicians and support personnel organized in 5 groups -- Consumer under Norman Doyle;

Digital under Peter Alfke; Instrumentation & Interface under Bob Ricks; Automotive under Bob Hood; and Packaging under Lee Marley. Grace Cole was our department secretary.

The new Applications attacked all markets from a systems point of view. Consumer Applications dissected TV sets, and proposed new IC products to replace whole PC boards. Doyle's depth of knowledge of consumer systems and his flamboyant style got Fairchild designed into all manner of consumer products.

Linear Applications maintained contacts with hundreds of individual customers who would call to ask how to get their circuit to stop oscillating, or how to bias a DC amplifier properly. Ricks' trick memory enabled him to tell a customer on the phone to" Put a .001µF capacitor between the collector and base of Q3," which would usually fix the problem. How he remembered everybody's schematics, I'll never know.

Automotive applications took apart new cars, and re-instrumented them with electronic ignition systems, multiplexed power controls, digital displays, and many other innovations that were ultimately to appear in new cars worldwide.

Digital applications turned out new logic designs for the TTL MSI product line; originated new architectures for MOS products, and cranked out an incredible number of technical articles, application notes and the TTL Applications Handbook.

The demand for applications engineers to visit customers with field salesmen became so great that it began to cut into the time we needed to spend on technical literature and new product planning. This spawned a new corps of technical sales people. Central Applications hired and trained 10 new Field Applications Engineers who were deployed to the sales regions to provide direct technical support to customers. Jerry Lawson was a key player in this new activity.

Applications was now the technical arm of the marketing and sales organization. Our responsibilities encompassed all product lines, and all geographic sales locations worldwide. This gave me the unique opportunity to think on behalf of the whole company, without any factional bias toward particular product lines, organization functions, or geography. When Wilf Corrigan decided that 9,000 products were way too many for efficient management by Fairchild Semiconductor, he decreed that we must cut this number in half. Product Division managers and Regional Sales managers feared that their businesses would suffer, and wanted everybody else's ox gored before theirs. Corrigan put me in charge of recommending which products to cut from each division because Applications' viewpoint was impartial and we were technically competent to evaluate product values. For several months, applications teams worked with product divisions, sales and marketing, and customers. I reported our progress weekly at the executive staff meeting as we pared back Fairchild's product lines. The first cuts of obsolete or unprofitable products were easy. Later on it got more difficult as we found that some customers would stop buying our profitable products from one division, if we cut off their supply of another division's

products that were slated for cancellation. In some cases, like DTL, we opted to raise prices dramatically and explain the obsolescence problem to key customers. In other cases we offered customers the chance to place their last and final order before products were declared obsolete and phased out of production. Eventually customers switched to less costly and more modern product lines like TTL. In some cases competitors picked up our discontinued products and made a business for themselves in phased-out product inventories. After a reasonable period, we met our goal, and Fairchild Semiconductor became leaner and meaner and more focused on fewer more profitable products.

I enjoyed leading Applications for about two years until Norman Doyle walked into my office and resigned to take a responsible position at National Semiconductor heading their Linear Product Marketing Group. The prospective loss of Doyle's talent to Fairchild was compounded by the damage he could do by helping National. I was also motivated by the fact that Norman was my chosen successor in Applications (we all had succession plans in those days). After a week he was still having none of my persuasion, until one evening while having at drink at the Wagon Wheel, I asked him if he would stay if promoted to my job as Manager of Systems & Applications Engineering. Doyle said he'd have to think about that. We had another drink and he accepted on the spot. Suddenly I was without a job. Although I had several drinks under my belt, I called my boss at home from the pay phone at the Wheel to report what I had done, and to see if he had another job for me. Dick Henderson who was VP of Marketing & Sales told me to be in his office early the next morning. He tried unsuccessfully to get me to reverse my brash conduct; and I explained why it had to be so. I was not sure that my arguments prevailed, until Henderson asked whether I preferred Digital or Linear. I had not realized that the positions of both the Digital and Linear Product Marketing Managers were recently vacated by Mike Markkula. Markkula had a long history in Linear, and had taken the Digital job for about a month before leaving Fairch to become Memory Marketing Manager at Intel. I told Henderson "Digital", and suddenly I was a marketing guy (for the first time) managing Digital Product Marketing, a group of talented & experienced people including Lowell Turiff, Bill DeMatteis, Rob Walker and Dave Laws.

About a year later, the product marketing managers were moved from Sales & Marketing into the new Product Divisions where I reported to Dr. Tom Longo, VP of Digital Products Division. There I would work to promote the same MSI products we had championed years before in the old Applications. But, that's another story...

The MSI Story

In 1966, in the Systems Engineering Group of the Applications Department including Nichols and Ghest had begun to conceive a whole new generation of digital products at a complexity level above gates and flip-flops. Unfortunately, no process existed for proposing and introducing new products, thus Nichols, Ghest, & I met numerous roadblocks attempting to promote the new TTL MSI functions they had invented. I wrote a new product planning procedure, and submitted it up the organization all the way to Syosset, NY where it was approved. MSI products proposed under the new procedure still met with opposition. Bipolar Circuit Production under John Carey resisted the proposed larger functional devices because of inadequate step-and-repeat cameras, difficult mask alignment, and yield/cost problems. Our frustration rose.

The marketing organization at the time was divided into Consumer, Commercial (Marshall Cox), Military (Jerry Sanders), and Industrial (Bernie Marren). Product Marketing under Floyd Kvamme reported to Jerry Sanders and was organized by product groups including Bipolar Digital (Dick Kors), Linear (Jack Gifford), MOS (?), LSI (Jerry Larkin), Hybrids (Dan Hauer), et al.

Finally, over a beer in the Fairchild Cafeteria, I appealed to Jerry Sanders who declared that our conversation would not go unheeded. Sanders broke the impasse. Within days Kvamme called the first product planning meeting using my newly approved process for new product planning. At that meeting the first six 9300 series MSI circuits were approved. A 4-bit shift register, 10-bit and 16-bit counters, adders, arithmetic logic units, decoders, and multiplexers were included in the list

of new 9300 series MSI products. At that time TI, the major competitor in TTL, had no MSI circuits in their standard product line. When Fairchild began to introduce the 9300 functions, TI copied them and assigned them TI's well known 54/74 series TTL product numbers. Fairchild's MSI products won the engineering design popularity contest, but TI's product code numbers won the standardization game in the marketing arena. The success of Fairchild's MSI devices was assured by the design principles established primarily by Nichols who insisted on breaking the mold of prior IC design guidelines. These principles were based on the needs of customers for complex, compatible logic functions that minimized device count in system designs, promoted ease of printed circuit layouts thru judicious choice of DIP pinouts, and added functionality by using all of the pins on every device to provide inverted inputs and outputs, enables, resets, etc. that would otherwise require additional SSI "glue logic". When Nichols noticed that a few of TI's MSI devices (originated as custom products) had NC (no-connection) pins, he suggested that they may have been provided as "spares" in case a useful pin function got a "flat"J These philosophical underpinnings of MSI logic design were not initially popular among circuit engineering and production because they complicated chip layouts, and added complexity and chip size. Nobody ever heard of constraining the pinouts before laying out the chips. Eventually these problems became features and other innovations by circuit and process engineers provided Shottky diode protection, chip-shrinking circuit & process innovations, high speed (74S) and low power (74LS), tri-state logic, package innovations like better lead frames and plastic DIPs. These innovations in circuit and process technology enabled the South Portland Maine plant (SPOR) to expand the TTL product line to meet customer demands for greater functionality, higher speed, and lower power consumption. With TI, National, Signetics, and other competitors vying for market share and driving prices down, the industry shared innovations through the second-source arrangements that were a requirement for customer acceptance of new products.

Dick Kors, then Manager of Digital Product Marketing, conceived an 8x10 flip chart presentation1 emphasizing ease of system design using MSI. It was developed with the help of Gene McClenning, Nichols and Ghest. This unique set of flip charts in a three ring binder had the basic logic functions on the customer side, and the selling points and answers to FAQ's on the salesman side. Now every salesman could be an MSI expert. As this new generation of MSI devices reached successful production, Fairchild Sales & Marketing launched a "product of the week" plan which ambitiously announced one new digital or linear product per week for a full year. This required a frenetic effort to coordinate advertising, product availability on distributor's shelves, data sheets, pricing, etc. Applications Engineers produced application notes, catalogs, technical articles, design seminars, showing customers the path from SSI logic designs to the modular design concepts of MSI. Fairchild's Digital IC Catalog and Digital Applications Handbook became bibles for customer digital designers. MSI became pervasive among mini-computer and industrial product customers.

In 1969, Jerry Sanders, Ed Turney, John Carey, Jack Gifford, Clive Ghest, Sven Simonsen, Jim Kubinec, and a host of other talented people formed AMD to successfully focus on production and sales of MSI and Linear products. Numerous other semiconductor companies were formed in this time frame, as shown on the famous Semiconductor Family Tree chart published periodically by the Semiconductor Equipment Manufacturing International (SEMI).

In 1971, I moved from Applications to manage Digital Product Marketing, under VP of Marketing & Sales, Dick Henderson. Wilf Corrigan had ascended to the Presidency of Fairchild Semiconductor, and division Vice Presidents headed each of the major Product Groups including Discretes, Digital, Linear, MOS, et al. When Product Marketing was later decentralized among the major Product Groups, I reported to Dr. Tom Longo, VP of Digital Products Division. Subsequently, Central Applications was broken up and its functional groups were distributed among the divisional Product Marketing Managers. Alfke and Nichols were again a part of my team.

Although MSI was the circuit family of choice for new designs, most of the digital systems in production by customers still were still dominated by SSI based designs. Competition had driven

the cost of gate and flip-flop products down to levels that were barely profitable, and Fairchild was not the lowest cost producer of SSI. To counter this problem Digital Products Division developed a new coordinated marketing strategy.

In 1972, I announced to field sales that Digital Product Marketing would not book orders with less than 25% MSI (vs. 75% SSI) in the mix. Of course, this ploy was met with reluctant exuberance and enthusiastic resignation by field sales who continued to be faced with customer releases having a much lower MSI/SSI mix. Sales legitimately complained that although industry MSI/SSI mix was increasing in new system designs, production systems were still much lower that my arbitrary 25% mix, and Fairchild would lose orders if it attempted this strategy. About this time Corrigan organized a tour of all field sales regions with the product marketing managers of the operating divisions presenting their product lines and strategies, and the regional sales managers presenting their customer's needs for product and pricing. In the Digital presentations I countered field sales objections to the new MSI mix strategy with the unpopular suggestion that sales reject customer orders for SSI to get the MSI mix up to 25%. Dr. Longo and John Sussenberger agreed to force the strategy by ramping up production of profitable MSI devices and reducing production of unprofitable SSI. The strategy worked. Within a few months Fairchild's competitors were inundated by SSI bookings, while Fairchild's bookings of profitable MSI devices increased rapidly. As a result, Digital Products Division exceeded its sales goal, beat its profit goal, raised average selling prices, and increased market share all in one year. MSI became Fairchild's largest selling and most profitable product line for several years. This remarkable performance was due primarily to exploitation of the MSI circuits conceived by Nichols and Ghest a few years before. And now you know the rest of the story...

Today at Fry's you can still buy the 74LS195 (Fairchild's 9300, the first MSI product).

The LSI Story - Success and Failure at Fairchild

In 1967, Bob Schreiner and a team of engineers under Bob Seeds at Fairchild R&D proposed an R&D effort to create the first LSI (Large Scale Integration) products. Maurice O'Shea and others under Schreiner's direction prepared a plan for something called "Arrays." Arrays were large numbers of logic gates, which could be interconnected on a single chip to form custom logic functions. In theory, as the semiconductor technology permitted more functionality on a chip than just a few gates & flip-flops, customers would to be able to "write on Silicon", so they could conceive their own proprietary monolithic logic chips to reduce cost and compete in the digital systems market. It would turn out that this theory was pre-mature until the production process technology permitted several orders of magnitude greater complexity per chip. Until then standard high volume semiconductor products would almost always win the product price competition.

On September 8, 1967, Schreiner's plan (The LSI Story2) was presented in a marathon meeting attended by Bob Noyce, Gordon Moore, Bob Seeds, Jerry Sanders, Jerry Larkin, John Sentous, John Hulme, Tom Bay, Bob Schreiner, and Maurice O'Shea. The result of that meeting was Noyce's blessing for the establishment of the Custom Micromatrix Arrays Dept, under Schreiner, reporting to Bob Seeds in Gordon Moore's R&D Laboratories at Palo Alto. Suddenly, I found myself reporting to Schreiner, and moving to Fairchild's Research Center in Palo Alto.

Schreiner's new organization was conceived as a fully functional product division which would grow its technology at R&D, then be transferred as a whole to production in Mountain View when it was mature. (This was part of a new method for transferring R&D technologies to Production - which had been problematical in past technology transfer attempts.) Reporting to Schreiner were Micromatrix Arrays (bipolar) under Bob Nevala; Micromosaic Arrays (MOS) under Jim Downey; Manufacturing under Charlie Ellenberger; Special Projects under Maurice O'Shea, and I headed Systems Engineering. Nancy Weaver was our department secretary. Systems engineering was expanded to include Test Engineering, under Harold Vitale, and Computer Aided Design. Rob Walker and Dick Derickson joined the Systems Group with responsibility for

developing logic architectures for Arrays that would best serve the electronic systems market, and assisting customers designing with Micromatrix and Micromosaic. A Computer Aided Design effort was already underway at R&D under Dr. Hugh Mays, ably assisted by Dr. Jim Koford, and Dr. Ed Jones among others.

Test Engineering developed the first LSI device tester -- the 8000A at R&D. It was designed to handle devices with large numbers of pins, and custom complex internal logic functions. Test patterns would be applied to inputs and output patterns observed to determine compliance with logic simulations performed by CAD during the custom product design. As the first tester started to come to fruition, Vitale had to interface with Fairchild Instrumentation who would build it. There was the usual interdivisional politics and in-fighting with Instrumentation, which had the charter to design & build testers, but CMA wanted to control the functionality of the LSI testers, a field in which Instrumentation had no experience. When Instrumentation failed to produce a viable 8000B product, Vitale and his entire group of test engineers transferred to Instrumentation to assure the continuity of the R&D design, and to transition LSI testers into production. The 8000B morphed into the Sentry, the first computer controlled high speed LSI tester.

When the CMA product lines and the support activities including Testing, CAD, & Systems were deemed mature, Schreiner's CMA department moved to Mt View (Bldg 20) under John Sentous to begin production of the first Micromatrix and Micromosaic arrays. Systems Engineering matured in the form of the "mighty MOS machine", a Computer Aided Design system running on an IBM 360 system, which automated logic simulation, test generation, test verification, cell placement & wire routing, and rubylith artwork generation. Leo Craft, Ralph Bestock and others joined CMA from Dr. Mays CAD group for the transition of the CAD system & software to production. As I recall, Hugh Mays retained the key CAD guys, Koford & Jones, but they spent a huge amount of time in Mt. View getting the computers and software running. During the early days in Bldg 20 we were still cutting rubylith artwork on IBM plotters. Maurice O'Shea's reticule generator system, produced by Perkin-Elmer, ultimately eliminated the rubylith process. Almost every customer in the industry passed through a "CAD tour" to show off Fairchild's fledgling LSI capability. Production of the first Micromatrix and Micromosaic products began.

In 1968, Bob Noyce and Gordon Moore departed Fairchild to start Intel. Hogan's heroes arrived as the new top management, and group directors were created over the former product line directors. Soon thereafter, the powers that be offered Schreiner the top job at Instrumentation, which he re-named Fairchild Systems Technology. Ultimately the Sentry Testers became a very successful business for Fairchild.

When Schreiner left CMA, I took over the CMA department for a brief period, and promoted Rob Walker to manage the Systems & CAD group. Gene Blanchette, who had become the group executive over the MOS LSI organization, wanted to bring in a seasoned production manager, Jack Gates, to run MOS Arrays. Blanchette and Schreiner conned me into taking over Central Applications, which probably saved my career. I lost track of the mighty MOS machine for a year or so while re-organizing Central Applications.

About a year later Nichols returned to Applications in Peter Alfke's Digital group. He headed a team that included Mogens Ravn, John Springer, and Rich Whicker. They began development of an MOS chip set dubbed Large Scale Standards (LSS). This effort was partially funded by the MOS division through a budget arrangement I made with Blanchette. It was intended to be a new programmable MOS standard product offering, to supplement the custom Array products. MOS was also involved in development of the PPS-25 calculator chips which had no relationship with the Large Scale Standards architecture. Nichols never favored the custom circuits inherent in Fairchild's LSI philosophy ("Which was: Build whatever the customer wants."). Instead, Nichols emphasized that the semiconductor industry thrives on high volume standard products to achieve both low cost and ever increasing functionality in accordance with Moore's law. Because packaging became an increasing cost burden on large multi-pin packages, Nichols sought ways to maximize gate to pin ratio in complex standard logic functions. Looking to the computer

industry, he envisioned that programmable logic devices organized as computer components could provide the varied needs of customers through customized software, while a standard hardware architecture could provide large scale standards that favored semiconductor production economies. The result was an architecture design for standard programmable LSI products, a fore-runner of microprocessors. One of the key characteristics of the LSS architecture was a bus structure that facilitated communications among CPU, Memory, and I/O sections, and a general purpose instruction set to program this computer on a chip, or chip-set, to perform a wide variety of logic applications without customization of silicon hardware.

In 1972, when Roy Pollack became VP of MOS, with Bernie Marren as product marketing manager, I helped to arrange a technical presentation by Nichols to MOS engineering and CAD personnel on the subject of the Large Scale Standards concept. The presentation and architecture were well received by the technical staff, but budget constraints and MOS Division's focus on custom LSI resulted in a rejection of the concept by Pollack and Marren3. Funding was withdrawn from Nichols' Applications effort and Fairchild lost its chance to compete in the coming microprocessor revolution.

This unfortunate turn of events led Nichols to begin looking outside of Fairchild for opportunities to participate in the microprocessor revolution he had foreseen. He recruited me in 1973 to co-found a company called Logical Services Incorporated which was dedicated to new product development at the system level based on microprocessors. One of the first projects Logical completed was the development of a set of bipolar chips for Dr. Longo at Fairchild called Super-MSI.

Alas, Fairchild never really mastered the production technology for MOS. And bipolar technology never achieved the circuit densities needed to go much beyond MSI complexities. The MOS organization at Fairchild foundered in spite of the architecture and CAD systems that were state of the art at the time. Either somebody kept dipping the wafers in HF, or they lost (maybe never found) the MOS process. The problems at MOS were compounded by the revolving door in Silicon Valley that spun new ventures out of Fairchild before they could be counted as Fairchild's successes. It was Intel, AMD, LSI Logic and other companies, many staffed by former Fairchildren, who were eventually able to successfully design and manufacture MOS products having 10,000 to 100,000 gates per chip -- orders of magnitude beyond our initial definition of "LSI" as "greater than 100 gates," and far beyond what CMA pioneered at Fairchild.

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The following referenced documents were donated to the Computer History Museum by Bob Ulrickson in 2007:

1. The 9300 MSI flip chart sales presentation was produced about 1969 by Dick Kors, Gene McClenning, John Nichols, Clive Ghest, and Bob Ulrickson

2. The LSI Story" - The verbatim (expletives deleted) transcript of a marathon meeting (Sept 8, 1967) that launched Fairchild into the LSI business. Attendees were Bob Noyce, Gordon Moore, Bob Seeds, Jerry Sanders, Jerry Larkin, John Sentous, John Hulme, Tom Bay, Bob Schreiner, and Maurice O'Shea.

Posted at: http://www.computerhistory.org/corphist/view.php?s=documents&id=1716

3. A memo dated September 2, 1971, from Roy Pollack, VP MOS and Bernie Marren, Product Marketing Director, which rejected John Nichols' proposal to develop a microprocessor chip set for Fairchild.

Entered By: David Laws
September 4, 2007

Title: I had no financial interest in "Walker's Wagon Wheel"
Author: Rob Walker
Created: August 17, 2007
Cataloguer:
Copyright:

Story:
First let me explain, I had no financial interest in "Walker's Wagon Wheel" I'm sure my patronage helped pay the bills, but it was some other Walker that owned the joint.

I had started my Fairchild career in Palo Alto where we knew nothing about any Wagon Wheel. We went to the Alpine Inn in Portola Valley (we called it Zotts for some reason); it was even older and more decrepit. It's still stands on Alpine Road, now given official historic status.

When I moved to the Mountain View "Rusty Bucket", Nancy Weaver, our department secretary, told me of the Friday night ritual starting at the Wagon Wheel and then moving to Chuck's Steak House on El Camino. I loved it! The crowds, the fun, the booze!

Many years later, I started to put together a documentary called "The Fairchild Chronicles" based on my many interviews over the years.

But I needed an introductory opening and I thought I would tape the intro standing in front of the Wagon Wheel. Susan and I checked it out, it was closed but intact. So the next Sunday we met the cameraman at the Wagon Wheel site. Now it's an empty lot. So we went down and shot in front of the Whisman site, now an hazard contaminated empty lot. Standing there in a December drizzle, forgetting my lines, it was unuseable.

But I still needed an intro. Ah plan B! Let's have the CEO of the new Fairchild in Portland Maine film an intro. I contacted their PR gal, she was enthusiastic, and I sent her a rough cut. After viewing all the stories of drunken fist fights, these proper New England types refused to take my calls or emails. I ended up donning a suit and tie and taping the introduction at Stanford.

Entered By: David Laws
August 20, 2007

Title: How we gave away the crown jewels
Author: Rob Walker
Created: August 18, 2007
Cataloguer:
Copyright:

Story:
I never understood why we protected only semiconductor processes and not architectures or software. For example the first TI 7400 MSI designs were amateurish. Meanwhile the 9300 TTL/MSI were carefully thought through; if you go to Fry's today you will find the very same organization and pinouts we come up with for the 9300's. The problem was that they have only 7400 numbers now; TI was free to copy them pin for pin. But that's small potatoes, we never copyrighted our CAD tools like Fairsim or patented our memories such as ROM or RAM. Years later I asked Gordon Moore about it: "Ah, one of the questions that has come out of a number of lawsuits as of recently, that here on the west coast, in Silicon Valley, we didn't patent circuit designs or computer aided design for that matter. And as a result, we never patented at Fairchild the ROM and the RAM. Intel never patented the microprocessor... and others did. East coast companies, TI in particular, took our work and patented it. How come we never recognized the importance of that circuit development"?

Gordon replied "Well, it was probably a different attitude about patents. One thing that happened in the semiconductor industry... semiconductor processes are a long series of steps and the patents had gotten pretty broadly spread because all of the people working on the technology had some of them. And the net result was in order for any of us to operate we had to be cross licensed so the participants tended to all cross license one another. So, there was not a tremendous advantage to having more patents; with a couple of exceptions, there wasn't much net benefit from it. What we never anticipated I guess, was a lot of other participants were going to enter the business later on. So, at Fairchild we tended to patent relatively few things, typically the ones that we thought we could police most easily and were the most difficult to get around, you know, the more fundamental things. But, I was responsible for a lot of those decisions. I remember one in particular that, in retrospect, is kind of funny. In the early days of the integrated circuit, Bob Norman, one of the people who were involved there, suggested the idea of semiconductor memory. The whole idea of how semiconductor flip-flops could be used as a memory structure, and I decided it was so economically ridiculous, it didn't make any sense to file a patent on it.

Later asked Wilf Corrigan about the subject: "At that time and the people really didn't feel that you could necessarily successfully sue people on trade secrets or on patents and I think this all changed some years later when Polaroid won the lawsuit on patents against Kodak on instant photography and after that lawsuit, suddenly the whole strength of patents litigation changed. But in retrospect, if I had taken on Intel, if I had been in a position in '68 to take an Intel like approach to this technology extraction that went on when the group set up Intel, Fairchild would be a different story today".

Entered By: David Laws
August 20, 2007

Title: How we derailed our last chance in TTL
Author: Rob Walker
Created: October 29, 2007
Cataloguer:
Copyright:
Story:
By 1974 Fairchild had been relegated to a follower in TTL integrated circuits. TI had grabbed the lead with their 54/74 series, first in conventional TTL, then Schottky TTL and finally in Low power Schottky, known as the 7400LS family.

When we introduced our LS/TTL family, it was twice as fast as the Texas Instruments IC's; Fairchild continued to be a leader in bipolar processes. Since we were just a market follower at that point someone decided we would market our identical products as two families, 54/74 LS, same as the market leader, and our own, twice the speed, sole-source family, the 9LS series. The trouble was customers had been burned by our inability to meet our delivery dates so often, they feared designing-in a Fairchild sole-source product.

Then AMD announced their low power LS/TTL with identical high performance speed as our own. At last we had a second-source so customers could design it in without depending on Fairchild production. The trouble was there were slight inconsistencies in the nomenclature and detail specs between us and AMD, but nothing a little data sheet massaging wouldn't fix.

At the time Tom Longo was in charge of the Digital division. I urgently met with him, "Tom we have a unique opportunity to grab market share from TI (they had over 50% in TTL). It won't require any technology transfer or licensing, all we need do is coordinate our nomenclature and advertise we both have product compatible with TI, but 50% faster!

Tom's face turned red, he stood a glowered at me shouting "I will crush AMD".

And so ended our last shot at regaining leadership in digital. I cashed in my options and went to Intel.

Entered By: David Laws
October 29, 2007

Documents

Title: Rheem Semiconductor plant
Author: William C. Eymann
Created:
Publisher: Rheem Semiconductor
Donated By: Courtesy City of Mountain View
Filename: doc-4513bdd916e35.tif (Size: 4.11 MB)
Pages: 1
Cataloguer:
Copyright:
Description:
Rheem Semiconductor, a 1959 spinoff of Fairchild Semiconductor, was located at 350 Ellis Street. At the time this photo was taken Rheem's plant was believed to have been the largest silicon transistor manufacturing facility in the world. In 1961, Rheem was acquired by the Raytheon Company's semiconductor division.
CLICK ON FILENAME ABOVE TO DISPLAY IMAGE
City of Mountain View Public Library Catalog
Image no. PHL B18 3

Entered By: David Laws
September 22, 2006
Related Events

Rheem Semiconductor is first Fairchild spin-out

Title: Shockley, Bardeen & Brattain - 'Electronics" cover photo
Author: Photographer unknown
Created: 1948
Publisher: McGraw-Hill
Donated By: Michael Riordan
Filename: doc-451c512ea34d3.jpg (Size: 2.89 MB)
Pages: 1
Cataloguer:
Copyright:
Description:
This photograph of the inventors of the transistor was printed on the cover of "Electronics" magazine in September 1948 to illustrate a feature article on "Revolutionary Amplifier - A Crystal Triode."
CLICK ON THE FILENAME ABOVE TO SEE THE IMAGE

Entered By: David Laws
September 28, 2006

Title: Shockley employees toast the Nobel prize winner

Author: Photographer unkown
Created: November 2, 1956
Publisher:
Donated By: Craig Addison
Filename: doc-451c593ca6d47.jpg (Size: 6.06 MB)
Pages: 1
Cataloguer:
Copyright:
Description:
At Rickey's Studio Inn on El Camino Real, Palo Alto, Shockley employees toast their boss William Shockley (seated at the head of the table) on the news of his 1956 Nobel Prize award. Later founders of Fairchild Semiconductor include, seated from left, Gordon Moore and Sheldon Roberts. Robert Noyce is standing with wine glass in hand at rear center and Jay Last at far right.
CLICK ON FILENAME TO ACCESS IMAGE

Entered By: David Laws
September 28, 2006

Title: Group resigns - Shockley notebook entry
Author: William Shockley
Created: September 18, 1957
Publisher:
Donated By: Michael Riordan
Filename: doc-45182ffe2bb1e.jpg (Size: 326 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
Copy of entries in William Shockley's notebook for the period September 18 - 20, 1957.
CLICK ON FILENAME ABOVE TO SEE IMAGE
The eight dissidents resigned on Wednesday, September 18
Arnold Beckman came up to meet with them on September 19
The formal resignations were received on September 20

Entered By: David Laws
September 25, 2006

Title: Dollar bill signed by Fairchild founders
Author: Leslie Berlin
Created: September 19, 1957
Publisher: Special Collections, Stanford University Libraries
Donated By:
Filename: doc-4710f840c913e.jpg (Size: 43 KB)
Pages: 1
Cataloguer:
Copyright: Special Collections, Stanford University Libraries
Description:
This dollar bill was one of 10 that were signed as a symbolic contract among the eight men who would start Fairchild Semiconductor, the first successful semiconductor company in Silicon Valley, and their financial backers. Photo courtesy of Special Collections, Stanford University Libraries.
From: "Tracing Silicon Valley's roots"
By Leslie Berlin, The San Francisco Chronicle
Sunday, September 30, 2007

Entered By: David Laws
October 13, 2007

Title: Architectural rendering of Whisman Road plant
Author: William J. Moran Company
Created: 1958
Publisher: Fairchild Camera & Instrument Corporation
Donated By: Courtesy Mountain View Chamber of Commerce
Filename: doc-4513bb32a2444.tif (Size: 3.80 MB)
Pages:
Cataloguer:
Copyright:
Description:
A 1958 architectural rendering of the new Fairchild Semiconductor plant on Whisman Road. This facility evolved into the transistor plant for the company. William J. Moran Company of Alhambra and Oakland, California, was the architectural firm responsible for the design.
CLICK ON FILENAME ABOVE TO DISPLAY IMAGE
City of Mountain View Public Library Catalog
Image no. PHL B15 2

Entered By: David Laws
September 22, 2006
Related Events

New manufacturing plant in Mountain View

Title: Ground breaking at 545 Whisman Road
Author: Melgar Commercial Photographers, Los Altos, Calif.
Created: 1958
Publisher: Fairchild Camera & Instrument Corporation
Donated By: Courtesy City of Mountain View
Filename: doc-4513b622e0eab.tif (Size: 4.39 MB)
Pages: 1
Cataloguer:
Copyright:
Description:
Fairchild Semiconductor, a division of Fairchild Camera and Instrument Corporation, broke ground at 545 Whisman Road, Mountain View in 1958. The attched file is a photograph of the corporate officers attending the ceremony, from left to right: Joseph Rogers, President; Joseph Ostele, Vice President; R. Hodgson, Executive Vice President; and Charles Morse, Vice President of Ferry-Morse Seed Company.
CLICK ON FILENAME ABOVE TO DISPLAY IMAGE
City of Mountain View Public Library Catalog
Image no. PHL B15 1:

Entered By: David Laws
September 22, 2006

Title: Mesa transistor cross-section diagram
Author: Unknown
Created: 1958
Publisher:

Donated By: Michael Riordan
Filename: doc-451c64e53d96c.jpg (Size: 238 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
This cross section view of mesa transistor structure shows the exposed junction region.

Entered By: David Laws
September 28, 2006

Title: Silicon Transistors
Author:
Created: 1958
Publisher:
Donated By: Lars Lunn
Filename: doc-473a32e400764.pdf (Size: 8.82 MB)
Pages:
Cataloguer:
Copyright:
Description:
The "Fairchild Silicon Transistors" brochure was one of the first pieces of marketing literature published by Fairchild Semiconductor Corporation. Much of the content is devoted to presenting the advatages of diffusion technology in the manufacture of transistors. The brochure includes photographs of the 8 founders plus General Manager Ed Baldwin and Marketing Manager Tom Bay.

Entered By: David Laws
November 13, 2007

Title: Charleston Road building photos (1958-9)
Author:
Created: 1958 ca.
Publisher:
Donated By:
Filename: doc-473a3147685fb.pdf (Size: 174 KB)
Pages:
Cataloguer:
Copyright:
Description:
The photos in the file above of the 844 Charleston Road, Palo building were taken in 1958 and 1959, by which time it housed the Research and Development department under Gordon Moore.

Entered By: David Laws
November 13, 2007

Title: Check from IBM for $1500
Author: Leslie Berlin
Created: July 9, 1958
Publisher: This check is an early installment on Fairchild Semiconductor's first sale: 100 transistors sold to IBM for $150 apiece. Equivalent transistors today cost less than a hundred-thousandth of a penny. Photo courtesy of Special Collections, Stanford Universit
Donated By:

Filename: doc-4710f93309877.jpg (Size: 34 KB)
Pages: 1
Cataloguer:
Copyright: This check is an early installment on Fairchild Semiconductor's first sale: 100 transistors sold to IBM for $150 apiece. Equivalent transistors today cost less than a hundred-thousandth of a penny. Photo courtesy of Special Collections, Stanford University
Description:
This check is an early installment on Fairchild Semiconductor's first sale: 100 transistors sold to IBM for $150 apiece. Equivalent transistors today cost less than a hundred-thousandth of a penny.
Photo courtesy of Special Collections, Stanford University Libraries
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Entered By: David Laws
October 13, 2007
Related Events

IBM places first order

Title: Annual Report 1958
Author: n/a
Created: December 1958
Publisher: Fairchild Camera & Instrument Corporation
Donated By: Geri Hadley
Filename: doc-4522f490d2d73.pdf (Size: 2.78 MB)
Pages: 4
Cataloguer:
Copyright:
Description:
This scan of selected pages from the Fairchild Camera and Instrument Corporation 1958 Annual Report devotes one page (page 13) to Fairchild Semiconductor Corporation.
The report states that Semiconductor advanced from the research and devlopment stage to successful production and substantial sales during 1958.

Entered By: David Laws
October 3, 2006

Title: First Planar Transistor - die photo
Author: Photographer unknown
Created: 1959
Publisher: Fairchild Camera & Instrument Corporation
Donated By: Alice Arsenault
Filename: doc-4514a11b33026.jpg (Size: 1.12 MB)
Pages: 1
Cataloguer:
Copyright:
Description:
The First Planar Transistor - A teardrop device which marked the beginning of an industry revolution.
CLICK ON FILENAME ABOVE TO DISPLAY IMAGE
Caption accompanying an image reproduced in "A Solid State of Progress" a portfolio of "some of the most important technical milestones in this era" published as a promotional item by Fairchild Camera and Instrument Corporation circa 1972.

Entered By: David Laws

September 22, 2006

Title: Welcome to Fairchild
Author:
Created: 1959
Publisher:
Donated By: Lars Lunn
Filename: doc-473a36910b9ce.pdf (Size: 836 KB)
Pages:
Cataloguer:
Copyright:
Description:
This "Welcome to Fairchild" brochure is one of the first pieces of corporate literature published by Fairchild Semiconductor Corporation. It was designed as a recruiting aid and to introduce cutomers to the company. The cover shows an artist's conception of the Whisman Road manufacturing pant and new division headquarters.

Entered By: David Laws
November 13, 2007

Title: Famous Eight photograph
Author: Wayne Miller, Carolyn Caddes
Created: 1959 ca.
Publisher: Intel Corporation
Donated By: Bill Welling
Filename: doc-4547dcbdf2185.pdf (Size: 244 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
The original Famous Eight photograph of the eight founders seated beneath the "Flying F" logo was taken in 1959 for a business publication. It has been reproduced many times over the years. The same group posed 26 years later for photographer Carolyn Caddes for her book “Portraits of Success.” These images are reproduced from a special edition of “Inteleads,” July 1990 commemorating the life and times of Robert Noyce who died on June 3, 1990.

Entered By: David Laws
October 31, 2006

Title: Planar transistor cut-away view
Author: Photogrpaher unknown
Created: 1959 ca.
Publisher: Fairchild Camera & Instrument Corporation
Donated By: Michael Riordan
Filename: doc-451c626770c74.jpg (Size: 384 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
View of an early planar transistor mounted on a metal can header with the "top-hat" cut away to show internal construction.
CLICK ON FILE NAME TO ACCESS IMAGE

Entered By: David Laws
September 28, 2006

Title: Noyce - Basic IC Patent #2981877
Author: Robert Noyce
Created: July 30, 1959
Publisher: U. S. Patent Office
Donated By: From website at www.ece.cmu.edu
Filename: doc-4542487ccbaa9.pdf (Size: 722 KB)
Pages: 8
Cataloguer:
Copyright:
Description:
This is a pdf copy of the "Semiconductor Device-and-Lead Structure" patent filed on July 30, 1959, based on notes written in January 1959.
It was posted at: http://www.ece.cmu.edu/~dwg/412/patent.html
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Entered By: David Laws
October 27, 2006

Title: IBM Transistor Pricing
Author: Tom Bay and Howard Bobb
Created: September 1959
Publisher: Internal documents
Donated By: Bill Welling
Filename: doc-4547e9706b52a.pdf (Size: 346 KB)
Pages: 3
Cataloguer:
Copyright:
Description:
This document comprises a carbon copy of a letter from Marketing Manager Tom Bay to IBM and a telex from Sales Manager Howard Bobb regarding high-volume transistor pricing for IBM. Bay was later General Manager of Semiconductor. Bobb co-founded both GME and AMI.

Entered By: David Laws
October 31, 2006

Title: Badge memo from Bob Noyce
Author:
Created: October 21, 1959
Publisher:
Donated By:
Filename: doc-46a7fb15e40eb.pdf (Size: 111 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
An apologetic memo from Bob Noyce regarding the need for ID badges.

Entered By: David Laws
July 25, 2007

Title: Mask layout of first Micrologic flip-flop
Author: Lionel Kattner
Created: December 22, 1959 ca.
Publisher:
Donated By: Lionel Kattner
Filename: doc-4766e80991c11.pdf (Size: 156 KB)
Pages:
Cataloguer:
Copyright:
Description:
Jay Last's Micrologic development team, including Sam Fok, Isy Hass, Lionel Kattner, and Jim Nall, began to work on the project in September 1959. The sketch of the metal mask interconnect pattern for the first flip-flop device shown on the attached pdf is taken from Lionel Kattner's notebook dated 12.22.59. The active area of this four transistor flip-flip measured 28 by 34 mils. The first functional physically-isolated integrated circuit based on this design was made on May 26, 1960.
Text revised 2.13.08

Entered By: David Laws
December 17, 2007

Title: Micrologic diffused isolation - Isy Hass notes
Author: Isy Haas
Created: 1960
Publisher:
Donated By: Isy Haas
Filename: doc-481baa943366b.pdf (Size: 3.93 MB)
Pages:
Cataloguer:
Copyright:
Description:
Pages from Isy Haas lab notebook referring to the developement of the diffused isolation process for the production version of the first Micrologic flip-flop.

Entered By: David Laws
May 2, 2008

Title: Micrologic Type F - Flip flop element
Author: Lionel Kattner
Created: 1960
Publisher:
Donated By: Lionel Kattner
Filename: doc-481b9019e0c47.pdf (Size: 951 KB)
Pages:
Cataloguer:
Copyright:
Description:
Mid-1960 die photograph and mask design layout of the physically-isolated version of the Micrologic flip-flop F element. A 1962 data sheet shows the logic function. This device uses an experimental aluminimum metal connection pattern covering a larger surface area in order to to strengthen the oxide layer of the physically isolated structure.

Entered By: David Laws
May 2, 2008

Title: Condensed Catalog - 1959/60
Author:
Created: 1960 ca.
Publisher:
Donated By:
Filename: doc-473a2d79c615d.pdf (Size: 426 KB)
Pages:
Cataloguer:
Copyright:
Description:
This simple four page folded card summarizes the company's complete product line in 1960. It comprises 13 transistors, including the 2N696/7 (NPN) and the 2N1131/2 (PNP), and a single diode, the FD-100.

Entered By: David Laws
November 13, 2007
Related Events

2N1131 and 1132 First Fairchild PNP transistors
2N1613 - First planar transistor introduced
First product (2N696/7) - mesa process, facilities & devices developed in just 5 months
San Rafael diode plant opened

Title: Micrologic diffused isolation - Lionel Kattner notes
Author: Lionel Kattner
Created: 1960 ca.
Publisher:
Donated By:
Filename: doc-481bab416d00e.pdf (Size: 13.04 MB)
Pages:
Cataloguer:
Copyright:
Description:
Pages from Lionel Kattner's notebook referring to the developement of the diffused isolation process for the production version of the first Micrologic flip-flop.

Entered By: David Laws
May 2, 2008

Title: Photo of Micrologic flip-flop with diffused isolation
Author: Lionel Kattner
Created: 1960 ca.
Publisher:
Donated By: Lionel Kattner
Filename: doc-47c5fb1a83f08.pdf (Size: 168 KB)
Pages:
Cataloguer:
Copyright:
Description:
Photograph of the final version of the diffused-isolation Type F Micrologic flip flop
---
Entered By: David Laws

February 27, 2008
Related Events

First planar IC demonstrated

Title: Shockley Labs exterior photo - circa 1960
Author: Hans Queisser
Created: 1960 ca.
Publisher:
Donated By: Michael Riordan
Filename: doc-451c539d160a3.jpg (Size: 151 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
This side view of the original building at 391 S. San Antonio Road, Mountain View occupied by Shockley Semiconductor Laboratories shows the distinctive roofline of the Quonset-style building that started life as a fruit packing shed in the orchard era of the "Valley of Heart's Delight."
CLICK ON FILENAME ABOVE TO SEE IMAGE

Entered By: David Laws
September 28, 2006
Related Events

Shockley Semiconductor opens in Mountain View

Title: Whisman Road assembly area photo
Author:
Created: 1960 ca.
Publisher:
Donated By: Ed Pausa
Filename: doc-46cb913539128.jpg (Size: 200 KB)
Pages:
Cataloguer:
Copyright:
Description:
Photo of the original FSC Whisman Road plant transistor assembly area taken about 1960.

Entered By: David Laws
August 21, 2007

Title: Annual Report 1959
Author:
Created: March 1960
Publisher:
Donated By:
Filename: doc-4643b19faf73e.pdf (Size: 2.59 MB)
Pages:
Cataloguer:
Copyright:
Description:
Selected pages from the 1959 Annual Report

Click on "File" above to open pdf

Entered By: David Laws
May 10, 2007

Title: Hoerni: “Planar Silicon Diodes and Transistors”
Author: Jean A. Hoerni
Created: October 1960
Publisher: Fairchild Semiconductor
Donated By: John McDonald
Filename: doc-472a58a7b0f46.pdf (Size: 1.09 MB)
Pages: 9
Cataloguer:
Copyright:
Description:
Presented in October 1960 at the Electron Devices Meeting in Washinton, DC, Jean Hoerni's paper “Planar Silicon Diodes and Transistors” was one of the most frequently quoted semiconductor technology documents of the 1960's.
The file posted above is a reprint of the paper published in 1961 as Fairchild Technical Paper TP-14.
It was also published under the same title in the IRE Transactions on Electron Devices, Vol. 8, Mar. 1961, p. 178

Entered By: David Laws
November 1, 2007
Related Events

Hoerni invents the planar process

Title: Planar - "The Fairchild Planar Story"
Author:
Created: December 1960
Publisher:
Donated By: Robert K. Waits
Filename: doc-483f3d150edf3.pdf (Size: 1.19 MB)
Pages: 12
Cataloguer:
Copyright:
Description:
"The Fairchild Planar Story" is a four color promotional brochure describing the features and benefits afforded to the company's transistors and diodes by the new Planar process.
A seond edition published in August 1961 added information on the Micrologic Family and the first epitaxial trnaistors.

Entered By: David Laws
May 29, 2008
Related Events

First planar transistor demonstrated
Planar transistors approved for Minuteman

Title: "What is a transistor"
Author:

Created: 1961
Publisher:
Donated By:
Filename: doc-46abc6461c022.jpg (Size: 240 KB)
Pages:
Cataloguer:
Copyright:
Description:
The image posted above is a sales promotional item on the new double diffused silicon Planar transistor structure in production at the Whisman Road, Mountain View facility.
Entered By: David Laws
July 28, 2007

Title: Planar Silicon Transistors (TP-14)
Author: Jean Hoerni
Created: 1961
Publisher:
Donated By: John MacDonald
Filename: doc-473a38a5e2bd5.pdf (Size: 1.09 MB)
Pages:
Cataloguer:
Copyright:
Description:
Published as Fairchild Technical Paper #14, "Planar Silicon Transistors and Diodes" is the text of a paper given by Jean Hoerni at the 1960 Electron Devices Meeting in Washington D.C. This was one of the first public presenations of the planar process.

Entered By: David Laws
November 13, 2007
Related Events

2N1613 - First planar transistor introduced
Hoerni invents the planar process
Planar transistors approved for Minuteman

Title: First Planar IC - die photo
Author: Unknown
Created: 1961 ca.
Publisher: Fairchild Camera & Instrument Corporation
Donated By: Alice Arsenault
Filename: doc-4518aa89bb581.JPG (Size: 1.51 MB)
Pages: 1
Cataloguer:
Copyright:
Description:
This Set/Reset Micrologic flip-flop was the industry's first integrated circuit fabricated as a monolithic chip. The first working units were tested in May 1960. Members of Jay Last's development team included I. Haas - Diffusion & Test, L. Kattner - Concept & Assembly, J. Nall - Masks, S. M. Fok, C. Gunter, M. Hoar, J. Lessard, R. Marlin, G. Tripp, J. Wilkerson, plus R. Norman - Circuit Design.
CLICK ON FILENAME ABOVE TO DISPLAY IMAGE
Caption accompanying an image reproduced in "A Solid State of Progress" a portfolio of "some of the most important technical milestones in this era" published as a promotional item by Fairchild Camera and Instrument Corporation circa 1972.

Entered By: David Laws
September 25, 2006

Title: Micrologic - µL Product Introduction Brochure
Author:
Created: 1961 ca.
Publisher:
Donated By: Jan Shinck Dennison
Filename: doc-481baf2bb1ee2.pdf (Size: 5.89 MB)
Pages:
Cataloguer:
Copyright:
Description:
"Announcing the first of a Family - The Micrologic Flip-Flop" - the "µL Micrologic" brochure describes the features and benefits of Micrologic devices and gives details of the "F" Element Flip-Flop introduced at the 1961 IRE show.

Entered By: David Laws
May 2, 2008

Title: Micrologic wafer and device
Author: David Laws
Created: 1961 ca.
Publisher:
Donated By: Bob and Marcella Major
Filename: doc-4685a0e7488f2.jpg (Size: 658 KB)
Pages:
Cataloguer:
Copyright:
Description:
Lucite presentation block containing a wafer and open package of the first planar integrated circuit. Fifty blocks were produced to mark the introduction of the first Micrologic devices in 1961. Gift of Bob and Marcella Major to the Computer History Museum (X3907.2007).

Entered By: David Laws
June 29, 2007

Title: Annual Report 1960
Author:
Created: March 1961
Publisher:
Donated By:
Filename: doc-479544096556f.pdf (Size: 32.25 MB)
Pages:
Cataloguer:
Copyright:
Description:
Selected pages from the 1960 Annual Report
Click on "File" above to open pdf

Entered By: David Laws
January 21, 2008

Title: "Future Trends in Semiconductors"
Author: Robert N. Noyce
Created: May 22, 1961
Publisher:
Donated By: Harry Sello
Filename: doc-463922d237afe.pdf (Size: 1.84 MB)
Pages: 12
Cataloguer:
Copyright:
Description:
Mimeograph copy of a talk given by Robert Noyce on May 22, 1961 exploring "Future Trends in Semiconductors," including microminiaturization, use of epitaxial films, parametric amplifiers, tunnel diodes, and the shift from Ge to Si.

Entered By: David Laws
May 2, 2007

Title: Micrologic Elements: Their Applications in Circuit Design
Author: Robert Norman and Richard Anderson
Created: July 1961
Publisher: Electrical Design News (EDN)
Donated By: Jan Schink Dennison
Filename: doc-4803fac071603.pdf (Size: 10.60 MB)
Pages: 5
Cataloguer:
Copyright:
Description:
The attached article, published in EDN magazine shortly after the formal introduction of Micrologic, was unique in that it was accompanied by a flexible phonograph record describing their characteristic and applications that was bound into the publication.

Entered By: David Laws
April 14, 2008
Related Events

First planar IC demonstrated
Micrologic introduced at IRE Show

Title: 1962 Sales Conference photo booklet
Author:
Created: 1962
Publisher:
Donated By: Bill Welling
Filename: doc-46086832367ac.pdf (Size: 751 KB)
Pages:
Cataloguer:
Copyright:
Description:
Click on the File name above to see the souvenir brochure of the 1962 sales conference held in San Diego
---
Entered By: David Laws

March 26, 2007

Title: MARTAC 420 Multipurpose Digital Control Computer
Author:
Created: 1962
Publisher: Martin Company
Donated By: Jan Schink Dennison
Filename: doc-481a640705b25.pdf (Size: 8.42 MB)
Pages: 10
Cataloguer:
Copyright:
Description:
Brochure describing the features of the MARTAC 420 Multipurpose Digital Control Computer. MARTAC 420 was one of the first computers designed with Fairchild Micrologic digital integrated circuits. It devotes one page to the benefits of monolithic integrated circuits compared to discrete module implementations.
See also paper: "Use of Integrated Circuitry in a Digital System."

Entered By: David Laws
May 1, 2008

Title: MAGIC - An Advanced Computer for Spaceborne Guidance Systems
Author: A. H. Faulker. et. al.
Created: 1962 ca.
Publisher: A.C. Spark Plug Divsion (of GM)
Donated By: Al Kossow
Filename: doc-48065d997dd9f.pdf (Size: 1.60 MB)
Pages: 11
Cataloguer:
Copyright:
Description:
This paper describes the design of one of the first computer systems to employ the full line (six part numbers) of Fairchild Micrologic DCTL integrated circuits.
Additional documents on MAGIC are posted at:
http://computer-refuge.org/bitsavers/pdf/ac_delco/magic/
The paper titled “Organization of MAGIC II” notes that “MAGIC I is the prototype of the family and was the first complete airborne computer to have its logic functions mechanized exclusively with integrated circuits. The circuits used were Fairchild Micrologic.”

Entered By: David Laws
April 16, 2008
Related Events

Micrologic introduced at IRE Show

Title: MARTAC - "Use of Integrated Circuitry in a Digital System."
Author: Lloyd Thayne
Created: 1962 ca.
Publisher: Martin Company, Denver, Colorado
Donated By: Jan Schink Dennison
Filename: doc-481a65d4f3c52.pdf (Size: 5.75 MB)
Pages: 10
Cataloguer:

Copyright:
Description:
This paper describes the design of the MARTAC 420 computer. One of the first digital computers implemented with Fairchild Micrologic integrated circuits.
See also the MARTAC 420 brochure posted on this site

Entered By: David Laws
May 1, 2008

Title: Micrologic - "The Inside Story on Fairchild Micrologic"
Author:
Created: 1962 ca.
Publisher: Fairchild Semiconductor
Donated By: Robert K. Waits
Filename: doc-483f38b92f248.pdf (Size: 2.36 MB)
Pages: 12
Cataloguer:
Copyright:
Description:
"The Inside Story on Fairchild Micrologic" is a four color promotional brochure illustrating the steps involved in the manufacture of a typical Micrologic element - the Half Shift Register - from Crystal Growing to Environmental Testing.

Entered By: David Laws
May 29, 2008

Title: Walker's Wagon Wheel (1962 photo)
Author: Unknown
Created: 1962 ca.
Publisher:
Donated By: Courtesy City of Mountain View
Filename: doc-453284dec98ef.tif (Size: 3.04 MB)
Pages: 1
Cataloguer:
Copyright:
Description:
This image from the City of Mountain View Public Library Catalog shows the intersection of Middlefield and Whisman Road circa 1962. Beyond the intersection, behind the gas station sign on the right, is a glimpse of the gable roof of Walker's Wagon Wheel restaurant.
The following text is from the Library site "This watering hole was famous as a meeting ground for the young engineers from such businesses as Fairchild Semiconductor and Raytheon Company. Between 1963 and 1964, Middlefield Road was expanded and extended to Moffett Blvd. In this photograph, these improvements have not yet happened."

Entered By: David Laws
October 15, 2006

Title: Annual Report 1961
Author:
Created: March 1962
Publisher:
Donated By: Geri Hadley
Filename: doc-4643b47fe44f5.pdf (Size: 2.66 MB)

Pages:
Cataloguer:
Copyright:
Description:
Selected pages from the 1961 Annual Report
Click on "File" above to open pdf

Entered By: David Laws
May 10, 2007 Related Events

FC&I Financial Results for 1961

Title: Micrologic wafer on cover of Business Week
Author:
Created: April 14, 1962
Publisher: McGraw Hill
Donated By:
Filename: doc-481badd1ab7a8.pdf (Size: 21.33 MB)
Pages:
Cataloguer:
Copyright:
Description:
"The Next Revolution in Electronics," a Special Report published in Business Week was one of the first major articles on the integrated circuit.

Entered By: David Laws
May 2, 2008

Title: Leadwire feature - Noyce opens patio
Author:
Created: April 18, 1962
Publisher:
Donated By:
Filename: doc-46311ba40965a.pdf (Size: 2.90 MB)
Pages:
Cataloguer:
Copyright:
Description:
The May 1962 cover of Leadwire features one of the more relaxed official occassions in Bob Noyce's busy life - cutting the ribbon at the patio opening at the Mountain View plant.

Entered By: David Laws
April 26, 2007

Title: Leadwire feature on R & D
Author:
Created: August 1962
Publisher:
Donated By:
Filename: doc-462420d81c94f.pdf (Size: 2.22 MB)
Pages:
Cataloguer:
Copyright:

Description:
The August 1962 issue of Leadwire was devoted to the R & D facilty in Palo Alto. It featured photographs of many staff members including Gordon Moore, Phil Ferguson, Vic Grinich, Jack Kabell, Worden Waring, C.T. Sah, Harley Perkins, and Julius Blank
---
Entered By: David Laws
April 16, 2007
Related Events

Palo Alto R&D under construction

Title: Early Ad for Micrologic ICs
Author: Fairchild Semiconductor
Created: August 10, 1962
Publisher: Electronics Magazine
Donated By:
Filename: doc-47eaaaf764f00.pdf (Size: 2.49 MB)
Pages: 2
Cataloguer:
Copyright:
Description:
The attached advertizement featuring the half-adder member of the Micrologic family as the first successful integrated semiconductor ciruit was published in Electronics magazine in August 1962.

Entered By: David Laws
March 26, 2008
Related Events

Three new Micrologic elements introduced

Title: "Sell from a Position of Power"
Author: Don Valentine
Created: December 3, 1962
Publisher: Fairchild Semiconductor
Donated By: Bill Welling
Filename: doc-4547d0d24aa40.pdf (Size: 365 KB)
Pages: 3
Cataloguer:
Copyright:
Description:
During his tenure as National Sales Manager and Director of Marketing, Don Valentine worked diligently to instill professional marketing and sales practices and procedures throughout the company. The museum has a number of his “All Field Sales” memos on topics from Factory Tours to Pricing Policies from 1962-3 in the archives. The examples displayed here explain how to use Fairchild technological prowess to advantage.

Entered By: David Laws
October 31, 2006

Title: 1963 Sales Conference photo booklet
Author:
Created: 1963

Publisher:
Donated By: Bill Welling
Filename: doc-461c2c6abf43c.pdf (Size: 2.13 MB)
Pages:
Cataloguer:
Copyright:
Description:
Click on the File name above to see the souvenir brochure of high jinks at the 1963 sales conference held in Bermuda. The editors credit Ed Turney of the Los Angeles sales office as the source of most of the photographs.

Entered By: David Laws
April 10, 2007

Title: Annual Report 1962
Author:
Created: 1963
Publisher:
Donated By:
Filename: doc-473a23eded609.pdf (Size: 2.13 MB)
Pages:
Cataloguer:
Copyright:
Description:
Selected pages from the 1962 Annual Report
Click on "File" above to open pdf

Entered By: David Laws
November 13, 2007
Related Events

FC&I Financial Results for 1962

Title: Custom Microcircuit Design Handbook
Author: Marketing Dept.
Created: 1963
Publisher: Fairchild Semiconductor
Donated By: Bill Welling
Filename: doc-4547e17205eb5.pdf (Size: 1.19 MB)
Pages: 7
Cataloguer:
Copyright:
Description:
The "Custom Microcircuit Design Handbook" was developed as a sales tool to educate high volume customers on how to develop integrated circuits using Fairchild process technology and design rules. The example pages reproduced here include data on specific devices and examples of several custom designs.

Entered By: David Laws
October 31, 2006
Related Events

$1M order IC order is “industry’s largest”
Custom IC Design

Fairchild Integrated Circuits custom designed for Spectra 70
Largest IC order placed by Univac

Title: Instrumentation Department
Author:
Created: 1963
Publisher:
Donated By: Geri Hadley
Filename: doc-4643b7f75d63e.pdf (Size: 1.94 MB)
Pages:
Cataloguer:
Copyright:
Description:
Capabilities brochure for the Instrumentation Department located on Charleston Drive, Palo Alto.

Entered By: David Laws
May 10, 2007

Title: Micrologic - "Fairchild Epitaxial Micrologic"
Author:
Created: 1963
Publisher: Fairchild Semiconductor
Donated By: Robert K. Waits
Filename: doc-483f3a82df98d.pdf (Size: 1.85 MB)
Pages: 16
Cataloguer:
Copyright:
Description:
"Fairchild Epitaxial Micrologic" is a four-color promotional brochure describing the process steps in the manufacture of "the most advanced, completely integrated silicon microcircuits available for computer logic applications." The addition of the epitaxial layer to the Planar process significantly improved the yield and performance of the original Micrologic Family introduced in 1961.

Entered By: David Laws
May 29, 2008

Title: Planar Progress Report
Author: Marketing Services
Created: 1963
Publisher: Fairchild Semiconductor
Donated By: Geri Hadley
Filename: doc-452ed7c58fa9c.pdf (Size: 8.38 MB)
Pages: 14
Cataloguer:
Copyright:
Description:
A non-technical glossy promotional brochure on the features and benefits of the Planar Process
---
Entered By: David Laws
October 12, 2006

Title: Souvenirs - Tie Clips

Author:
Created: 1963 ca.
Publisher:
Donated By: Bill Welling
Filename: doc-45527e6e51e4b.JPG (Size: 303 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
This photograph shows examples of a number of tie clips given to the sales force as souvenirs of meetings and events.
The Hawaiian Tiki god image was designed for the 1967 sales conference and shows one of the first uses of the abbreviation FAIRCH.
The bar with the original “Flying F” logo was issued prior to the acquisition of Fairchild Semiconductor Corporation by FC&I in 1959.
The mounted wafer illustrates the 7/8” (2.3mm) diameter size of silicon wafers of the period. The pattern is believed to be the metal layer of an early Micrologic device
---
Entered By: David Laws
November 8, 2006

Title: Sporck memo seeks engineering personnel
Author: Charles Sporck
Created: January 25, 1963
Publisher: Farichild Semiconductor Corporation
Donated By: Bill Welling
Filename: doc-4550f561e634e.pdf (Size: 94 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
This 1963 memo from Charlie Sporck solicting help from Field Sales in recruiting engineering personnel shows that the "shortage of technical people" is a problem that has plagued the industy for at least 50 years.

Entered By: David Laws
November 7, 2006

Title: Wanlass CMOS patent # 3,356,858
Author: Frank Wanlass
Created: June 18, 1963
Publisher: U. S. Patent Office
Donated By: From website at www.ece.cmu.edu
Filename: doc-454249e6c7e48.pdf (Size: 744 KB)
Pages: 10
Cataloguer:
Copyright:
Description:
This is a pdf copy of the Frank Wanlass patent for the invention of CMOS technology (“Low Stand-By Power Complementary Field Effect Circuitry” #3,356,858) filed on June 18, 1963.
It was posted at: http://www.ece.cmu.edu/~dwg/412/patent.html
---
Entered By: David Laws
October 27, 2006

Title: Organization of MAGIC II Advanced Computer
Author:
Created: November 21, 1963
Publisher: AC Spark Plug
Donated By: Al Kossow
Filename: doc-47950d988223c.pdf (Size: 1.08 MB)
Pages: 20
Cataloguer:
Copyright:
Description:
This report, "Organization of MAGIC II Advanced Computer for Airborne Guidance Systems," describes an improved version of the MAGIC I machine. The text claims that "MAGIC I was the first complete computer to have its logic ciruits mechanized exclusively with integrated circuits. The circuits were Fairchild micrologic." As of this writing MAGIC I had accumulated over 9 months of operation. Eventually over 20,000 MAGIC machines were produced using several generations of logic, including TTL and then VLSI.

Entered By: David Laws
January 21, 2008
Related Events

First complete IC airborne computer

Title: Computer for Simplified Intertial Guidance System
Author:
Created: December 3, 1963
Publisher: AC Spark Plug
Donated By:
Filename: doc-47950ffe36e58.pdf (Size: 12.90 MB)
Pages:
Cataloguer:
Copyright:
Description:
The attached document "Technical Proposal Computer for Simplified Intertial Guidance System" was submitted to Lear Siegler. It proposed extensive use of Fairchild micrologic and anticipated a forthcoming lower power version of the family. It includes photographs of a protoype machine and summary pinout sheets for the devices.

Entered By: David Laws
January 21, 2008

Title: 1964 Sales Conference photo booklet
Author:
Created: 1964
Publisher:
Donated By: Geri Hadley
Filename: doc-460869ff113a9.pdf (Size: 2.91 MB)
Pages:
Cataloguer:
Copyright:
Description:

Click on the File name above to see a copy of the souvenir brochure of photos from the 1964 sales conference held in Hawaii

---

Entered By: David Laws
March 26, 2007
Related Events

Annual Sales Conference held in Hawaii (1964)

Title: Industrial Micrologic Datasheet
Author:
Created: October 1964
Publisher: Fairchild Semiconductor
Donated By:
Filename: doc-4548342ab4c21.jpg (Size: 394 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
This data sheet for low-cost Industrial Micrologic was created to stimulate demand for integrated circuits in commercial computer, industrial control, instrument and test equipment applications.

Entered By: David Laws
October 31, 2006
Related Events

First plastic ICs announced
Low-cost Industrial Micrologic introduced

Title: "The Future of Integrated Electronics"
Author: Gordon Moore
Created: 1965
Publisher: Fairchild Semiconductor, R & D Dept.
Donated By:
Filename: doc-466c99b5a9801.pdf (Size: 1.17 MB)
Pages: 19
Cataloguer:
Copyright:
Description:
This the original internal paper written by Gordon Moore that was edited and published as "Cramming more components onto integrated circuits" in "Electronics," magazine Volume 38, Number 8, on April 19, 1965 that gave birth to the concept of "Moore's Law."

Entered By: David Laws
June 10, 2007

Title: 1965 Sales Conference photo booket
Author:
Created: 1965
Publisher:
Donated By:
Filename: doc-46086ab5d0b99.pdf (Size: 3.31 MB)
Pages:

Cataloguer:
Copyright:
Description:
Click on the File name above to see a copy of the souvenir brochure of photos from the 1965 Sales Conference held in San Juan, Puerto Rico
---
Entered By: David Laws
March 26, 2007
Related Events

Annual Sales Conference held in Puerto Rico (1965)

Title: Souvenirs - Lapel Pins
Author:
Created: 1965 ca.
Publisher:
Donated By: Bill Welling
Filename: doc-4552804926219.JPG (Size: 324 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
meetings and events.
The Puerto Rico shield design is from the 1965 meeting.
The Mexican calendar disk was distributed at the Acapulco Sales Conference in 1966.
The Fairchild - The Hawaii bar is from the 1964 Hawaii conference
---
Entered By: David Laws
November 8, 2006

Title: Sporck smooches Widlar
Author: Joe Malone
Created: 1965 ca.
Publisher:
Donated By: Joe Malone
Filename: doc-473a2b600f9cd.pdf (Size: 40 KB)
Pages:
Cataloguer:
Copyright:
Description:
A jovial Charlie Sporck smooches an inebriated Bob Widlar purportedly for his successful development of the 709 operational amplifier
---
Entered By: David Laws
November 13, 2007

Title: Annual Report 1964
Author:
Created: March 1965 ca.
Publisher:
Donated By:
Filename: doc-4643b5fcef061.pdf (Size: 2.99 MB)
Pages:

Cataloguer:
Copyright:
Description:
Selected pages from the 1964 annual report
Click on File name above.

Entered By: David Laws
May 10, 2007
Related Events

FC&I Financial Results for 1964

Title: "Cramming more components on to integrated circuits"
Author: Gordon Moore
Created: April 19, 1965
Publisher: McGraw Hill
Donated By:
Filename: doc-45f1baa60a8c8.pdf (Size: 801 KB)
Pages: 4
Cataloguer:
Copyright:
Description:
"Cramming more components onto integrated circuits"
With unit cost falling as the number of components per
circuit rises, by 1975 economics may dictate squeezing as
many as 65,000 components on a single silicon chip
By Gordon E. Moore, Director, Research and Development Laboratories, Fairchild
Semiconductor division of Fairchild Camera and Instrument Corp.
The original magazine article that led to the hypthesis that today is called "Moore's Law." From:
Electronics, Volume 38, Number 8, April 19, 1965

Entered By: David Laws
March 9, 2007
Related Events

Moore's “Law” published in Electronics

Title: Leadwire - May 1965
Author:
Created: May 1965
Publisher:
Donated By: Ed Turney
Filename: doc-473a607f05cee.pdf (Size: 13.14 MB)
Pages: 3
Cataloguer:
Copyright:
Description:
The May 1965 issue of Leadwire published a cover photograph of Robert Noyce, Charlie Sporck, and John Auld. It announced the promotion of Sporck to General Manager of Semiconductor, Auld to GM of Instrumentation and Noyce to Group Vice President. It also featured items on Ed Turney's million dollar order for SDS custom ICs and Pierre Lamonds's promotion to manufacturing manager.

Entered By: David Laws

November 13, 2007

Title: Fairchild IC Sales thru 1964 - memo
Author: E. North
Created: July 30, 1965
Publisher: Fairchild Semiconductor
Donated By: Bill Welling
Filename: doc-4547e3d446912.pdf (Size: 258 KB)
Pages: 2
Cataloguer:
Copyright:
Description:
The "Microcircuit Sales" memo from E. North to Tom Bay reproduced here summarizes EIA (Electronic Industries Association) data from 1962 through the first quarter of 1965.

Entered By: David Laws
October 31, 2006

Title: "Fairchild 71" campaign brochure
Author: Charles Sporck
Created: 1966
Publisher: Fairchild Semiconductor
Donated By: Bill Welling
Filename: doc-4551027ca7c46.pdf (Size: 488 KB)
Pages: 5
Cataloguer:
Copyright:
Description:
Charlie Sporck issued this brochure in 1966 to describe the realignment of his organization to support a newly established Semiconductor Division "ambitious but realistic" goal of reaching a $400M sales level by 1971.

Entered By: David Laws
November 7, 2006
Related Events

"Fairchild 71" campaign to reach $400M by 1971
Sporck joins as Production Manager

Title: 1966 Sales Conference photo booklet
Author:
Created: 1966
Publisher:
Donated By: Bill Welling
Filename: doc-461c2d5606f7f.pdf (Size: 2.41 MB)
Pages:
Cataloguer:
Copyright:
Description:
Click on the File name above to see a copy of the souvenir brochure of photos from the 1966 sales conference held in Acapulco
---
Entered By: David Laws

April 10, 2007
Related Events

Annual Sales Conference held in Acapulco (1966)

Title: Annual Report 1965
Author:
Created: 1966
Publisher:
Donated By:
Filename: doc-473a245d79937.pdf (Size: 1.97 MB)
Pages:
Cataloguer:
Copyright:
Description:
Selected pages from the 1965 Annual Report
Click on "File" above to open pdf

Entered By: David Laws
November 13, 2007

Title: Reardon, Chris - Fairchild Australia
Author:
Created: 1966
Publisher:
Donated By: Chris Reardon
Filename: doc-47421734dfdca.jpg (Size: 599 KB)
Pages:
Cataloguer:
Copyright:
Description:
Fairchild Australia, manufacturing manager Chris Reardon introduces US Ambassador Ed Clark to his operators.

Entered By: David Laws
November 19, 2007
Related Events

Australian facility opened by Bob Noyce

Title: Australian Laboratory dedication
Author:
Created: May 11, 1966
Publisher:
Donated By: Bob Major
Filename: doc-45f5c7538cd65.pdf (Size: 771 KB)
Pages:
Cataloguer:
Copyright:
Description:
Photographs of dignitaries attending the dedication ceremony for the new facilities include John Baldwin Managing Director, Australia; U.S.Ambassador Ed Clark; Charles Sporck, General Manager; Bob Major Marketing Director; and Robert Noyce, VP FC&I;

Entered By: David Laws
March 12, 2007
Related Events

Australian facility opened by Bob Noyce

Title: "A Briefing on Integrated Circuits" - Booklet
Author: Harry Sello
Created: 1967
Publisher: Fairchild Semiconductor
Donated By: Geri Hadley
Filename: doc-4522fa5726a1f.pdf (Size: 10.13 MB)
Pages: 15
Cataloguer:
Copyright:
Description:
This booklet was published to accompany a 30 minute TV infomercial created by Fairchild to educate viewers on the basics of integrated circuits.
Page 5 shows the basic steps in the fabrication of the planar process.

Entered By: David Laws
October 3, 2006
Related Events

Hoerni invents the planar process
TV Broadcast on ICs

Title: 1967 Sales Conference photo booklet
Author:
Created: 1967
Publisher:
Donated By: Geri Hadley
Filename: doc-45f5c925e3fe8.pdf (Size: 2.48 MB)
Pages:
Cataloguer:
Copyright:
Description:
Complete copy of 1967 Sales Conference souvenir brochure

Entered By: David Laws
March 12, 2007

Title: APP-111 Using the uA702A
Author: Robert Widlar
Created: 1967
Publisher:
Donated By: Robert Ulrickson
Filename: doc-45ff4ef5bdbf4.pdf (Size: 780 KB)
Pages:
Cataloguer:
Copyright:
Description:

Application bulletin describing improvements incorporated in the redesign of the uA702 operational amplifier.

Entered By: David Laws
March 19, 2007

Title: SAM 1024-bit Hybrid Memory Stack
Author:
Created: 1967 ca.
Publisher:
Donated By: Ed Turney
Filename: doc-473a292b557c0.pdf (Size: 734 KB)
Pages: 4
Cataloguer:
Copyright:
Description:
The four photographs in the pdf file show the three hybrid arrays that comprise the SAM memory stack designed for Burroughs Corporation. Sixteen 64-bit P-channel MOS chips and a bipolar driver were mounted on a ceramic substrate to form 1024-bit memory planes. Multiple planes together with X and Y driver planes were assembled on top of each other to form a compact semiconductor memory system.

Entered By: David Laws
November 13, 2007
Related Events

SAM Multichip Modules enter preproduction

Title: Leadwire 5
Author: Judy Horst, Editor
Created: May 1967
Publisher: Fairchild Semiconductor
Donated By: Geri Hadley
Filename: doc-4547d468e0e88.pdf (Size: 3.00 MB)
Pages: 16
Cataloguer:
Copyright:
Description:
This document represents a typical issue of "Leadwire" the monthly journal "Published by and for Employees of Fairchild Semiconductor/Instrumentation" from company headquarters in Mountain View from 1959 until 1970.
Leadwire 5 (Volume 9, No.5) published in mid-1967 includes an inspirational letter from Group Vice President Bob Noyce, an article on the new 464 Ellis St HQ building, a profile of John Sentous; a summary of the Bowling season, and round-ups of information from around the company.

Entered By: David Laws
October 31, 2006

Title: LSI Meeting transcript
Author: Maurice O'Shea
Created: September 8, 1967
Publisher:

Donated By: Robert Ulrickson
Filename: doc-45ff48eee2fb7.pdf (Size: 1.08 MB)
Pages:
Cataloguer:
Copyright:
Description:
A pdf of 5 pages from a 78 page transcript (expletives deleted) of a marathon meeting that committed the company to pursue LSI products based on the Micromatrix and Micromosaic technology using CAD design tools is shown on the above pdf. This is the basic technology that led to the founding of the semicustom industry including such firms as LSI Logic. The full document is held in the Computer History Museum archives. This
Attendees at the meeting were R.N. Noyce, T.H. Bay, G.E. Moore, R. Seeds, J. Sanders, J. Larkin, M. O'Shea, B. Schriener, J. Sentous, and J. Hulme.

Entered By: David Laws
March 19, 2007

Title: 1968 Sales Conference photo booklet
Author:
Created: 1968
Publisher:
Donated By: Bill Welling
Filename: doc-46086b7d15b0b.pdf (Size: 1.91 MB)
Pages:
Cataloguer:
Copyright:
Description:
Click on the File name above to see a souvenir brochure of events at the 1968 Sales Conference held at the Hilton Hawaiian Village, Hawaii.

Entered By: David Laws
March 26, 2007
Related Events

Annual Sales Conference held in Hawaii (1968)

Title: MOS Micromosaic custom chip for GE
Author:
Created: 1968
Publisher:
Donated By: Bill Bennett
Filename: doc-465385134cf63.pdf (Size: 252 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
The die photo in the file above is the first MOS Micromosaic developed for a paying customer. The 250-gate device that can perform "a series of combinatorial logic functions" is on an 80-by-80-mil chip. GE paid Fairchild $12,000 to develop the array that will sell for $60 per chip for the first 100 and about $44 thereafter.
[Source: Electronics, September 2, 1968]

Entered By: David Laws
May 22, 2007

Title: Australian artist's image of a silicon wafer
Author: Alun Leach Jones
Created: 1968 ca.
Publisher:
Donated By: Bob and Marcella Major
Filename: doc-46859757650fe.jpg (Size: 786 KB)
Pages:
Cataloguer:
Copyright:
Description:
Acrylic on canvas image "Noumenon XX11 Integrated Matrix" inspired by the patterns on silicon wafers painted by noted Australian artist Alun Leach Jones. Commissioned by Fairchild Australia and used on promotional literature of the era. Gift of Bob and Marcella Major to the Computer History Museum (X3907.2007).

Entered By: David Laws
June 29, 2007

Title: The Famous Fairchild Finger
Author:
Created: 1968 ca.
Publisher:
Donated By: Elliott Sopkin
Filename: doc-469c383df257c.jpg (Size: 195 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
The picture posted at "File" above came out of an interview with EEE magazine on the subject of custom vs standard circuits. The interview was with John Hulme, Mike Markkula, and Ben Anixter. After the interview Jerry Larkin (on the right) and Jack Gifford (on the left) who were in the room with Ben were asked the question, in fun, "What do you think of T.I."? The picture resulted.

Entered By: David Laws
July 16, 2007
Related Events

The Fairchild Finger

Title: Semiconductor Family Tree
Author: Don Hoefler
Created: July 8, 1968
Publisher: Electronic News
Donated By:
Filename: doc-47eaa5940c774.pdf (Size: 9.20 MB)
Pages: 4
Cataloguer:
Copyright:
Description:
The attached article "Semiconductor Family Tree" by Don Hoefler from Electronic News on July 8, 1968 was one of the first published genealogies of Silicon Valley that described the multiple

spinouts from Fairchild in the form of a family tree. It was used as the basis of a poster created by SEMI in 1977 and reprinted and updated several times in succeeding years.
See:

Entered By: David Laws
March 26, 2008

Title: 1968 Sales Conference Agenda
Author: Jerry Sanders
Created: August 4, 1968
Publisher: Fairchild Semiconductor Sales Department
Donated By: Ed Turney
Filename: doc-45180a7d0bb73.pdf (Size: 11.77 MB)
Pages: 8
Cataloguer:
Copyright:
Description:
"Welcome Fairchildren" heads the opening message from Jerry Sanders to attendees of the last sales conference with "the Old Guard in attendance and in control of the company." The document includes the schedule of meetings and a list of attendees.
CLICK ON FILENAME ABOVE TO OPEN PDF FILE.
NOTE: THIS IS A LARGE FILE AND WILL TAKE SEVERAL MINUTES TO OPEN
PDF file provided by Ed Turney in an e-mail dated 8.9.06.

Entered By: David Laws
September 25, 2006
Related Events

Annual Sales Conference held in Hawaii (1968)

Title: Annual Report 1968
Author:
Created: December 31, 1968
Publisher:
Donated By: Robert Blair
Filename: doc-45be54cac4e43.pdf (Size: 1.86 MB)
Pages:
Cataloguer:
Copyright:
Description:
Selected pages from the 1968 Annual Report
Contains Les Hogan's first report to shareholders on pg. 3
Click on "File" above to open pdf

Entered By: David Laws
January 29, 2007

Title: Fairchild Restaurant Guide
Author: Gene McClenning with Jim Hauptli
Created: 1969
Publisher: Fairchild Semiconductor
Donated By: David Laws
Filename: doc-453551f61dec2.pdf (Size: 2.80 MB)

Pages: 5
Cataloguer:
Copyright:
Description:
"Fairchild Semiconductor's Guide to Peninsula and San Francisco Bay Area Restaurants" was published in 1969 to give to customers and other visitors to the company. The cover and pages listing Peninsula spots are reproduced here. Popular watering holes for Fairchild employees included L'Auberge, Redwood City; Andre's L'Omelette, Dinah's Shack, and Mings, Palo Alto; and Chez Yvonne and Walker's Wagon Wheel in Mountain View.
Note that at Mac's Tea Room in Los Altos two drinks and dinner with wine cost the visitor "about 6 bucks."

Entered By: David Laws
October 17, 2006

Title: Honk Kong plant and the "Flying F" logo photo
Author:
Created: 1969 ca.
Publisher:
Donated By: Ed Pausa
Filename: doc-46cb90705f9b5.jpg (Size: 185 KB)
Pages:
Cataloguer:
Copyright:
Description:
The "Flying F" on the front of the Hong Kong building on Hoi Bun Road was the brainstorm of expatriate plant engineering manager Jay Trepanier. Jay noticed that many Hong Kong buildings had neon signs on them and decided that Fairchild needed one also. As we were adjacent to and parallel with the Kaitak Airport runway, the logo would be seen by everyone who flew in or out. It proved to be great PR!

Entered By: David Laws
August 21, 2007

Title: Annual Report 1969
Author:
Created: March 1969
Publisher:
Donated By: Robert Blair
Filename: doc-45621ba5d2e49.pdf (Size: 7.72 MB)
Pages: 11
Cataloguer:
Copyright:
Description:
The Fairchild Camera and Instrument Annual Report for 1969 is the first to be published with the headquarters moved from Syosset, NY to Mountain View, CA. In his "Message to Shareholders" President and CEO C. Lester Hogan speaks optimistically about 1969 as a "year of substantial progress and new beginnings for the Company."
The pdf file above comprises 11 pages out of a total of 24.

Entered By: David Laws
November 20, 2006
Related Events

FC&I Financial Results for 1969

Title: Van Poppelen named Semiconductor General Manager
Author:
Created: July 1969
Publisher: Microwire
Donated By: Geri Hadley
Filename: doc-45e4bd29caef3.pdf (Size: 145 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
Joe Van Poppelen,a Vice President of Fairchild Camera and Instrument was named General Manager of the corporation's Semiconductor Division
Full article and photo posted at File name above

Entered By: David Laws
February 27, 2007
Related Events

Van Poppelen named General Manager

Title: Shiprock dedication commemorative brochure
Author: Unknown
Created: September 6, 1969
Publisher: Fairchild Semiconductor
Donated By: Geri Hadley
Filename: doc-4550f0a61103e.pdf (Size: 8.88 MB)
Pages: 10
Cataloguer:
Copyright:
Description:
The brochure on this link was published to commemorate the dedication of a new assembly plant on the Navajo reservation at Shiprock, New Mexico in September 1969.

Entered By: David Laws
November 7, 2006
Related Events

Shiprock Plant begins operations
Shiprock Plant Closed

Title: Semiconductor Division Group Directors 1970
Author:
Created: 1970
Publisher:
Donated By: Geri Hadley
Filename: doc-45d0c3a27613b.pdf (Size: 321 KB)
Pages:
Cataloguer:
Copyright:
Description:

This 2-page spread photograph from Leadwire April-May 1970 features the 11 group directors responsible for leading the Semiconductor Division in 1970.
From left to right front row:
Jim Hazle, Tom Longo, Joe Van Popplen, George Scalise, Doug O'Connor, Gene Blanchette
Rear row:
Andy Procassini, Bob Friedman, Wilf Corrigan, Dave Haynes, Bill Lehner
---
Entered By: David Laws
February 12, 2007
Related Events

Leadwire started publication

Title: 464 Ellis Street HQ Building
Author: Melgar Commercial Photographers, Mountain View, CA
Created: 1970 ca.
Publisher: Fairchild Camera & Instrument Corporation
Donated By: Courtesy City of Mountain View
Filename: doc-4523eddb2bb9b.tif (Size: 3.82 MB)
Pages: 1
Cataloguer:
Copyright:
Description:
This building became the corporate headquarters for Fairchild Semiconductor when it was built in the late 1960s. Located at 464 Ellis Street, the building was known as the "Rusty Bucket." It was demolished in 1993.
CLICK ON FILENAME ABOVE TO DISPLAY IMAGE
City of Mountain View Public Library Catalog
Image no. PHL B15 3

Entered By: David Laws
October 4, 2006

Title: Norman Doyle and Larry Blaser
Author:
Created: 1970 ca.
Publisher:
Donated By: Norman Doyle
Filename: doc-4643ad87b383f.tif (Size: 323 KB)
Pages:
Cataloguer:
Copyright:
Description:
Norman Doyle and Larry Blaser (on the right) getting up his courage to fly to the Consumer Electronics Conference in Chicago. It was the first time he had flown since being a USAF pilot in the Korean War. He used to take the train to Chicago every year, but two years prior the conference was flooded out when he got there. The following year the train was derailed in Nebraska.

Entered By: David Laws
May 10, 2007

Title: San Rafael Diode plant feature in Leadwire

Author: Vicki Heinsheimer, Editor
Created: March 1970
Publisher: Fairchild Semiconductor
Donated By: Geri Hadley
Filename: doc-4550f3546c1c0.pdf (Size: 1.01 MB)
Pages: 5
Cataloguer:
Copyright:
Description:
The San Rafael diode plant was the cover feature article in the February - March 1970 issue of Leadwire. The article notes that there were 550 employees working at the facility in 1970.

Entered By: David Laws
November 7, 2006
Related Stories

Diodes to DRAMs - Memories of San Rafael and beyond
Related Events

San Rafael diode plant opened

Title: Lyle Ronalds - "May you always roll winners"
Author:
Created: April 7, 1970
Publisher:
Donated By: Lyle A. Ronalds
Filename: doc-46abc455c3861.jpg (Size: 115 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
Lyle Ronalds won one share of Fairchild stock in a gaming diversion at the 1969 sales conference held in La Costa, California. At that time Lyle was working in the Tokyo sales office. Following is the text of the letter accompanying the certificate posted above, under "File":
Dear Lyle,
The mills of the stock market grind very slowly, so here belatedly, is the Fairchild stock certificate you won at La Costa.
My congratulations on your gaming skill, and may you always roll winners for yourself and for Fairchild
Sincerely
Andy Procassini
Group Director of Marketing

Entered By: David Laws
July 28, 2007

Title: Organization Changes
Author:
Created: October 1970
Publisher: Microwire
Donated By: Geri Hadley
Filename: doc-45e4c36666f66.pdf (Size: 109 KB)
Pages: 1
Cataloguer:

Copyright:
Description:
Article from Microwire on reorganization of Semiconductor Division with photographs of Wilf Corrigan; V.P. Domestic Operations, Leo Dwork; V.P. Memory Systems, George Scalise; V.P. International Operations, and Doug O'Conner; General Manager European Operations.

Entered By: David Laws
February 27, 2007

Title: Systems and Applications Engineering feature
Author:
Created: October 1970
Publisher: Microwire
Donated By: Geri Hadley
Filename: doc-45e383be87eef.pdf (Size: 521 KB)
Pages:
Cataloguer:
Copyright:
Description:
A two page article from Microwire on the Systems and Applications Engineering department under Bob Ulrickson. Includes photographs of many of the managers and engineers.

Entered By: David Laws
February 26, 2007

Title: Leadwire - FAIRCH Heart cover
Author: Larry Bender
Created: 1971 ca.
Publisher:
Donated By: Ed Turney
Filename: doc-473a41f00bb81.pdf (Size: 1.04 MB)
Pages:
Cataloguer:
Copyright:
Description:
The bold red heart with the diagonal FAIRCH legend designed by graphic artist Larry Bender was used on the cover of this issue of Leadwire to illustrate the company's committment to a new Customer Satisfaction program promted by Les Hogan and Doug O'Conner. It was used many times in succeeding years including the the "Thank You Fairchild" party in 1987 and the 'Fairchild@50" celebration in 2007

Entered By: David Laws
November 13, 2007
Related Events

Fairchild@50 - Fiftieth Anniversary Events
Thank You Fairchild

Title: First Silicon Valley dateline
Author: Don Hoefler
Created: January 11, 1971
Publisher: Electronic News, Fairchild Business Publications
Donated By: David Laws

Filename: doc-45354c6f6a401.pdf (Size: 2.00 MB)
Pages: 1
Cataloguer:
Copyright:
Description:
This is the front page of industry newspaper "Electronic News" where the headline "Silicon Valley - USA" was used by journalist Don Hoefler as the lead for a series of articles on the history of the semiconductor business in the Santa Clara Valley. This is the first time the name Silicon Valley appeared in print. Note that the masthead carries the date as 1970. This is incorrect, the year is 1971.

Entered By: David Laws
October 17, 2006

Title: Silicon Valley dateline - full article
Author: Don Hoefler
Created: January 11, 1971
Publisher: Electronic News
Donated By:
Filename: doc-468d93bf552d4.pdf (Size: 4.41 MB)
Pages:
Cataloguer:
Copyright:
Description:
The full article and text of the Don Hoefler 1971 "Silicon Valley USA" article is posted under "Filename" above.

Entered By: David Laws
July 5, 2007
Related Events

"Silicon Valley" is named

Title: Paul Driscoll wins Business Week Award - article
Author:
Created: March 22, 1971
Publisher: Microwire
Donated By: Geri Hadley
Filename: doc-45e4ccbec9eef.pdf (Size: 244 KB)
Pages:
Cataloguer:
Copyright:
Description:
Article from Microwire on a Business Week award presentation to Paul Driscoll for his management of the Shiprock facility on the Navajo reservation.

Entered By: David Laws
February 27, 2007
Related Events

Shiprock Plant begins operations
Shiprock Plant Closed

Title: Annual Report 1970
Author:
Created: March 26, 1971
Publisher:
Donated By: Robert Blair
Filename: doc-45621d1d2eb21.pdf (Size: 659 KB)
Pages: 5
Cataloguer:
Copyright:
Description:
The Fairchild Camera and Instrument Annual Report for 1970 describes a dramatic reversal of fortune over 1969. President and CEO C. Lester Hogan's message "To Our Shareholders" begins "After a record first quarter, 1970 turned into a year of pronounced adversity for Fairchild Camera."
The above pdf file includes 5 pages out of a total of 16.

Entered By: David Laws
November 20, 2006
Related Events

FC&I Financial Results for 1970

Title: MOD Makes New Move
Author:
Created: April 1971
Publisher: Microwire
Donated By: Geri Hadley
Filename: doc-45e4c64439c19.pdf (Size: 279 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
Article from Microwire on move of MOD to new facilties in Palo Alto.

Entered By: David Laws
February 27, 2007
Related Events

Microwave and Optoelectronics (MOD) moves to Palo Alto

Title: Fairchild Completes Delivery of Illiac IV Memory System
Author:
Created: May 1971
Publisher: Microwire
Donated By: Geri Hadley
Filename: doc-45e4c850ba94b.pdf (Size: 114 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
Article from Microwire marking the delivery of the 70th and final PEM system to Burroughs for the Illiac IV, "the world's largest and most sophisticated computer."

Entered By: David Laws

February 27, 2007
Related Events

First Semiconductor Memory System delivered

Title: Isoplanar Process introduction brochure
Author: W. Baker and David Laws
Created: June 1971
Publisher: Fairchild Semiconductor
Donated By: David Laws
Filename: doc-45528ad0c5dfa.pdf (Size: 2.08 MB)
Pages: 9
Cataloguer:
Copyright:
Description:
This brochure was prepared by Bipolar Memory Marketing to promote the Isoplanar process and the first product based on this new high-performance technology, the 93410 256-bit TTL RAM

Entered By: David Laws
November 8, 2006
Related Events

Isoplanar Process announced

Title: MOS Large Scale Standards (MPU proposal)
Author: Roy Pollack
Created: September 2, 1971
Publisher:
Donated By: Robert Ulrickson
Filename: doc-45ff4b95df33e.pdf (Size: 289 KB)
Pages:
Cataloguer:
Copyright:
Description:
This memo was generated following a presentation to the MOS technical staff by John Nichols of a proposal for Fairchild to develop a microprocessor chip set. Intel had entered the market with the 4004 earlier in the year. The rejection of the proposal was based on exisiting committments to higher priority projects.

Entered By: David Laws
March 19, 2007

Title: Fairchild forms Semiconductor Components Group
Author:
Created: November 1971
Publisher: Microwire
Donated By: Geri Hadley
Filename: doc-461bfdca0038e.pdf (Size: 227 KB)
Pages:
Cataloguer:
Copyright:
Description:

The above article published in Microwire includes photographs of Tom Longo (Digital Products), John Husher (Analog), Roy Pollack (MOS), Greg Reyes (Discrete Products), and Joe Van Poppelen (MOD) the five new division general managers reporting to Wilf Corrigan.

Entered By: David Laws
April 10, 2007

Title: 1972 Sales Conference photo booklet
Author:
Created: 1972
Publisher:
Donated By: Geri Hadley
Filename: doc-45f5cb7026d6c.pdf (Size: 3.73 MB)
Pages:
Cataloguer:
Copyright:
Description:
Click on File above to view the booklet of photos from the 1972 Sales Conference that was distributed at the 1973 event
---
Entered By: David Laws
March 12, 2007
Related Events

Annual Sales Conference held in Hawaii (1972)
Annual Sales Conference held in Hawaii (1973)

Title: "Shockley Transistor Labs is Formed in Palo Alto"
Author: Jerry Eimbinder, editor
Created: 1972 ca.
Publisher: Circuit News (Jericho, New York)
Donated By:
Filename: doc-4828b1254bb13.pdf (Size: 11.20 MB)
Pages: 30
Cataloguer:
Copyright:
Description:
Chapter III "Shockley Transistor Labs is Formed in Palo Alto" begins on page 13 of the "History of the Semiconductor Industy" booklet reprinted from the industry newspaper "Circuit News" (Jericho, New York) in the early 1970s:

Entered By: David Laws
May 12, 2008
Related Events

Shockley Semiconductor opens in Mountain View

Title: Annual Report 1971
Author:
Created: March 24, 1972
Publisher:
Donated By: Robert Blair
Filename: doc-45624845351c5.pdf (Size: 1.32 MB)

Pages:
Cataloguer:
Copyright:
Description:
In the Fairchild Camera and Instrument Annual Report for 1971 President and CEO C. Lester Hogan's message "To Our Shareholders" begins "Although the company did not resume profitable operations in 1971, results improved over the previous year."
The above pdf file includes 7 pages out of a total of 12.

Entered By: David Laws
November 20, 2006
Related Events

FC&I Financial Results for 1971

Title: "Fairchild Announces Birth of 3" Wafers"
Author: Emil Glosel
Created: September 1972
Publisher: Microwire
Donated By: Geri Hadley
Filename: doc-45e388cfd3841.pdf (Size: 285 KB)
Pages:
Cataloguer:
Copyright:
Description:
Article from Microwire, September 1972

Entered By: David Laws
February 26, 2007
Related Events

"Birth of 3 inch wafers"

Title: International Sales Conference, Mallorca 1973
Author:
Created: 1973
Publisher:
Donated By: Norman Doyle
Filename: doc-4643ae0c066a9.JPG (Size: 64 KB)
Pages:
Cataloguer:
Copyright:
Description:
Mallorca airport reception for the International Sales Conference. Art Massicott on the left, Norman Doyle on the right
---
Entered By: David Laws
May 10, 2007

Title: Fairchild Diode plant in San Rafael
Author: Mike Bromham
Created: 1973 ca.
Publisher:

Donated By:
Filename: doc-47d47925075c0.jpg (Size: 847 KB)
Pages:
Cataloguer:
Copyright:
Description:
Fairchild Diode plant in San Rafael circa 1973

Entered By: Michael Bromham
March 9, 2008

Title: Hogan with Consumer Applications team
Author:
Created: 1973 ca.
Publisher:
Donated By: Norman Doyle
Filename: doc-4643ae634923d.tif (Size: 1.22 MB)
Pages:
Cataloguer:
Copyright:
Description:
Lester Hogan with the Consumer Applications team that put together the modular AM/FM/Stereo/Audio demo kit.

Entered By: David Laws
May 10, 2007

Title: Fairchild Components Group Consolidates
Author:
Created: March 1973
Publisher: Microwire
Donated By: Geri Hadley
Filename: doc-461c00fab100e.pdf (Size: 196 KB)
Pages:
Cataloguer:
Copyright:
Description:
A description of the consolidation of five Semiconductor divisions into the Discrete and Digital Product Groups, together with photos of Greg Reyes, Tom Longo, Bud Frye, and Leo Dwork is posted at the above link.

Entered By: David Laws
April 10, 2007
Related Events

Components Group Consolidates

Title: Annual Report 1972
Author:
Created: March 15, 1973
Publisher:
Donated By:
Filename: doc-45624a02bbb6e.pdf (Size: 1.98 MB)

Pages: 9
Cataloguer:
Copyright:
Description:
In the Fairchild Camera and Instrument Annual Report for 1972 President and CEO C. Lester Hogan's message "To Our Shareholders" begins "It was a good year for Fairchild."
The above pdf file includes 9 pages out of a total of 28.

Entered By: David Laws
November 20, 2006
Related Events

FC&I Financial Results for 1972

Title: Philip Thomas named General Manager/MOS
Author:
Created: May 1973
Publisher: Microwire
Donated By: Geri Hadley
Filename: doc-461c047842546.pdf (Size: 82 KB)
Pages:
Cataloguer:
Copyright:
Description:
Thje above article from Microwire includes a photograph and brief biography of Phil Thomas
---
Entered By: David Laws
April 10, 2007

Title: "Organizational change provides a structure for growth"
Author:
Created: July 1973
Publisher: Microwire
Donated By: Geri Hadley
Filename: doc-46240ef264f3e.pdf (Size: 207 KB)
Pages:
Cataloguer:
Copyright:
Description:
This article from Microwire describes the new divisional and strategic business unit structure of the Semiconductor Components Gruop. It includes photographs of eight of the managers- Dave Heck, George Wells, Bud Frye, Paul Reagan, Phil Thomas, Jim Smaha, Bill Baker, and C. J. Stoll
---
Entered By: David Laws
April 16, 2007
Related Events

Discrete, Digital and Analog Groups Reorganized

Title: Diode Plant newsletter from 1973
Author: Bob Feld
Created: July 1, 1973
Publisher:

Donated By: Mike Bromham
Filename: doc-4b3a846f61b7d.pdf (Size: 2.23 MB)
Pages:
Cataloguer:
Copyright:
Description:
A 1973 Newsletter published for the employees of the Diode Division.

Entered By: Michael Bromham
December 29, 2009

Title: Linear Division Staff - 1974
Author:
Created: 1974 ca.
Publisher:
Donated By: Dick Forrest
Filename: doc-473a6354acd42.jpg (Size: 711 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
Fairchild Linear Division staff circa 1974
Front Row: Fred Roeder (Operations), Georg Ubani (Marketing), Doug Sullivan (VP Linear Division), Art Hoage (Production Control)
Back Row: Larry Fuornell (HR), Harry Gill ((Design Engineering), Norm Chinowski (QC), Dick Forrest (Product/Packaging Engineering)

Entered By: David Laws
November 13, 2007
Related Events

Discrete, Digital and Analog Groups Reorganized

Title: Santa Clara Applications Van Heads North
Author:
Created: June 1974
Publisher: Microwire
Donated By: Bill Bennet
Filename: doc-46538820a422b.pdf (Size: 260 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
This article from "Microwire" describes the trip planned for the Santa Clara Applications Van to customers in the Pacific Northwest. It is signed "To Bill (Bennett) from Jerry (Lawson)" Bill and Jerry were the masterminds behind this extremely successful concept that started in 1972.

Entered By: David Laws
May 22, 2007
Related Events

Applications Van

Title: CCD Demonstrates new capabilty
Author:
Created: January 1975
Publisher: Microwire
Donated By: Geri Hadley
Filename: doc-46241e1407331.pdf (Size: 264 KB)
Pages:
Cataloguer:
Copyright:
Description:
At a press conference on January 8, the CCD department demostarted the use of CCD technology for high density solild state memories. The CCD450, slated for terminal buffers, video displays and electronic switching systems, was develpoed under the direction of Gil Amelio.

Entered By: David Laws
April 16, 2007

Title: Shiprock seizure flyer
Author: Unknown
Created: March 3, 1975
Publisher: Unknown
Donated By: Geri Hadley
Filename: doc-453561be93aad.pdf (Size: 580 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
The "Let's Talk Facts" flyer on the attached document summarizes the status of the Navajo-owned Shiprock, New Mexico assembly plant that had been being seized on February 24, 1975 and occupied by an outside group of armed Indians.

Entered By: David Laws
October 17, 2006
Related Events

Shiprock Plant Closed

Title: Annual Report 1974
Author:
Created: March 17, 1975
Publisher:
Donated By: Robert Blair
Filename: doc-45be5370d1f1a.pdf (Size: 2.52 MB)
Pages:
Cataloguer:
Copyright:
Description:
Selected pages from the 1974 Annual Report
Click on "File" above to open pdf

Entered By: David Laws
January 29, 2007

Title: "Timely entry into consumer market"
Author:
Created: August 1975
Publisher: Microwire
Donated By: Geri Hadley
Filename: doc-46241c57e81a6.pdf (Size: 207 KB)
Pages:
Cataloguer:
Copyright:
Description:
This article from Microwire describes the July 25, 1975 entry of the newly formed Consumer Products Group into the consumer end-product market for LED digital watches.

Entered By: David Laws
April 16, 2007
Related Events

Digital Watch Market entered

Title: Business Week cover article
Author:
Created: October 6, 1975
Publisher:
Donated By: Geri Hadley
Filename: doc-45d0c0041031b.pdf (Size: 937 KB)
Pages: 3
Cataloguer:
Copyright:
Description:
This feature article on "Young Top Management" included a cover photograph and a profile on Wilfred Corrigan the 37 year old president and CEO of Fairchild.

Entered By: David Laws
February 12, 2007
Related Events

Corrigan on Business Week cover

Title: "No Electricity"
Author: Jerry Eimbinder - Editor
Created: 1976 ca.
Publisher: Newsprint Inc., a Morgan Grampian Company
Donated By: Alice Arsenault
Filename: doc-4514a9a3233fc.jpg (Size: 3.45 MB)
Pages: 2
Cataloguer:
Copyright:
Description:
Describes the early days of the founders of Fairchild during the period before and after they moved into Charleston Road.
CLICK ON FILENAME ABOVE TO DISPLAY IMAGE
Comprises the second page (pg.17) of Chapter IV of "History of the Semiconductor Industry" a series of articles published in industry newspaper "Circuit News" in the mid-1970's. Scanned from a copy reprinted by Signetics, a subsidiary of U. S. Philips Corporation.

Entered By: David Laws
September 22, 2006

Title: No Electricity
Author: Jerry Eimbinder, et al.
Created: 1976 ca.
Publisher: Newsprint Inc., a Morgan Grampian Company
Donated By: Alice Arsenault
Filename: doc-4514ade2efc03.pdf (Size: 143 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
Describes the October 1957 period when the founders of Fairchild were in the process of moving into Charleston Road.
CLICK ON FILENAME ABOVE TO DISPLAY IMAGE
Comprises the second page (pg.17) of Chapter IV of "History of the Semiconductor Industry" a series of articles published in industry newspaper "Circuit News" in the mid-1970's. Scanned from a copy reprinted by Signetics, a subsidiary of U. S. Philips Corporation.

Entered By: David Laws
September 22, 2006

Title: Annual Report 1975
Author:
Created: March 15, 1976
Publisher:
Donated By: Robert Blair
Filename: doc-45cb82c8e3b60.pdf (Size: 3.01 MB)
Pages:
Cataloguer:
Copyright:
Description:
Selected pages from the 1975 Annual Report
Click on "File" above to open pdf

Entered By: David Laws
February 8, 2007

Title: Fairchild/Silicon Valley Genealogy Chart
Author: Don Hoefler, Harry Smallwood, and James E. Vincler
Created: 1977
Publisher: SEMI
Donated By: James E. Vincler
Filename: doc-45ff3e214d9ea.pdf (Size: 656 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
The first published version of the Silicon Valley Genealogy chart that traced the lineage of 66 semiconductor companies founded between 1959 and 1976 back to Fairchild was prepared as part of the The Semicon/West '77 Souvenir Banquet Program honoring Drs. Bardeen, Brattain,

and Shockley on the 30th anniversary of the discovery of the transistor. It was subsequently updated and reprinted at least twice by SEMI.

Entered By: David Laws
March 19, 2007
Related Events

Fairchild/Silicon Valley Genealogy

Title: FC&I 50th Anniversary Photo Album
Author:
Created: 1977
Publisher:
Donated By:
Filename: doc-473a252347d41.pdf (Size: 2.79 MB)
Pages: 12
Cataloguer:
Copyright:
Description:
A 12-page booklet published to mark the 50th anniversay of the founding of Fairchild Aviation Corporation in 1927. The F8 microprocessor is the featured product.

Entered By: David Laws
November 13, 2007

Title: Cray 1 computer uses Fairchild ECL
Author:
Created: 1977 ca.
Publisher:
Donated By:
Filename: doc-45d0c68f4b4c9.pdf (Size: 240 KB)
Pages:
Cataloguer:
Copyright:
Description:
This photo of the Cray 1 supercomputer "the world's most powerful information processing machine" was featured on pages 6 and 7 of the 1977 Annual Report. The Cray 1 used 250,000 dual subnanosecond ECL gates and 65,000 ECL RAMs manufactured by Fairchild.

Entered By: David Laws
February 12, 2007

Title: Annual Report 1976
Author:
Created: March 14, 1977
Publisher:
Donated By:
Filename: doc-45cb837a63ad2.pdf (Size: 13.50 MB)
Pages:
Cataloguer:
Copyright:
Description:
Selected pages from the 1976 Annual Report

Click on "File" above to open pdf

Entered By: David Laws
February 8, 2007
Related Events

FC&I Financial Results for 1976

Title: 1976 Highlights
Author:
Created: April 1977
Publisher:
Donated By: Robert Blair
Filename: doc-45d09ba7302c8.pdf (Size: 202 KB)
Pages:
Cataloguer:
Copyright:
Description:
Page 6 from the "Fairchild Annual Report to Employees 1976" presents a summary of the major events of that year
---
Entered By: David Laws
February 12, 2007
Related Events

4K Bipolar DRAM introduced
Consumer products shown at CES
San Jose plant occupied
Silicon Plant joint venture with Applied Materials

Title: Condensed Catalog - 1978
Author: Marketing Services Dept.
Created: 1978
Publisher: Fairchild Semiconductor
Donated By: Harry Sello
Filename: doc-4522ff9e174af.pdf (Size: 5.89 MB)
Pages: 10
Cataloguer:
Copyright:
Description:
The 1978 Condensed Catalog lists the part numbers and summary specifications of all products offered for sale by the company. The cover pages, index, and details of the memory product line are reproduced here.

Entered By: David Laws
October 3, 2006

Title: Annual Report 1977
Author:
Created: March 13, 1978
Publisher:
Donated By: Robert Blair
Filename: doc-45cb84963e7e3.pdf (Size: 3.04 MB)

Pages:
Cataloguer:
Copyright:
Description:
Selected pages from the 1977 Annual Report
Click on "File" above to open pdf

Entered By: David Laws
February 8, 2007
Related Events

FC&I Financial Results for 1977

Title: Channel F System II promotional flyer
Author:
Created: 1979 ca.
Publisher: Zircon International Inc
Donated By: Alice Betz
Filename: doc-456372b86d3b1.pdf (Size: 446 KB)
Pages: 2
Cataloguer:
Copyright:
Description:
"Channel F" is the sucessor brand name for the system introduced in 1976 as the Fairchild Video Entertainment System (VES). Based on Fairchild's F-8 microprocessor, Channel F was the first commercial game system to use game cartridges programmed with on Read-Only-Memory (ROM) chips.
The attached document is a tri-fold flyer distributed to promote the Channel F System II after the product line was acquired by Zircon International Inc. in 1979.

Entered By: David Laws
November 21, 2006
Related Events

Video Game system receives FCC approval

Title: Annual Report 1978
Author:
Created: March 12, 1979
Publisher:
Donated By:
Filename: doc-45cb85d171f5b.pdf (Size: 3.09 MB)
Pages:
Cataloguer:
Copyright:
Description:
Selected pages from the 1978 Annual Report
Click on "File" above to open pdf

Entered By: David Laws
February 8, 2007
Related Events

FC&I Financial Results for 1978

Title: Sentinel tester
Author:
Created: 1980 ca.
Publisher:
Donated By:
Filename: doc-47eaad3101c58.pdf (Size: 1.25 MB)
Pages:
Cataloguer:
Copyright:
Description:
The Sentinel tester, see photo attched, was offered as a lower cost alternaite to the Sentry system in the early 1980s.

Entered By: David Laws
March 26, 2008

Title: Annual Report 1980 (Schlumberger)
Author:
Created: February 26, 1981
Publisher:
Donated By: Geri Hadley
Filename: doc-45d0c1271e30c.pdf (Size: 3.14 MB)
Pages:
Cataloguer:
Copyright:
Description:
Selected pages featuring Fairchild information from the 1980 Schlumberger Annual Report. This is the first year following the acquistion.

Entered By: David Laws
February 12, 2007

Title: Silicon Valley napkin
Author: Bob Zeidman
Created: 1986 ca.
Publisher: Z Enterprises
Donated By: David Laws
Filename: doc-45354e91765be.pdf (Size: 1.02 MB)
Pages: 1
Cataloguer:
Copyright:
Description:
A cocktail napkin from Walker's Wagon Wheel circa late 1980s. It is designed so that a prospective entrepreneur need only complete the check boxes in order to have a business plan ready to present to a venture capitalist for funding.
The napkin designer/entrepreneur Bob Zeidman tells the following story about its creation. "In 1986 I created the Silicon Valley Napkin and began marketing and selling it. The printer required minimum print runs in the thousands, so I had boxes stacked to the ceiling in the kitchen of my one-bedroom apartment. By 1990, the napkin had run its course, and I still had boxes left. I approached The Garage, the precursor to the Tech Museum, to make a napkin donation. They were excited to have the napkins at their invitation-only, kickoff donor event, and I was glad to supply them.

Afterwards, I thought maybe I could get my girlfriend and myself invited to this gala event and impress her by hobnobbing with the Silicon Valley bigwigs. The Garage invited us, and we mingled with, among others, Andy Grove, Ed Zschau, and Margaret Wozniak (filling in for her son Steve who couldn't make it at the last minute). Sitting at the table I asked the man on my right what he did for a living. He waved his arms around his head, "embracing" the room, and told me his company had designed the museum's interior space. Cool! I turned to the man on my left and asked him what he did for a living. He was the founder and CEO of a biotech firm in Berkeley. Wow! They both asked me what I did and, a little sheepishly, I picked up a napkin, proclaimed that I had supplied the napkins for tonight's event, and wiped the béarnaise sauce from my mouth.
As a footnote, my girlfriend at the time is now my wife. I guess she was sufficiently impressed."

Entered By: David Laws
October 17, 2006

Title: Hoefler, Don - Obituary
Author:
Created: April 17, 1986
Publisher: San Jose Mercury News
Donated By: Joe Malone
Filename: doc-473a61e89e396.pdf (Size: 310 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
Obituary of journalist Don Hoefler publisher of industry newsletter Microelectronic News who died on April 15, 1986.

Entered By: David Laws
November 13, 2007

Title: Thank You Fairchild Invitation
Author: Larry Bender
Created: April 1988
Publisher: Silicon Valley Wayfairers
Donated By: David Laws
Filename: doc-452edbe2d0cf4.pdf (Size: 718 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
Image of the invitation and ticket/name badge to a "Thank You Fairchild" party to celebrate the memory of Fairchild Semiconductor held at the Hyatt Rickeys Ballroom in Palo Alto on April 14, 1988. This is the same hotel where some of the founders of Fairchild celebrated the award of the Nobel Prize to their boss William Shockley in 1956. Rickeys was razed to make way for a housing development in 2006.

Entered By: David Laws
October 12, 2006
Related Events

Thank You Fairchild

Title: Wagon Wheel artifacts – shirt, can opener, and poker chips
Author: David Laws
Created: 1997 ca.
Publisher:
Donated By: C. J. Stoll and Ray Lett
Filename: doc-46859b2c0fa2e.jpg (Size: 490 KB)
Pages:
Cataloguer:
Copyright:
Description:
Photograph of Wagon Wheel mementos submitted for display at the Fairchild 50th Anniversary event held at the Computer History Museum in October 2007. Polo shirt and beer can opener loaned by C. J. Stoll. Wagon Wheel inscribed poker chips, gift to the museum by Ray Lett.

Entered By: David Laws
June 29, 2007
Related Events

Walker's Wagon Wheel closes

Title: "National Semi letting go of a legend"
Author: Ricardo Sandoval
Created: January 28, 1997
Publisher: San Jose Mercury News
Donated By: Ruth Betz
Filename: doc-45be57a16d9bb.pdf (Size: 594 KB)
Pages: 2
Cataloguer:
Copyright:
Description:
This article was publshed on page C1 of the San Jose Mercury News.
Click on "File" above to read pdf

Entered By: David Laws
January 29, 2007

Title: "Fairchild's Offspring"
Author:
Created: August 25, 1997
Publisher: Business Week
Donated By:
Filename: doc-45df8d75a72ba.pdf (Size: 255 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
This chart from Business Week is one of many generated over the years to show the Fairchild genealogy. It includes 26 companies created directly or indirectly by former Fairchild employees.

Entered By: David Laws
February 23, 2007
Related Events

Hoerni, Last & Roberts leave to form Amelco

Micrologic team departs for Signetics
Moore resigns and Intel is founded
Rheem Semiconductor is first Fairchild spin-out
Shockley defectors resign, FC&I agreement negotiated
Sporck resigns to join National Semiconductor

Title: Fairchild's Offspring
Author:
Created: August 25, 1997
Publisher: McGraw-Hill
Donated By:
Filename: doc-4671c5c248bed.pdf (Size: 255 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
On August 25, 1997 Business Week magazine published a "Silicon Valley Special Report" that on page 84 included an updated version (but heavily edited version) of the Fairchild genealogy table. Click on "File" above.
For the full report see:
http://www.businessweek.com/1997/34/internal.htm

Entered By: David Laws
June 14, 2007
Related Events

Fairchild/Silicon Valley Genealogy

Title: Walker's Wagon Wheel (RIP 2003)
Author: Dick Kors
Created: 2003
Publisher:
Donated By:
Filename: doc-456dc43a011de.jpg (Size: 105 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
Industry watering hole Walker's Wagon Wheel is in the process of being razed in this photo from 2003. See "Walker's Wagon Wheel closes" in "References" section for more information.

Entered By: David Laws
November 29, 2006
Related Events

Walker's Wagon Wheel closes

Title: John Ready - photo
Author: Dick Kors
Created: 2006 ca.
Publisher:
Donated By: Dock Kors
Filename: doc-45c71a1ea8d9e.jpg (Size: 90 KB)

Pages: 1
Cataloguer:
Copyright:
Description:
Dick Kors submitted the attached photo of John Ready who died February 2, 2007 to be posted on the day of John's memorial service at St. Simon's, Los Altos [February 5, 2007].
John managed the diode operation in San Rafael in the aeearly 1960's before moving to Fairchild headquarters in Mountain View.
Click on the hyperlinked "File" name above to access photo.

Entered By: David Laws
February 5, 2007
Related Stories

Memories of John Ready
Related Events

San Rafael diode plant opened

Title: "Birthplace of Silicon Valley" poster
Author: William Moeller
Created: February 2006
Publisher: SEMI
Donated By: Scott Smith
Filename: doc-4518420bb6b4a.pdf (Size: 1.48 MB)
Pages:
Cataloguer:
Copyright:
Description:
This poster was created by SEMI to be displayed in the original Shockley Semiconductor laboratory at 391 S. San Antonio Road, Mountain View to mark its role as the Birthplace of Silicon Valley in association with the 50th anniversary of the company.
CLICK ON THE FILENAME TO SEE IMAGE

Entered By: David Laws
September 25, 2006
Related Events

Shockley Semiconductor opens in Mountain View

Title: Shockley Labs bronze plaque photo
Author: David Laws
Created: February 2006
Publisher:
Donated By: David Laws
Filename: doc-451835be4eb99.jpg (Size: 938 KB)
Pages:
Cataloguer:
Copyright:
Description:
A bronze plaque to recognize the former fruit packing shed as the original laboratory of Shockley Semiconductor is inset in the sidewalk in front of the building at 391 S. San Antonio Road, Mountain View.
CLICK ON FILENAME TO SEE IMAGE

Entered By: David Laws
September 25, 2006
Related Events

Shockley Semiconductor opens in Mountain View

Title: Shockley Labs exterior photo 2006
Author: David Laws
Created: February 2006
Publisher:
Donated By: David Laws
Filename: doc-4518323a66305.jpg (Size: 625 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
The original building at 391 S. San Antonio Road, Mountain View occupied by Shockley Semiconductor Laboratories in 1956 started life as a fruit packing shed in the orchard era of the "Valley of Heart's Delight."
CLICK ON FILENAME ABOVE TO SEE IMAGE
In 2006 it was once again filled with fruit as the Wholesale Produce market.

Entered By: David Laws
September 25, 2006

Title: Shockley Labs commemorative poster unveiled - photo
Author: Unknown photographer
Created: February 26, 2006
Publisher:
Donated By: SEMI
Filename: doc-4518397c8831e.jpg (Size: 664 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
A commemorative poster was unveiled inside the former Shockley Semiconductor Laboratory building at 391 S. San Antonio Road, Mountain View to mark the 50th anniversary of the public announcement of the founding of the company and the birthplace of Silicon Valley. The poster was designed and donated by SEMI. Included in the photo from the left are: Former Shockley employee Andy Ramans, Nick Galiotto Mayor Mountain View, Stanley Myers CEO SEMI, and John Toole CEO Computer History Museum.
CLICK ON FILENAME TO SEE PHOTO

Entered By: David Laws
September 25, 2006

Title: Tom Bay Memorial invitation
Author:
Created: August 2006
Publisher:
Donated By: David Laws
Filename: doc-4522f88985308.pdf (Size: 183 KB)

Pages: 1
Cataloguer:
Copyright:
Description:
Formal invitation to a "gathering and reception to memorialize the life and accomplishments of Thomas Henry Bay" on September 10, 2006.

Entered By: David Laws
October 3, 2006

Title: Notes on Analog IC milestones
Author: David Laws
Created: October 24, 2006
Publisher:
Donated By:
Filename: doc-4803f5a67ccc3.pdf (Size: 19 KB)
Pages: 3
Cataloguer:
Copyright:
Description:
The attached Analog Milestones were developed as research for the Silicon Engine website project. They are substantially based on information derived from the "Op Amp History" lecture notes of Kent Lunberg.

Entered By: David Laws
April 14, 2008

Title: From Bell Labs to Silicon Valley
Author: Michael Riordan
Created: 2007
Publisher: The Electrochemical Society Interface • Fall 2007
Donated By: Michael Riordan
Filename: doc-4740fdc8bb5fd.pdf (Size: 2.50 MB)
Pages: 6
Cataloguer:
Copyright:
Description:
I have attached here an article about Shockley Labs and Fairchild that I wrote for a special issue of INTERFACE magazine celebrating the 50th anniversary of Frosch and Derick's famous paper on the silicon-dioxide layer. It describes the rebellion at Shockley Labs and the development of the planar process and the IC at Fairchild.

Entered By: David Laws
November 18, 2007
Related Events

Hoerni invents the planar process
Last begins “microcircuit” development
Noyce conceives a method of manufacturing integrated circuits
Shockley Semiconductor dissidents plan to leave
Shockley Semiconductor opens in Mountain View

Title: Shockley, William biography

Author: Michael Riordan
Created: 2007 ca.
Publisher:
Donated By:
Filename: doc-4742153d4d850.pdf (Size: 1.48 MB)
Pages:
Cataloguer:
Copyright:
Description:
Biography of Willian Shockley

Entered By: David Laws
November 19, 2007
Related Events

Shockley Semiconductor opens in Mountain View

Title: Zelencik receives sales Award
Author: David Laws
Created: March 6, 2007
Publisher:
Donated By:
Filename: doc-45ee42f612d03.pdf (Size: 261 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
Page 3 from Leadwire December 1966 celebrates Steve Zelencik's booking the "the largest single IC order ever given in the semiconductor industry." The article includes a photograph of Regional Sales Manager Ed Turney presenting the Salesman of the Month plaque to Steve.

Entered By: David Laws
March 6, 2007
Related Events

Largest ever order for ICs

Title: Wagon Wheels donated
Author: David Laws
Created: April 18, 2007
Publisher:
Donated By: SEMI
Filename: doc-46859cbf2178d.jpg (Size: 144 KB)
Pages:
Cataloguer:
Copyright:
Description:
On April 18, 2007 photo Stan Myers, president and CEO of SEMI, presented two wheels rescued from the demolition of Walker’s Wagon Wheel tavern in Mountain View to Dave House, co-chair of the Semiconductor Special Interest Group of the Computer History Museum to add to the artifact collection.

Entered By: David Laws
June 29, 2007

Related Events

Walker's Wagon Wheel closes

Title: Golfing In Marin County. 1965
Author: Floyd Harris
Created: September 5, 2007
Publisher:
Donated By:
Filename: doc-46dec9a51cfff.jpg (Size: 134 KB)
Pages:
Cataloguer:
Copyright:
Description:
From left to right..Floyd Harris, Lee Rogers Len Smith and Jim Bell golfing in Marin County in 1965. Jim Bell shot a 76...my score was unmentionable. (this was my first round of golf--probably should have been my last)

Entered By: Floyd Harris
September 5, 2007

Title: Sales Department at San Rafael..1965
Author: Floyd Harris
Created: September 5, 2007
Publisher: Floyd Harris
Donated By:
Filename: doc-46dec81cb6b4b.jpg (Size: 109 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
Most of the sales department at San Rafael sometime in 1965. (minus the photographer..Floyd Harris) If someone remembers the missing persons' names or I have misspelled any of them please let me know so I can update this photo or enter the correct ones. From left to right...?, Bobbi Fox, Brenda Musgrave, Ward Gebhardt, Bill Walton, ?, Raghnild Trier, and Lee Rogers.

Entered By: Floyd Harris
September 5, 2007

Title: Last photo of Bob Noyce
Author: Gene Meieran
Created: September 22, 2007
Publisher:
Donated By: Gene Meieran
Filename: doc-46f70fe48dac1.jpg (Size: 291 KB)
Pages:
Cataloguer:
Copyright:
Description:
One of the last photos of Bob Noyce taken in May 1990 a couple of weeks before he died is posted above. The event was held at the Smithsonian opening of the information age exhibit featuring Ted Hoff of Intel and Bob for their inventions
Left to right the Ted Hoff, Judy Hoff, Bob Noyce, Rosalind Meieran, and Gene Meieran

---
Entered By: David Laws
September 23, 2007
Related Events

Noyce conceives a method of manufacturing integrated circuits
Noyce elected VP of FC&I
Noyce named to Board of Directors

Title: Fairchild at 50 - Silicon Valley's Seminal Start-Up
Author: Mark Boslet
Created: September 30, 2007
Publisher: San Jose Mercury News
Donated By: David Laws
Filename: doc-472a1fe7e9659.pdf (Size: 1.37 MB)
Pages: 2
Cataloguer:
Copyright:
Description:
This feature article from page 1 of the Sunday edition of the San Jose Mercury News described how "the chipmaker sdpawned an industry - and a culture." It includes the iconic image of the Fairchild founders seated under the Flying F logo taken by Wayne Miller in 1960 and a diagram showing some of the company spin-outs including AMD, Intel, LSI Logic, and National Semiconductor.

Entered By: David Laws
November 1, 2007
Related Events

Fairchild@50 - Fiftieth Anniversary Events

Title: Tracing Silicon Valley’s Roots
Author: Leslie Berlin
Created: September 30, 2007
Publisher: San Francisco Chronicle
Donated By:
Filename: doc-471105d1d0bf0.pdf (Size: 398 KB)
Pages: 6
Cataloguer:
Copyright:
Description:
This article was written by Leslie Berlin to coincide with the fiftieth anniversary of the founding of Fairchild Semiconductor Corporation and events held at Stanford University and the Computer History Museum in Mountain View from October 4 - 6, 2007.
Leslie Berlin is the project historian for the Silicon Valley Archives at Stanford University, where she also teaches. She is the author of “The Man Behind the Microchip: Robert Noyce and the Invention of Silicon Valley.”

Entered By: David Laws
October 13, 2007
Related Events

Fairchild@50 - Fiftieth Anniversary Events

Title: Fairchild@50 - "A Love Affair"
Author:
Created: October 2007
Publisher: Fairchild Alumni Volunteers
Donated By:
Filename: doc-47110afe2e19a.pdf (Size: 412 KB)
Pages:
Cataloguer:
Copyright:
Description:
The attached flyer was generated by the Fairchild Alumni Volunteer organizing committee to promote events at the Computer History Museum. It features the heart design created by graphic artist Larry Bender in the early 1970s and updated by him for this event.

Entered By: David Laws
October 13, 2007

Title: Fairchild@50 - Event Brochure
Author: Kat Thomas
Created: October 2007
Publisher: Fairchild Alumni Volunteers
Donated By:
Filename: doc-47110fae190d4.pdf (Size: 629 KB)
Pages:
Cataloguer:
Copyright:
Description:
The attached brochure was printed to hand out to attendees of the Fairchild@50 celebration events at the Computer History Museum on October 5 and 6, 2007. It includes a complete listing of panel participants, event sponsors, and other contributors.

Entered By: David Laws
October 13, 2007

Title: Founder's banner for Fairchild@50
Author: Kat
Created: October 2007
Publisher: Fairchild Alumni Volunteers
Donated By:
Filename: doc-47110935a6977.pdf (Size: 5.95 MB)
Pages:
Cataloguer:
Copyright:
Description:
This 10 foot by 4 foot banner of the founders hung in the Computer History Museum during the 50th anniversary celebrations
---
Entered By: David Laws
October 13, 2007
Related Events

Fairchild@50 - Fiftieth Anniversary Events

Title: The Father of Analog Integrated Circuits
Author: Thomas H. Lee
Created: October 2007
Publisher: IEEE
Donated By:
Filename: doc-474105e60c87c.pdf (Size: 165 KB)
Pages: 5
Cataloguer:
Copyright:
Description:
This article on "The Father of Analog Integrated Circuits: Robert J. Widlar" is taken from: "Tales of the Continuum: A Subsampled History of Analog Circuits," by Thomas H. Lee, Center for Integrated Systems, Stanford University published in the IEEE Solid-State Circuits Society Newsletter (October 2007)

Entered By: David Laws
November 18, 2007

Title: “Easy to use” wins: The µA741
Author: Thomas H. Lee
Created: October 2007
Publisher: IEEE Solid-State Circuits Society Newsletter
Donated By:
Filename: doc-47410880edc4e.pdf (Size: 114 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
This article on Dave Fullagar's 741 answer to Bob Widlar's LM101 is taken from: "Tales of the Continuum: A Subsampled History of Analog Circuits," by Thomas H. Lee, Center for Integrated Systems, Stanford University published in the IEEE Solid-State Circuits Society Newsletter (October 2007)

Entered By: David Laws
November 18, 2007
Related Events

µ741 Op-amp Introduced

Title: The Legacy of Fairchild in the Computer History Museum's Visible Storage Exhibit
Author: David Laws
Created: October 3, 2007
Publisher:
Donated By: David Laws
Filename: doc-472a31a31c5fb.pdf (Size: 64 KB)
Pages: 6
Cataloguer:
Copyright:
Description:
This guide describes eight exhibits in the Visible Storage gallery at the Computer History Museum that derive from processes, products, or people associated with Fairchild Semiconductor. The temporary exhibit was developed for attendees of the Fairchild@50 celebration events held at the museum on October 5 and 6, 2007.

Entered By: David Laws
November 1, 2007
Related Events

Fairchild@50 - Fiftieth Anniversary Events

Title: Even an Intel Founder Can Still Be Impressed By Technology's Pace
Author: Lee Gomes
Created: October 10, 2007
Publisher: Wall Street Journal
Donated By:
Filename: doc-472be6303c0b7.pdf (Size: 111 KB)
Pages: 2
Cataloguer:
Copyright:
Description:
Interview with Gordon Moore at the Fairchild@50 event

Entered By: David Laws
November 2, 2007

Title: Silicon Valley's founding fathers
Author: Chris Nuttall
Created: October 31, 2007
Publisher: Financial Times
Donated By:
Filename: doc-472a95fb630de.pdf (Size: 149 KB)
Pages: 2
Cataloguer:
Copyright:
Description:
The article above was written by the San Francisco correspondent for the Business Section of the London Financial Times who attended the Fairchild@50 celebration events on October 4 and 5, 2007.

Entered By: David Laws
November 1, 2007

Title: Dave Fullagar, Analog-IC Designer and Entrepreneur
Author: Paul Rako
Created: November 22, 2007
Publisher: EDN
Donated By: Dag Spicer
Filename: doc-47b901188747c.pdf (Size: 393 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
In this interview Dave Fullagar talks about developing the 741 op amp and his later career at Intersil and Maxim where he served as vice president of R&D and Applications.
The interview is continued on-line at: follows. To read more, go to www.edn.com/071122pulse1.

Entered By: David Laws
February 17, 2008
Related Events

µ741 Op-amp Introduced

Title: "An American Epic" - an interview with Gordon Moore
Author: Wyn Wachhorst
Created: March 2008
Publisher: Gentry magazine
Donated By:
Filename: doc-47df121aedde3.pdf (Size: 1.60 MB)
Pages: 8
Cataloguer:
Copyright:
Description:
The attached article "An American Epic: Gordon Moore and the Legacy of Fairchild" was based on an interview with Gordon Moore following the Fairchild@50 celebration held at the Computer History Museum in October 2007. This is the second feature published in Gentry magazine on Fairchild written by Wyn Wachhorst.

Entered By: David Laws
March 17, 2008
Related Events

Fairchild@50 - Fiftieth Anniversary Events

Title: E-Mail from Bob Norman
Author: Robert Norman
Created: June 24, 2009
Publisher:
Donated By:
Filename: doc-4b108186456c3.pdf (Size: 21 KB)
Pages:
Cataloguer:
Copyright:
Description:
Bob Norman designed the DCTL circuits for the first planar integrated circuits, Fairchild Micrologic in late 1959 and 1960. He wrote the attached e-mail that contains several references and interesting information on the project.

Entered By: David Laws
November 27, 2009

References

Title: 3810 MOS-LSI data sheet
Author:
Created:
Publisher:
Cataloguer:
Copyright:
Reference:

The 3801 monolithic MOS-LSI 10-bit was a serial to parallel – parallel to serial converter using P-channel enhancement mode technology.
See data sheet at:
http://www.electronballet.com/DataSheets/Fairchild%20Micrologic%201/MOS%203801/1.jpg
Entered By: David Laws
December 10, 2006

Title: Channel F - Interviews with Jerry Lawson
Author:
Created:
Publisher: Shallow Inn Films
Cataloguer:
Copyright:
Reference:
The following links connect to interviews with Jerry Lawson, Engineering Manager for the Fairchild Channel F video game system conducted in June and November 2006.
Jun 16, 2006 (8 min 55 sec)
http://video.google.com/videoplay?docid=-2498129174652261598&q=jerry+lawson
Nov 15, 2006 (15 min 28 sec)
http://video.google.com/videoplay?docid=4639425208915226542&q=jerry+lawson
Entered By: David Laws
November 21, 2006

Title: Noyce, Robert - biographies
Author: Various
Created:
Publisher: many
Cataloguer:
Copyright:
Reference:
Robert Noyce a founder and early General Manager of Fairchild Semiconductor and co-founder of Intel is the subject of numerous biographical studies. A number are noted below:
Books:
"The Man Behind the Microchip" by Leslie Berlin, Oxford University Press, (June, 2005). See reference on this site.
"The Chip: How Two Americans Invented the Microchip and Launched a Revolution" by T. R. Reid, Random House (October 9, 2001)
Articles:
"The Tinkerings of Robert Noyce: How the Sun Rose on the Silicon Valley" by Tom Wolfe, Esquire (December 1983). See reference on this site.
Online:
"Robert Noyce" from the PBS "Transistorized" program:
http://www.pbs.org/transistor/album1/addlbios/noyce.html
A video and downloadable photos on the Intel site:
http://www.intel.com/pressroom/archive/releases/20050616corp.htm
Entered By: David Laws
October 23, 2006

Title: Shockley, William - biographies
Author: Various
Created:
Publisher:
Cataloguer:

Copyright:
Reference:
The following references offer biographies of the brilliant and troubled William Shockley told in increasing levels of detail:
"William B. Shockley The Nobel Prize in Physics 1956: Biography"
http://nobelprize.org/nobel_prizes/physics/laureates/1956/shockley-bio.html
From Nobel Lectures, Physics 1942-1962, Elsevier Publishing Company, Amsterdam, 1964
"William Bradford Shockley"
BIOGRAPHICAL MEMOIRS National Academy of Sciences
By John L. Moll
http://www.nap.edu/readingroom/books/biomems/wshockley.pdf
"Broken Genius: The Rise and Fall of William Shockley, Creator of the Electronic Age" by Joel N. Shurkin
Macmillan Science, June 2006
Link to the publisher's page:
http://www.macmillanscience.com/1403988153.asp
Entered By: David Laws
September 24, 2006

Title: Venture Capital
Author:
Created:
Publisher:
Cataloguer:
Copyright:
Reference:
Many founders and employees of Fairchild became partners or invested in the venture capital groups that burgeoned along Sand Hill Road in Menlo Park following successful investments in semiconductor and other high-technology companies. Links to information on some of these individuals are below:
Eugene Kleiner cofounder of Kleiner Perkins:
http://www.kpcb.com/team/index.php?Eugene%20Kleiner
Don Valentine, a senior sales and marketing executive with Fairchild Semiconductor who moved to National with Charlie Sporck, founded Sequoia Capital:
http://www.sequoiacap.com/people/donald-valentine/
"Pioneers of Venuture Capital" A panel discussion answers the question "How did the venture capital industry get started in Silicon Valley?" To watch the video go to:
http://www.computerhistory.org/events/index.php?id=1090270676
Arthur Rock and Don Valentine are two venture capitalists interviewed by Rob Walker on the Silicon Genesis sessions at:
http://silicongenesis.stanford.edu/complete_listing.html
Entered By: David Laws
October 14, 2006

Title: Walker's Wagon Wheel
Author: Various
Created:
Publisher:
Cataloguer:
Copyright:
Reference:
Over its half century of serving industry workers, Walker's Wagon Wheel at 282 E. Middlefield Road, Mountain View probably earned more ink than all other industry watering holes comblned. A few samples:

In "The Tinkerings of Robert Noyce: How the Sun Rose on the Silicon Valley" [Esquire (Dec. 1983) 346-374] Tom Wolfe describes the trading of war stories at the Wagon Wheel. Christophe Lecuyer tells how the free exchange of information at the bar enhanced MOS yields across the valley. See: "Making Silicon Valley" page 275
On June 2, 2000, the San Jose Mercury News published a piece on the last rites under the headline "TECHIES' LAST CALL AUCTION CLOSES MTN. VIEW 'INCUBATOR'" that began: "Unlike the drinks that helped loosen the tongues of the men and women who gave Silicon Valley its name, the auctioning off of history Thursday left a bitter taste in the mouths of some of the Wagon Wheel's loyal patrons and its owner. Just last week, the legendary Mountain View hangout -- where some of the biggest companies in the valley were conceived -- closed for good." According to the Mountain View Voice, the Wagon Wheel buildings were finally demolished in November 2003:
http://www.mv-voice.com/morgue/2003/2003_11_14.wwheel.html
Entered By: David Laws
October 14, 2006

Title: Shockley Labs announcement article
Author: Unkown
Created: February 16, 1956
Publisher: San Jose Mercury News
Cataloguer:
Copyright:
Reference:
Mercury News, February 15, 1956
Spinco Plans Stanford Transistor Laboratory
PALO ALTO – Beckman Instruments Corp., now building a $500,000 laboratory on Stanford University land for its Spinco Division, Monday announced it will also establish its new Shockley Semiconductor Laboratory in the structure.
Dr. Arnold O. Beckman, founder-president of Beckman Instruments, said the new activity will develop an dproduce transistors and other semi-conductor devices in the field of advanced electronics for automation of machinery and whole factories.
Heading the research team which will undertake the new operation is Dr. William Shockley, inventor of the junction transistor. He and Dr. Smoot Horsley, Dr. Leo B. Valdes, Dr. William W. Happ and Dr. R.V. Jones, are now headquartered temporarily in Mountain View and will move to Stanford when the Spinco building is completed about August.
Dr. Shockley predicts the production of transistors, which have revolutionized communications and other fields using vacuum tubes, “will increase by a thousandfold within the next five to 10 years.”
Formerly director of transistor physics research for Bell Laboratories, Dr. Shockley served as director of research for the Navy’s anti-submarine warfare operations research group, was a consultant to the Secretary of War, and also has served as deputy director and research director of the Weapons System Evaluation Group for the Department of Defense.
Entered By: David Laws
September 28, 2006

Title: "Contract among the California Group, et al"
Author: n/a n/a
Created: September 23, 1957
Publisher:
Cataloguer:
Copyright:
Reference:
Contract between the California Group (the founders), Parkhurst (Hayden Stone), Fairchild Controls, and Fairchild Camera and Instrument Corporation.

Copy in the William Shockley papers, Dept. of Special Collections, Stanford University Libraries, SC222
Entered By: David Laws
September 4, 2006

Title: "New Palo Alto electronics company plans to produce transistors"
Author: n/a n/a
Created: October 17, 1957
Publisher: Palo Alto Times
Cataloguer:
Copyright:
Reference:
Article in the Palo Alto Times newspaper announces the formation of the company and the signing of a lease on a new building under construction at 844 Charleston Avenue, Palo Alto.
Entered By: David Laws
September 4, 2006

Title: "Fairchild Silicon Transistors"
Author:
Created: 1958
Publisher:
Cataloguer:
Copyright:
Reference:
This 8-page brochure is one of the first pieces of marketing literature published by the young company. It promotes the features and benefits of the new diffused mesa process for silicon transitors and includes photos of the ten senior managers, the Palo Alto headquarters, and the diffusion furnace room.
Courtesy of Art Zafiropoulo,the brochure is posted at:
https://www.chiphistory.org/equipment_landmarks/1960/fairchild_silicon_transistors_ph/fairchild.htm
Entered By: David Laws
November 29, 2006

Title: Hoerni Planar Patent
Author: Jean Hoerni
Created: 1959
Publisher: U.S. Patent Office
Cataloguer:
Copyright:
Reference:
Based on a notebook entry "read and understood" by Robert Noyce on December 1, 1957, in January 1959 Jean Hoerni wrote up a patent disclosure on a method of protecting exposed p-n junctions on the surface of silicon transistors by oxide masking techniques. It was filed as:
“Method of Manufacturing Semiconductor Devices,” U.S. Patent # 3025589, applied for on May 1, 1959, awarded March 20, 1962.
Heorni described the results in:
Hoerni J A, “Planar Silicon Diodes and. Transistors,” IRE Transactions on Electron Devices, Vol. 8, Mar. 1961, p. 178
"January 14, 1959
Entered By: David Laws
September 15, 2006

Title: "Leadwire"
Author: Various
Created: 1959 ca.
Publisher:
Cataloguer:
Copyright:
Reference:
"Leadwire" was a monthly journal "Published by and for Employees of Fairchild Semiconductor/Instrumentation" from company headquarters in Mountain View.
Profusely illustrated with photographs and drawings, Leadwire recorded product introductions, new employee bios, profiles of personalities and departments from R & D to Shipping, news of picnics, sports activities, and parties. Publication started in 1959 and continued at least until 1968. Editors included Richard Molay and Judy Horst.
Company photographer Dick Steinheiemer, who joined in September 1962, established a high standard of photographic quality for a monthly in-house publication. He left in 1970. A transcript of an interview of Dick Steinheimer, together with other important contributors Steve Allen and Lawrence Bender, by Rob Walker is available at:
http://silicongenesis.stanford.edu/transcripts/allenbendersteinheimer.htm
This is one of the many interviews with pioneers of Silicon Valley conducted by Rob Walker in the Silicon Genesis oral histories series archived at Stanford University.
Entered By: David Laws
September 25, 2006

Title: Noyce: “Semiconductor Device-and-Lead Structure”
Author: Robert Noyce
Created: July 30, 1959
Publisher: U. S. Patent Office
Cataloguer:
Copyright:
Reference:
Link to pdf of patent # 2981877 “Semiconductor Device-and-Lead Structure” published April 25, 1961
http://www.freepatentsonline.com/2981877.pdf
Entered By: David Laws
September 20, 2006

Title: Norman: "Solid-state micrologic elements"
Author: Robert Norman
Created: February 1960
Publisher: IEEE
Cataloguer:
Copyright:
Reference:
"Solid-state micrologic elements"
Norman, R. Last, J. Haas, I.
Fairchild Semiconductor Corporation, Palo Alto, CA, USA;
Paper read at the Solid-State Circuits Conference, Philadelphia, PA in February 1960.
The text appears in: Solid-State Circuits Conference. Digest of Technical Papers. 1960 IEEE International
Publication Date: Feb 1960
Volume: III, On page(s): 82- 83
Paper in PDF form is available at:

http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?isnumber=25936&arnumber=1157264&count=62&index=28
Entered By: David Laws
September 25, 2006

Title: Annual Report 1959
Author:
Created: March 1960
Publisher:
Cataloguer:
Copyright:
Reference:
The Fairchild Camera and Instrument Annual Report for year ending December 31, 1959 pubished in 1960. A photograph of the "Hexistor" is printed on page 7.
Entered By: David Laws
September 22, 2006

Title: FC&I Annual Report 1958
Author: n/a n/a
Created: March 1960
Publisher:
Cataloguer:
Copyright:
Reference:
Fairchild Camera and Instrument Corporation Annual Report for the year ending December 1959 includes mention of the acquisition of Semiconductor. It also notes that personnel at Semiconductor had increased to 12,600 employees occupying plant space of 100,000 square feet with the August opening of the Mountain View facility.
Entered By: David Laws
September 23, 2006

Title: "Micrologic elements being developed"
Author: EDN Staff
Created: October 1, 1960
Publisher: EDN Magazine
Cataloguer:
Copyright:
Reference:
EDN magazine posted this pre-introductory article on Fairchild Micrologic, originally published in 1960, on its website in 2006 as part of its 50th Anniversary celebration "Milestones that Mattered."
MOUNTAIN VIEW, CALIF.—High-speed, low power digital computer logic building blocks are under development at Fairchild Semiconductor Corp. To be available early next year, the family of solid-state micrologic elements will handle all the logic function requirements of a digital machine, no other components being required.
For the full text of the article visit the site below:
http://www.edn.com/article/CA6325587.html?industryid=45989
Entered By: David Laws
October 10, 2006

Title: Epitaxial technology
Author: Various

Created: 1961 ca.
Publisher: Fairchild Business Publications
Cataloguer:
Copyright:
Reference:
Fairchild's first epitaxial devices were introduced at the March 1961 IRE Show in New York. They were described in an article in Electronic News, February 13, 1961. "Fairchild Sampling Industry with Si Epitaxial Transistor." [Note: Fairchild Business Publications, publisher of Electronic News, was unrelated to FC&I]
Epitaxial technology, first proposed by James Early of Bell Labs (and Vice President of Fairchild R&D in the 1970's) in 1954, was developed into a practical process by Ian Ross and Henry Theuerer at Murray Hill in 1960. [Bassett, Ross Knox "To The Digital Age" pg 26]
In his article "The Role of Fairchild in Silicon Technology in the Early Days of 'Silicon Valley,'" Gordon Moore notes that early on Fairchild "had the idea of the epitaxial transistor" but was not in a position to pursue it.[Proceedings of the IEEE, 86 (1998): 53-62]
During this same period Wilfred Corrigan Corrigan, president and chief executive officer of Fairchild Camera and Instrument Corporation from 1974 to 1979, developed and brought into production Motorola's epitaxial deposition technology, and introduced gas-doping techniques to control the resistivity of deposited silicon and germanium epitaxial layers.
Entered By: David Laws
October 13, 2006

Title: Wanlass: "Nanowatt logic using field-effect metal-oxide semiconductor triodes"
Author: Frank Wanlass and C. T. Sah
Created: February 1963
Publisher: IEEE
Cataloguer:
Copyright:
Reference:
Frank M. Wanlass and C.T. Sah of Fairchild R&D, Palo Alto presented a paper describing the use of complementary MOS structures to achieve very low power operation compared to contemporary bipolar circuits at ISSCC in February 1963. Manufacturing difficulties delayed the widespread application of this important technology that enables today's billion transistor chips for almost two decades.
"Nanowatt logic using field-effect metal-oxide semiconductor triodes"
Wanlass, F., Sah, C.T.
Fairchild Camera-Instrument Corporation, Palo Alto, CA, USA;
This paper appears in: Solid-State Circuits Conference. Digest of Technical Papers.
IEEE International, Publication Date: Feb 1963
Volume: VI on page(s): 32-33
http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?isnumber=25939&arnumber=1157450&count=72&index=17
Entered By: David Laws
October 16, 2006

Title: Fairchild Micrologic in the Apollo Guidance Computer
Author: Eldon Hall, et al.
Created: 1965 ca.
Publisher: Various
Cataloguer:
Copyright:
Reference:

The decision by MIT's Instrumentation Laboratory in 1962, to design the Apollo Guidance Computer using integrated circuit logic devices was critical to the AGC success and a key moment in the history of computing.
Eldon Hall's book "Journey to the Moon" recounts this decision process:
"Journey to the Moon:The History of the Apollo Guidance Computer" (1996)
AIAA (American Institute of Aeronautics & Ast) ISBN:156347185X
http://www.amazon.com/gp/reader/156347185X/ref=sib_dp_pt/102-5159419-4410516#reader-link
The following websites provide detailed information of specific aspects of the program related to the use of Fairchild Micrologic devices.
Integrated Circuits in the Apollo Guidance Computer
http://www.klabs.org/history/history_docs/integrated_circuits/ic4-po.pdf
This pdf includes copies of the first orders placed by MIT /IL on February 16, 1962 with Fairchild for 100 Micrologic elements type “G” at $43.50 each for the Apollo Guidance Computer. It was addressed to Mr. Bruce Cirum at the Fairchild sales office at 36 North Road, Bedford, Mass. Delivery was just a few days.
Apollo Guidance Computer Logic Study
http://www.klabs.org/richcontent/Misc_Content/AGC_And_History/PartsAnalysis/PartsAnalysis.htm
This website shows documents describing the quality and long term reliability of logic used for the Apollo Guidance Computer (AGC), which was designed by MIT's Instrumentation Laboratory. Two versions of this were computer built. Block I and Block II. Block I units used, as a logic element, a single 3-input NOR function, with VCC = 3V, packaged in a TO-47 can. Block II microcircuits, packaged in flat packs were dual 3-input NOR functions, with VCC = 4V.
A Case History of the ACG Logic Integrated Circuits
http://www.klabs.org/history/history_docs/mit_docs/1716.pdf
This pdf is a case history of the integrated circuit used for the logic in the Apollo Guidance Circuit written by Eldon Hall in December 1965. Achieving the required goals of low weight, volume, and power coupled with extreme high reliability necessitated the use of one single, simple integrated circuit for all logic functions. A brief description of the evolution of the computer design is given along with a general discussion of some of the engineering and design problems which arise with the use of a standardized semiconductor monolithic integrated circuit.
Note: The f i r s t prototype computer was operating in July 1963 with the Raytheon built flight computer operating in January 1964.
The page notes that MIT/IL had placed an order with Texas Instruments for 64 ICs at $1000 each in 1959. They were the Kilby mesa process Solid Logic devices. That TI order was not delivered until late 1962. The document also shows copies of purchase orders placed with TI, Westinghouse, Transitron and Motorola for alternate source devices.
One Giant Leap: The Apollo Guidance Computer
http://www.ddj.com/184404139
This article by Dag Spicer published in Dr Dobbs Journal, August 12, 2001, describes the Apollo Guidance Computer (AGC) designed by MIT/IL and built by Raytheon that used approximately 4000 discrete integrated circuits from Fairchild Semiconductor.
Photograph of Micrologic “G” element (µL 903 Single 3-input NOR gate) in 6-pin low-profile TO-5 (TO-47) can used in the Apollo AGC Block 1 systems see:
http://homepages.nildram.co.uk/~wylie/ICs/monolith.htm
Photograph of Micrologic flat packs (µL 915 Dual 3-input NOR gate) used in in the Apollo AGC Block 2 systems see: http://hrst.mit.edu/hrs/apollo/public/visual3.htm
Entered By: David Laws
October 15, 2006

Title: RCA Spectra 70 brochure highlights CML ICs
Author:
Created: 1965 ca.
Publisher: RCA

Cataloguer:
Copyright:
Reference:
Page 3 of this brochure claims that the RCA Spectra 70 computers are the “first full-scale systems with monolithic integrated circuitry.. .true third generation technology.”
http://archive.computerhistory.org/resources/text/RCA/RCA.SPECTRA70.1965.102646099.pdf
Under the heading “Monolithic integrated electronics /CIRCUITS ON A SPECK” page 8 shows a mask layer of one of the integrated circuits and describes the technology as follows:
The highest evolution of solid-state technology today is attained by monolithic integrated electronic circuits used in the senior Spectra 70 computers, through size compression of functional elements. They make possible reduced cost and faster, more reliable performance. Just as RCA pioneered the first commercial fully transistorized EDP system with the 501, it is again ushering in a new generation of full-scale computers with the extensive monolithic integrated electronics in Spectra 70.
Integrated electronics are literally circuits on a speck. One of the integrated elements used incorporates 15 silicon transistors, 13 resistors and interconnecting "wiring" on about a 1/20 x 1/20 inch -chip for two complete logic circuits. In contrast, hybrid multiple chip circuits incorporate several active and passive components inter- connected and mounted in a single housing.
Entered By: David Laws
December 10, 2006

Title: An Examination of the Applicability of Microelectronic Circuits to the Telemetry and Command Subsystems of Several Applications Spacecraft
Author: Athur D. Little Inc. Contractor to NASA
Created: May 1965
Publisher: NASA
Cataloguer:
Copyright:
Reference:
The following report prepared under contract to NASA includes text and tables comparing Fairchild, TI and other low-power IC vendor's products for space applications. It is 146 pages long. Portions relating to IC families are included on pages 73 - 81. The Fairchild Milliwatt Micrologic Family was developed under contract to NASA.
"An Examination of the Applicability of Microelectronic Circuits to the Telemetry and Command Subsystems of Several Applications Spacecraft"
Prepared by ARTHUR D. LITTLE, INC. Cambridge, Mass. For the NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C. May 1965
http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19650014213_1965014213.pdf
From page 73:
"The characteristics of a variety of silicon integrated circuits have been derived from the manufacturers' specifications, and only those deemed most suitable for medium-speed low power operation have been investigated in more detail. Attention has been focused in particular on the generic types represented by the Texas Instrument Series5 1 and the Fairchild Milliwatt Micrologic, since most of the satellite applications studied here do not require any great speed but do require as low power consumption as possible. The two manufacturers, Texas Instruments and Fairchild, have the lowest power devices available on a standard off-the-shelf basis, although others, CBS for example, have designed lower power types of specialized design. The types of logic circuits readily available in low power forma re either resistor coupled transistor logic or diode transistor logic. Of the first four manufacturers, listed T.I., Fairchild and Motorola use the resistor coupled transistor logic and Westinghouse uses diode transistor logic."
Entered By: David Laws
October 27, 2006

Title: 9300 data sheet and CCSL strategy

Author:
Created: September 1967
Publisher:
Cataloguer:
Copyright:
Reference:
Fairchild responded to Texas Instruments dominance of the standard logic market with the SN7400 Series TTL Family with two approaches.
The technical strategy was to create Medium Scale Integration (MSI) TTL devices that offered more functionality and higher complexity (20 to 100 gates). Products such as the 9300 Universal 4-bit Shift Register and the 9310/9316 counters were extremely successful.
9300 Preliminary Data Sheet:
http://www.electronballet.com/DataSheets/Fairchild%20Micrologic%201/CCSL%209300/1.jpg
Note the $36 price handwritten at the top.
The marketing strategy was to create a new logic class of Compatible Current Sinking Logic (CCSL) products that was specified to allow the designer to mix and match Fairchild's DTL and TTL-MSI devices. This was ignored by most engineers and one-upped by TI when they copied the cream of the Fairchild devices as 7400 part numbers. The 9300 was sold by TI as the 74195.
Entered By: David Laws
December 10, 2006

Title: 1969 Data Catalog - Digital ICs
Author:
Created: 1969
Publisher:
Cataloguer:
Copyright:
Reference:
A PDF version of the Bipolar Digital IC pages (DTL/TTL aka CCSL, Special ICs, and Hybrid sections) of the 1969 Data Book is posted at:
http://www.bitsavers.org/pdf/fairchild/_dataBooks/1969_Fairchild_ch1-5.pdf
Entered By: David Laws
December 18, 2006

Title: Thorton: "Design of a Computer"
Author: J. E. Thornton
Created: 1970
Publisher: Scott, Foresman and Company, Glenview, IL
Cataloguer:
Copyright:
Reference:
"Design of a Computer: The Control Data 6600" by J. E. Thornton, who, according to the Forward by Seymour Cray, was "personally responsible for the most of the detailed design of the Control Data model 6600 system" describes the logic design and architecture of the machine. Section IIIA on page 19 covers the important role of the silicon transistor (but without mentioning Fairchild). Cray's approval of the 2N709 was the beginning of a long relationship between Fairchild and the computer industry icon. In the mid-1970's he specified the 100K Series of ECL logic and bipolar memory products for use in the Cray 1 machine.
The museum has an original copy of the book in the archives.
A pdf copy scanned (with permission) by Tom Uban (7.9 megabytes) is posted at:
http://www.bitsavers.org/pdf/cdc/6x00/books/DesignOfAComputer_CDC6600.pdf
A local copy by museum volunteer Ed Thelen is posted at:
http://ed-thelen.org/comp-hist/DesignOfAComputer_CDC6600.pdf
Entered By: David Laws

October 7, 2006

Title: 1972 TTL Data Dook
Author: David Laws
Created: 1972
Publisher:
Cataloguer:
Copyright:
Reference:
One of my last tasks before leaving Fairchild in 1972 was editing the "TTL Data Book." With over 250 logic, memory, and interface function data sheets to harass engineering to review and correct this was a memorable experience. I threw out my copy of this masterwork sometime ago, but thankfully someone has taken the time to scan the document for posterity and post it on the bitsavers.org website at: http://www.bitsavers.org/pdf/fairchild/_dataBooks/1972_Fairchild_TTL/
This link will take you an index page listing of 12 pdf files (one single file would be very large) under the heading:
Index of /pdf/fairchild/_dataBooks/1972_Fairchild_TTL
Happy reading!
Entered By: David Laws
December 18, 2006

Title: "'Traitorous Eight' Leave Shockley Labs"
Author: Jerry Eimbinder, et al.
Created: 1975 ca.
Publisher: Circuit Design News. Newsprint Inc.
Cataloguer:
Copyright:
Reference:
Chapter IV in a series of articles entitled "History of the Semiconductor Industry" published in industry newspaper Circuit Design News, circa 1975. Describes the founding and early technology development at Fairchild Semiconductor.
Entered By: David Laws
September 4, 2006

Title: Don Hoefler's "Microelectronics News"
Author: Don Hoefler
Created: 1975 ca.
Publisher: Don C. Hoefler
Cataloguer:
Copyright:
Reference:
Don C. Hoefler, the journalist who named Silicon Valley in 1971, published a weekly muckracking newsletter exposing the dark side of industry and its power brokers for more than 10 years starting in the mid-1970s. Many of his best stories derived from his "office" at the bar of Walker's Wagon Wheel, 282 E. Middlefield Road, Mountain View before its demolition in 2003.
Although Fairchild Semiconductor and its executives were favorite targets of his barbs, he was extremely gracious in describing the departure of Dr. Harry Sello in the May 2, 1981 issue headlined "Harry Sello calls it a day at Fairchild."
Robert J. Schreiner, a manager at Fairchild for many years and later president of Synertek, donated copies from 1975 through 1986 to the Smithsonian Institution. They can be viewed at:http://smithsonianchips.si.edu/
Scroll down and click on "Schreiner" then click on the year of interest.
Entered By: David Laws

October 4, 2006

Title: F8 Preliminary Microprocessor Users Manual
Author:
Created: January 1975
Publisher:
Cataloguer:
Copyright:
Reference:
The complete Preliminary F8 Microprocessor Users Manual published in January 1975 is posted in pdf form on the bitsavers.org website at:
http://www.bitsavers.org/pdf/fairchild/F8_prelimUM_Jan75.pdf
Entered By: David Laws
December 19, 2006

Title: 1976 Macrologic Bipolar Microprocessor Data Book
Author:
Created: 1976
Publisher:
Cataloguer:
Copyright:
Reference:
A pdf version of the 1976 Fairchild 1976 Macrologic Bipolar Microprocessor Data Book is posted at:
http://www.bitsavers.org/pdf/fairchild/_dataBooks/1976_Fairchild_Macrologic.pdf
Entered By: David Laws
December 18, 2006

Title: The Fairchild Video Entertainment System
Author:
Created: 1976
Publisher:
Cataloguer:
Copyright:
Reference:
"The Fairchild Video Entertainment System: The Best of the Video Games, Explained" [1976]
http://archive.computerhistory.org/resources/text/Fairchild/Fairchild.VideoEntertainmentSystem.1976.102646127.pdf
This booklet published in 1976 and posted at the URL above was shipped with early versions of the Fairchild Video Entertainment System.
Entered By: David Laws
January 8, 2007

Title: "A Solid State of Progress"
Author:
Created: 1979
Publisher: Fairchild Camera & Instrument Corporation
Cataloguer:
Copyright:
Reference:
A SOLID STATE OF PROGRESS

“It is a classic truth in biological science that the development of a single human being usually retraces the development of an entire race.
Much of the same is true of the evolution of silicon technology at Fairchild Camera and Instrument Corporation, as it relates to the semiconductor industry. The history one of one is the history of the other.
From the first planar transistor in 1959 to present day Isoplanar and other highly advanced integrated circuits, Fairchild has been at the forefront of solid-state electronics.
This portfolio includes some of Fairchild’s most important technical milestones in this era – color photographs which portray an industry, and a company, in the making.”
This is the introduction to a portfolio of semiconductor device microphotographs published by Fairchild in 1979. It is an updated version of an earlier edition issued circa 1972. The 144 pages cover the first Planar transistor from 1959 to a 16K I3L DRAM from 1979.
This large pdf file is located at:
http://www.bitsavers.org/pdf/fairchild/A_Solid_State_Of_Progress_1973_1979.pdf
Entered By: David Laws
December 19, 2006

Title: "State of the Art"
Author: Stan Augarten
Created: 1983
Publisher: Ticknor & Fields, New Haven and New York
Cataloguer:
Copyright:
Reference:
STATE OF THE ART by Stan Augarten
Ticknor & Fields, New Haven and New York, 1983
ISBN 0-89919-195-9
This book of high quality photographs of early semiconductor devices is posted on the Smithsonian Institution "The Chip Collection" web site under the following abstract. ”One of many pictorial histories relating to the evolution and development of the integrated circuit – most notably the microprocessor. Includes literal transcriptions, actual pages and referenced images.”
For the index page click below:
http://smithsonianchips.si.edu/augarten/index.htm
The following links connect to pages describing specific Fairchild devices. Click on the thumbnail image on each page to see the full device photograph.
The Planar Process: The Most Efficient Way to Make Transistors [1959]
http://smithsonianchips.si.edu/augarten/p8.htm
The First Planar IC: Putting the Planar Process to Good Use [1961]
http://smithsonianchips.si.edu/augarten/p10.htm
µL907: Resistor - Transistor Logic [1963]
http://smithsonianchips.si.edu/augarten/p14.htm
µA702: The First Linear IC [1964]
http://smithsonianchips.si.edu/augarten/p16.htm
µA709: A Semiconductor Best-Seller [1965]
http://smithsonianchips.si.edu/augarten/p18.htm
Micromosaic: The First IC Made with Computer-Aided Design [1967]
http://smithsonianchips.si.edu/augarten/p22.htm
4100: The First 256-Bit Static RAM [1970]
http://smithsonianchips.si.edu/augarten/p24.htm
Entered By: David Laws
October 11, 2006

Title: Wolfe: "The Tinkerings of Robert Noyce - How the Sun Rose on the Silicon Valley"
Author: Tom Wolfe

Created: December 1983
Publisher: Esquire Magazine
Cataloguer:
Copyright:
Reference:
This is a link to the article Tom Wolfe wrote in the December 1983 Esquire about Robert Noyce, Shockley Labs, Fairchild, the semiconductor industry and the early history of Silicon Valley before it was called Silicon Valley.
http://www.stanford.edu/class/e140/e140a/content/noyce.html
Entered By: Mike Humphries
October 14, 2006

Title: Malone: "The Big Score"
Author: Michael Malone
Created: August 1985
Publisher: Doubleday and Company, Inc.
Cataloguer:
Copyright:
Reference:
With his background at Hewlett-Packard and as a journalist with the San Jose Mercury News, Michael Malone brings firsthand experience and knowledge to this account of the birth and evolution of Silicon Valley from the early radio pioneers to the semiconductor and personal computer moguls. He covers the rise and fall of Fairchild Semiconductor and describes the founding years of several spin-outs including AMD, Intel, National, and Signetics.
Profiles of major semiconductor figures are published on the following pages:
Bob Noyce - 73
Lester Hogan - 115
Jerry Sanders - 165
Charles Sporck - 221
Published by Doubleday (ISBN: 0385183518)in 1985, this 442-page volume is usually available from used book retailers on the Internet.
Entered By: David Laws
October 7, 2006

Title: INTERGRAPH INTERESTED
Author:
Created: June 5, 1987
Publisher: Computer Business Review
Cataloguer:
Copyright:
Reference:
INTERGRAPH INTERESTED IN JOINING CONSORTIUM TO BUY FAIRCHILD SEMICONDUCTOR
Computer Business Review reported that Intergraph Inc of Huntsville, Alabama, confirmed that it has expressed an interest in joining the management consortium being put together to buy Fairchild Semiconductor from Schlumberger Ltd
From Issue Number: 696
Entered By: David Laws
June 13, 2007

Title: Citicorp Unit Said To Seek Fairchild
Author:
Created: August 20, 1987

Publisher: AP/ New York Times
Cataloguer:
Copyright:
Reference:
Citicorp Venture Capital has reportedly joined in the bidding for the Fairchild Semiconductor Corporation, which is being sold by its parent, Schlumberger Ltd. The San Jose Mercury News said today that Citicorp had been working with Fairchild's president, Donald Brooks, to finance a leveraged buyout.
Citicorp Venture Capital has reportedly joined in the bidding for the Fairchild Semiconductor Corporation, which is being sold by its parent, Schlumberger Ltd. The San Jose Mercury News said today that Citicorp had been working with Fairchild's president, Donald Brooks, to finance a leveraged buyout. Schlumberger has been considering several buyout offers for Fairchild since March, when it bowed to Government pressure and withdrew a proposal to sell 80 percent of Fairchild to Fujitsu Ltd. of Japan.
The Mercury News, quoting unidentified sources, said that under the offer most of the money would come from Citicorp and the current management team and most of the company would remain intact. A Fairchild spokeswoman would not comment.
From:
http://query.nytimes.com/gst/fullpage.html?res=9B0DE1DF143DF933A1575BC0A961948260
Entered By: David Laws
June 13, 2007

Title: Fairchild Semiconductor: The Lily of the Valley 1957 – 1987
Author:
Created: September 28, 1987
Publisher:
Cataloguer:
Copyright:
Reference:
"As attorneys for National Semiconductor purchase and Schlumberger await pro-forma regulatory approval, transition teams are combing the corridors of Fairchild Semiconductor identifying for one last time the remaining enclaves of talent and technology which in former years poured into the Santa Clara Valley in a seemingly endless flood to create an industry that has given the economy a new leading indicator."
This is the opening paragraph in a several page obituary of Fairchild.
From: Electronic News, Monday September 28, 1987, page 1.
Entered By: David Laws
February 22, 2007

Title: National takes Fairchild reigns today
Author:
Created: October 1, 1987
Publisher: Electonic New
Cataloguer:
Copyright:
Reference:
National Semiconductor received federal approval to complete its purchase of the company
National Semiconductor received federal approval to complete its purchase of Fairchild from Schlumberger Ltd. last week and takes operating control of the company today.
National, which signed a definitive agreement to buy Fairchild for $122M in stock and warrants on August 31 took fiscal responsibility for the company on October 1.
From: Electronic News, Monday October 5, 1978, page 33.
Entered By: David Laws
February 22, 2007

Title: Donal Brooks resigns
Author:
Created: October 7, 1987
Publisher: New York Times
Cataloguer:
Copyright:
Reference:
Donald W. Brooks, who led an unsuccessful attempt to take over the Fairchild Semiconductor Corporation, has resigned as the company's president and chief executive. The acquisition of Fairchild, a unit of Schlumberger Ltd., by the National Semiconductor Corporation is expected to be completed later this week.
The departure of Mr. Brooks, who is 47 years old, was expected by analysts, who said he was unlikely to remain while National reduced Fairchild's staff and sold off the parts of the company it did not want.
While Mr. Brooks's efforts to reorient management and the product mix have improved Fairchild's results, the company has continued to lose money, and a year ago Schlumberger decided to sell it.
From:
http://query.nytimes.com/gst/fullpage.html?res=9B0DE6DA1030F934A35753C1A961948260
Entered By: David Laws
June 13, 2007

Title: Sah: "Evolution of the MOS transistor-from conception to VLSI"
Author: Chih-Tang Sah
Created: October 1988
Publisher: IEEE
Cataloguer:
Copyright:
Reference:
"Evolution of the MOS transistor-from conception to VLSI"
http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?tp+&arnumber=16328
Sah Chih-Tang
Dept. of Electr. & Comput. Eng., Illinois Univ., Urbana, IL;
This paper appears in: Proceedings of the IEEE
Publication Date: Oct 1988
Volume: 76, Issue: 10, pages: 1280-1326
ISSN: 0018-9219
C T Sah worked at Shockley Labs and in the R&D Laboratory of Fairchild Semiconductor where he made important early contributions to the development of bipolar and MOS technology.
Abstract
Historical developments of the metal-oxide-semiconductor field-effect transistor (MOSFET) during the last 60 years are reviewed, from the 1928 patent disclosures of the field-effect conductivity modulation concept and the semiconductor triode structures proposed by Lilienfeld to the 1947 Shockley-originated efforts which led to the laboratory demonstration of the modern silicon. MOSFET in 1960. A survey is then made of the milestones of the past 30 years leading to the latest submicron silicon logic CMOS (complementary MOS) and BICMOS (bipolar-junction transistor CMOS combined) arrays and the three-dimensional and ferroelectric extensions of Dennard's one-transistor dynamic random access memory (DRAM) cell. The status of the submicron lithographic technologies is summarized. Future trends of memory cell density and logic gate speed are projected. Comparisons of the switching speed of the silicon MOSFET with that of silicon bipolar and GaAs field-effect transistors are reviewed. The use of high-temperature superconducting wires and GaAs-on-Si monolithic semiconductor optical clocks to break the interconnect-wiring delay barrier is discussed

Entered By: David Laws
October 13, 2006

Title: Moore, Gordon - Interview
Author: Rob Walker
Created: March 3, 1995 ca.
Publisher: Stanford University - Silicon Genesis project
Cataloguer:
Copyright:
Reference:
"Gordon Moore joined Shockley Semiconductor Laboratory shortly after its founding in 1956 and worked on semiconductor process technology with William Shockley, co-inventor of the transistor. Moore was on the original team at Fairchild Semiconductor in 1957 and co-founded Intel in 1968, where he developed large-scale integrated products beginning with semiconductor memories. His recognition of the trend that integrated circuit complexity doubles every 18 to 24 months, known today as Moore's Law, has become one of the driving principles of the semiconductor industry." [Abstract from the Silicon Genesis web site]
A transcript of the interview is posted at:
http://www-sul.stanford.edu/depts/hasrg/histsci/silicongenesis/moore-ntb.html
A video version of the interview in RealMedia format is avilable at:
http://silicongenesis.stanford.edu/complete_listing.html
In this interview, also excerpted in "Fairchild Chronicles," Dr. Moore notes that the device developed for IBM in 1959 was not only the first double-diffused silicon transistor but also the first commercial device to use photolithography and the first to be batch produced on a wafer.
This is one of the many interviews with pioneers of Silicon Valley conducted by Rob Walker in the Silicon Genesis oral histories series archived at Stanford University.
Entered By: David Laws
October 7, 2006

Title: Allen, Bender, & Steinheimer - Interview
Author: Rob Walker
Created: March 25, 1995
Publisher: Silicon Genesis
Cataloguer:
Copyright:
Reference:
Steve Allen , Lawrence Bender, and Richard Steinheimer directed Fairchild's pioneering work in chip photography and art. They made many contributions to Leadwire and other publications and have donated 35mm slides of their photographs to the Stanford Libraries' Silicon Valley Archives.
A transcript of this interview is available at:
http://silicongenesis.stanford.edu/transcripts/allenbendersteinheimer.htm
This is one of the many interviews with pioneers of Silicon Valley conducted by Rob Walker in the Silicon Genesis oral histories series archived at Stanford University.
Entered By: David Laws
September 25, 2006

Title: Hodgson, Richard - Interview
Author: Rob Walker
Created: September 19, 1995
Publisher: Silicon Genesis
Cataloguer:
Copyright:
Reference:

"The late Richard Hodgson of Fairchild Camera and Instrument describes his role in the founding of Fairchild Semiconductor. Mr. Hodgson was the Fairchild executive who negotiated the agreement with the founders." [Abstract from the Silicon Genesis web site]
A video version of the interview in RealMedia format is avilable at:
http://silicongenesis.stanford.edu/complete_listing.html
A transcript of interview is available at:
http://silicongenesis.stanford.edu/transcripts/hodgson.htm
This is one of the many interviews with pioneers of Silicon Valley conducted by Rob Walker in the Silicon Genesis oral histories series archived at Stanford University.
Entered By: David Laws
September 1, 2006

Title: Riordan: "Crystal Fire"
Author: Michael Riordan and Lillian Hoddeson
Created: 1997
Publisher: W. W. Norton & Company
Cataloguer:
Copyright:
Reference:
"Crystal Fire: The Invention of the Transistor and the Birth of the Information Age," title in the Sloan Technology Series, is a very readable but thoroughly researched account of the development of the transistor. It focuses on the the lives and work of the three principal discoverers, John Bardeen, Walter Brattain, and William Shockley.
The final chapters (11 - California Dreaming and 12 - The Monolithic Idea) cover the spin out of Fairchild Semiconductor from Shockley's company, and the development of the Planar process and Micrologic. It includes a 10-page Biblography and 30-pages of Notes identifying sources of information quoted in the text.
References related to the Events listed on the right are found on the following pages:
Beckman funds Shockley [234]
Hoerni Planar process [262]
Noyce conceives IC [264]
Shockley awarded the Nobel Prize [243]
Shockley defectors resign [251]
Shockley dissidents plan [251]
Shockley Semiconductor opens [237]
TI announcement [264]
For information on the book and the authors visit:
http://www.wwnorton.com/catalog/fall98/crystal.htm
Entered By: David Laws
September 18, 2006

Title: Rock, Arthur - HBS Biography and Time feature
Author:
Created: December 1997 ca.
Publisher: Havard Business School and Time Inc.
Cataloguer:
Copyright:
Reference:
This short Harvard Business School online bulletin of Arthur Rock summarizes his career of successfully funding high technology companies including Fairchild Semiconductor, Intel, Teledyne, Scientific Data Systems, Apple Computer, General Transistor, and Diasonics:
http://www.alumni.hbs.edu/bulletin/1997/december/rock.html
Rock's career was featured in a Time magazine article on January 23, 1984. His portrait was featured on the cover:

http://www.time.com/time/covers/0,16641,19840123,00.html
Entered By: David Laws
October 13, 2006

Title: Moore: "The Role of Fairchild in Silicon Technology in the Early Days. of 'Silicon Valley'"
Author: Gordon Moore
Created: January 1998
Publisher: IEEE
Cataloguer:
Copyright:
Reference:
"The role of Fairchild in silicon technology in the early days of "Silicon Valley"
http://ieeexplore.ieee.org/search/freesrchabstract.jsp?arnumber=658759&isnumber=14340&punumber=5&k2dockey=658759@ieeejrns&query=%28the+role+of+fairchild%29+%3Cin%3E+metadata&pos=0
Moore, G.E.
Intel Corp., Santa Clara, CA, USA ;
This paper appears in: Proceedings of the IEEE
Publication Date: Jan. 1998
Volume: 86 , Issue: 1, pages: 53 - 62
ISSN: 0018-9219
Abstract
Fairchild Semiconductor was founded in 1957 by a group originating from Shockley Semiconductor Laboratory, the first organization attempting to exploit silicon transistor technology in the region at the base of the San Francisco peninsula now often referred to as "Silicon Valley". Fairchild produced the first commercial silicon mesa transistors and invented the "planar" process that formed the basis of practical integrated circuits. Several of the key directions in silicon device technology originated at Fairchild Semiconductor Corporation and its successor organization, the Semiconductor Division of Fairchild Camera and Instrument Corporation. This paper describes the author's recollections of some of the related events.
Entered By: David Laws
October 13, 2006

Title: Brooks, Donald - Interview
Author: Rob Walker
Created: February 8, 2000
Publisher: Stanford University - Silicon Genesis project
Cataloguer:
Copyright:
Reference:
"Don spent many years at Texas Instruments in variety of positions. He was recruited to Fairchild and became the last CEO of the California company. He recounts his efforts to save Fairchild that ultimately resulted in its sale to National. He then took over the reins at Taiwan Semiconductor and made it the first profitable semiconductor foundry."
Transcript available here:
http://silicongenesis.stanford.edu/transcripts/brooks.htm
Entered By: David Laws
June 13, 2007

Title: Sporck, Charlie - Interview
Author: Rob Walker
Created: February 21, 2000

Publisher: Silicon Genesis
Cataloguer:
Copyright:
Reference:
Charlie learned manufacturing at General Electric and was recruited to Fairchild as their first dedicated manufacturing director. He was there as the planar process was being developed, which, together with the manufacturing equipment and organization, became the foundation of Silicon Valley. Later he became CEO of National Semiconductor where he instituted a no-nonsense style of management. He offers his insights on the successes and failures of Fairchild and National, and their abortive forays into consumer markets." [Abstract from the Silicon Genesis web site]
A video version of the interview in RealMedia format is avilable at:
http://silicongenesis.stanford.edu/complete_listing.html
A transcript of interview is available at:
http://silicongenesis.stanford.edu/transcripts/spork.htm
This is one of the many interviews with pioneers of Silicon Valley conducted by Rob Walker in the Silicon Genesis oral histories series archived at Stanford University.
Entered By: David Laws
September 23, 2006

Title: Kilby Nobel Prize Lecture
Author: Jack S. Kilby
Created: December 8, 2000
Publisher: World Scientific Publishing Co., Singapore, 2002
Cataloguer:
Copyright:
Reference:
Jack Kilby was awarded the Nobel Prize in Physics in 2000 for his role as co-inventor with Robert Noyce of the integrated circuit. Noyce did not receive the award as he died on June 3, 1990.
Jack Kilby presented his Nobel Lecture December 8, 2000, at Aula Magna, Stockholm University. It is published as "Turning Potential into Reality: The Invention of the Integrated Circuit" on the following website: http://nobelprize.org/nobel_prizes/physics/laureates/2000/kilby-lecture.pdf
Entered By: David Laws
September 23, 2006

Title: Sporck: "Spinoff: A Personal History of the Industry that Changed the World"
Author: Charles E. Sporck with Richard Molay
Created: June 2001
Publisher: Lake Saranac Press
Cataloguer:
Copyright:
Reference:
"Spinoff: A Personal History of the Industry that Changed the World" written by Charles E. Sporck with Richard L. Molay is the "inside story of California's Silicon Valley, related by a man who was literally in the middle of everything."
From the promtional material: "Charlie Sporck distinguished himself as a production manager, was rapidly promoted to operations manager, and then became vice president and general manager of Fairchild Semiconductor during a period when sales grew from a few hundred thousand dollars a year to hundreds of millions. In 1967 he took over management of National Semiconductor, a small company struggling to stay in business. Under Charlie's leadership, National became a multibillion dollar giant."
http://www.national.com/sporck/spinoff2.html
Entered By: David Laws
September 23, 2006

Title: The Silicon Gate Technology
Author: Federico Faggin
Created: October 2001
Publisher:
Cataloguer:
Copyright:
Reference:
History of the self-aligned MOS process technology: a testimonial from Federico Faggin on the thirtieth birthday of the first microprocessor. The Intel 4004 was fabricated using silicon gate MOS technology.
See: http://www.intel4004.com/sgate.htm
Following are references to the earliest published papers on the work of Faggin and others at Fairchild on silicon gate technology:
Faggin, F., Klein, T., and Vadasz, L.: "Insulated Gate Field Effect transistor Integrated Circuits with Silicon Gates", presented at the IEEE International Electron Device Meeting. Washington, October 1968
Federico Faggin and Thomas Klein.: "A faster generation of MOS devices with low thresholds is riding the crest of the new ware, silicon-gate IC's". "Electronics" magazine, September 29, 1969
Entered By: David Laws
April 1, 2007

Title: "The Accidental Entrepreneur"
Author: Gordon Moore
Created: December 3, 2001
Publisher: nobelprize.org website
Cataloguer:
Copyright:
Reference:
"The Accidental Entrepreneur"
by Gordon E. Moore, December 3, 2001
This article is adapted from a talk given at Caltech in March 1994 at the groundbreaking ceremonies of the Gordon and Betty Moore Laboratory of Engineering, being built with a $16.8 million from the Moores.It was originally published in "Engineering & Science," Summer 1994, vol. LVII, no. 4, .
The article is posted at: http://nobelprize.org/nobel_prizes/physics/articles/moore/index.html
Entered By: David Laws
October 31, 2006

Title: Bassett: "To the Digital Age"
Author: Ross Knox Bassett
Created: May 1, 2002
Publisher: Johns Hopkins University Press
Cataloguer:
Copyright:
Reference:
"To the Digital Age: Research Labs, Start-Up Companies, and the Rise of MOS Technology"
By Ross Knox Bassett
References related to the Events listed on the right are found on the following pages:
Grove joins R & D [108]
Micrologic engineers found first MOS company [117]
Wanlass invents CMOS [51]
Snow identifies sodium as MOS stability culprit [111]

“To the Digital Age” is the first book devoted to the history of the MOS transistor, which overthrew the previously dominant bipolar transistor and made digital electronics ubiquitous. Combining technological with corporate history, Ross Knox Bassett, an assistant professor of history at North Carolina State University, examines the breakthroughs of individual innovators as well as the research and development power (and problems) of companies such as IBM, Intel, and Fairchild
ISBN: 0801868092
Publisher: Johns Hopkins University Press
May 1, 2002
Publisher’s site:
http://www.press.jhu.edu/books/title_pages/2925.html
For Google Book Search see:
http://books.google.com/books?vid=ISBN0801868092&id=Qge1DUt7qDUC&dq=to+the+digital+age
Entered By: David Laws
October 16, 2006

Title: Gifford, John - interview
Author: Rob Walker
Created: July 17, 2002
Publisher: Stanford University - Silicon Genesis project
Cataloguer:
Copyright:
Reference:
"Jack Gifford went to Fairchild in 1965 and became the semiconductor industry's first linear integrated circuit product manager. After leaving Fairchild, Jack co-founded Advanced Micro Devices (AMD) and recruited Jerry Sanders. Always passionate about analog integrated circuits, he became president of Intersil and then founded Maxim Integrated Products. In this 2002 interview, Jack tells of his tempestuous relationships with industry legends Bob Widlar, Jean Hoerni, Jerry Sanders, Jack Welch, and others." [Abstract from the Silicon Genesis web site]
A video version of the interview in RealMedia format is avilable at:http://vodreal.stanford.edu/sul/sgp/gifford.ram
A transcript of interview is available at:
http://silicongenesis.stanford.edu/transcripts/gifford.htm
This is one of the many interviews with pioneers of Silicon Valley conducted by Rob Walker in the Silicon Genesis oral histories series archived at Stanford University.
Entered By: David Laws
October 31, 2006

Title: Sanders, Jerry - Interview
Author: Rob Walker
Created: October 18, 2002
Publisher: Silicon Genesis
Cataloguer:
Copyright:
Reference:
"Jerry Sanders graduated in 1958 with a degree in Electrical Engineering and was recruited to Fairchild Semiconductor in 1961. He was a star performer at Fairchild, becoming world-wide sales manager at the age of 31. When Bob Noyce left to found Intel, C. Lester Hogan was brought in as head of Fairchild and ended up firing the young and brash Sanders. Other former Fairchild employees had left to form Advanced Micro Devices (AMD) but could not obtain funding. Sanders was asked to join them, got the money, and became Chairman and CEO of AMD, a position he held from 1969 to 2002. In this 2002 interview, by Rob Walker, Sanders describes his 41 years in semiconductors and speculates on the future of technology." [Abstract from the Silicon Genesis web site]

A video version of the interview in RealMedia format is avilable at:
http://silicongenesis.stanford.edu/complete_listing.html
A transcript of interview is available at:
http://silicongenesis.stanford.edu/transcripts/sanders.htm
This is one of the many interviews with pioneers of Silicon Valley conducted by Rob Walker in the Silicon Genesis oral histories series archived at Stanford University.
Entered By: David Laws
October 1, 2006

Title: Rock, Arthur - Interview
Author: Rob Walker
Created: November 12, 2002
Publisher: Silicon Genesis
Cataloguer:
Copyright:
Reference:
"Arthur Rock was a young "resident scientific guru" at the New York investment bank of Hayden Stone, who together with Alfred "Bud" Coyle, negotiated the financing of Fairchild Semiconductor Corporation with Richard Hodgson of Fairchild Camera and Instrument. He later moved to San Francisco and was the lead investor in Intel." [Abstract from the Silicon Genesis web site]
A video version of the interview in RealMedia format is avilable at:
http://silicongenesis.stanford.edu/complete_listing.html
A transcript of interview is available at:
http://silicongenesis.stanford.edu/transcripts/rock.htm
This is one of the many interviews with pioneers of Silicon Valley conducted by Rob Walker in the Silicon Genesis oral histories series archived at Stanford University.
Entered By: David Laws
September 2, 2006

Title: Grove, Andrew - Interview
Author: Various
Created: 2003
Publisher:
Cataloguer:
Copyright:
Reference:
The following sites offer transcripts of interviews with Andy Grove late in his career at Intel:
August 25, 2003
"We Can't Even Glimpse the Potential"
A Business Week interview with Rob Hof in the series THE FUTURE OF TECH -- THE BIG PICTURE:
http://www.businessweek.com/magazine/content/03_34/b3846612.htm
April 14, 2003
"Andy Grove on the Confident Leader"
Harvard Business School interview with Walter Kiechel:
http://hbswk.hbs.edu/item/3419.html
November 15, 2001
"The Charlie Rose Show"
http://www.intel.com/pressroom/archive/speeches/asg20011115.htm
Entered By: David Laws
October 26, 2006

Title: Fairchild 2N1613

Author: Jack Ward
Created: 2004
Publisher: www.transistormuseum.com
Cataloguer:
Copyright:
Reference:
Photograph and description of the 2N1613 is posted at:
http://semiconductormuseum.com/PhotoGallery/PhotoGallery_2N1613.htm
Entered By: David Laws
September 25, 2006

Title: Fairchild 2N697
Author: Jack Ward
Created: 2004
Publisher: http://www.transistormuseum.com
Cataloguer:
Copyright:
Reference:
Description and photograph at:
http://semiconductormuseum.com/PhotoGallery/PhotoGallery_2N697.htm
Entered By: David Laws
September 11, 2006

Title: Shockley Labs 4-layer diode
Author: Jack Ward
Created: 2004
Publisher: http://www.transistormuseum.com
Cataloguer:
Copyright:
Reference:
After the Fairchild founders departed Shockley Semiconductor Labs, later renamed the Shockley Transistor Corporation, continued to try to establish the PNPN four-layer diode as a replacement for the mechanical cross-point switches used by telephone equipment. Samples of the device were produced as the 4E30 but due to manufacturing difficulties volume production was never achieved. The company was purchased by Clevite in 1965.
For information on the 4E30 and other Shockley devices see:
http://semiconductormuseum.com/PhotoGallery/PhotoGallery_Shockley4E30.htm
Entered By: David Laws
October 3, 2006

Title: Valentine, Don - Interview
Author: Rob Walker
Created: April 12, 2004
Publisher:
Cataloguer:
Copyright:
Reference:
"Don Valentine started his semiconductor career at Fairchild Semiconductor, where as Sales Manager he hired bright young men such as Jerry Sanders, Jack Gifford, Mike Markula and many others who went on to become industry leaders. Then, as a founder of National Semiconductor, Don built its sales force from scratch. In 1972 he entered the Venture Capital field then still in it's infancy, founding Sequoia Capital." In this 2004 interview by Rob Walker Don discusses the

factors that make Silicon Valley great, and his criteria for investing. " [Abstract from the Silicon Genesis web site]
A video version of the interview in RealMedia format is avilable at:
http://vodreal.stanford.edu/sul/sgp/valent.ram
A transcript of interview is available at:
http://silicongenesis.stanford.edu/transcripts/valentine.htm
This is one of the many interviews with pioneers of Silicon Valley conducted by Rob Walker in the Silicon Genesis oral histories series archived at Stanford University.
Entered By: David Laws
October 23, 2006

Title: Faggin, Federico - interview
Author: Gardner Hendrie
Created: September 22, 2004
Publisher: Computer History Museum
Cataloguer:
Copyright:
Reference:
Oral History of Federico Faggin:
http://archive.computerhistory.org/search/oh/oral_history.php
Scroll down and click on Faggin, Federico.
Interviewed by Gardner Hendrie, Federico Faggin describes his childhood and early education in Italy where he received a degree in physics at the University of Padua. After graduation Faggin went on to work at Olivetti. In 1968 he moved to Palo Alto, to work for Fairchild Semiconductor, where he invented the MOS Silicon Gate technology. In 1970 Faggin moved to Intel where, with Marcian Hoff, Stanley Mazor and Intel customer Masatoshi Shima, he developed the Intel 4004, the world's first microprocessor. He also supervised the design of the Intel 8008, the world's first 8-bit microprocessor. In 1974 Faggin left Intel to co-found Zilog with Ralph Ungermann. At Zilog, Faggin conceived of the architecture of the Z80 and Z8000 microprocessors. In 1982 Faggin started Cygent Technologies, and in 1986 he co-founded Synaptics.
Entered By: David Laws
April 1, 2007

Title: "The Fairchild Chronicles"
Author: Rob Walker
Created: 2005
Publisher: Panalta, Inc., Palo Alto, CA
Cataloguer:
Copyright:
Reference:
"The Fairchild Chronicles" is a 2-hour DVD video anthology of selected interviews from the Silicon Genesis series conducted by Rob Walker with executives of Fairchild Semiconductor from its founding in 1957 to the sale to National Semiconductor in 1986.
http://www.thesilicongenesiscollection.com/detail.cfm?productID=46C413CC-E69A-E1B9-0EFFF9F651D4A6B2
Entered By: David Laws
October 16, 2006

Title: Berlin: "The Man Behind the Microchip"
Author: Leslie Berlin
Created: 2005
Publisher: Oxford University Press, Inc., New York
Cataloguer:

Copyright:
Reference:
"The Man Behind the Microchip: Robert Noyce and the Invention of Silicon Valley" is a 400-page biography of the life of Robert N. Noyce, an early employee of Shockley Semiconductor, one of the eight founders of Fairchild Semiconductor, and co-founder with Gordon Moore of Intel.
The early days of Fairchild Semiconductor are described in chapters 4 - Breakaway and 5 - Invention. The volume includes a 14-page biblography and 56-pages of notes detailing the sources of quotations and data. Dr. Berlin was a visiting Scholar in the Program in the History of Science and Technology at Stanford University, California at the time of publication.
References related to the Events listed on the right are found on the following pages:
Baldwin hired [95]
Bay joins as head of marketing [91]
Double-diffused Mesa process [142]
FC&I acquires FSC [112]
First Planar transistor [105]
Fourth founder, Eugene Kleiner [124]
Hoerni Planar process [107]
Hoerni, Last, & Roberts leave to form Amelco [124]
Hong Kong is first offshore plant [131]
IBM places first order [92]
Last begins “microcircuit” [111]
Micrologic introduced [135]
Micrologic team departs for Signetics [124]
Minuteman reliability problem [102]
Minuteman transistor [121]
NEC technology license [134]
Noyce conceives IC [104]
Palo Alto R&D [126]
Rheem Semiconductor [105]
SGS - Fairchild [121]
Shockley defectors resign [88]
Shockley dissidents plan [80]
TI announcement [111]
TV Broadcast on ICs [130]
For reviews and other information see:
http://www.themanbehindthemicrochip.com/index.html
A 34-page article by Dr. Berlin, "Robert Noyce and the Rise and Fall of Fairchild Semiconductor, 1957–1968" published in the Business History Review, covers highlights of Noyce's time at Fairchild. A copy of the article togther with extensive footnotes and references is posted at:
http://www.themanbehindthemicrochip.com/bbhra.pdf
Entered By: David Laws
September 1, 2006

Title: Videos of Shockley Semiconductor legacy panels
Author: Stanford University & Computer History Museum
Created: 2005 ca.
Publisher:
Cataloguer:
Copyright:
Reference:
In late 2005 and early 2006 two panel sessions were held in Silicon Valley to mark the 50th anniversary of Shockley Semiconductor Laboratories.
Stanford University, September 27, 2005
"Legacy of Shockley Semiconductor"
Panel with Gordon Moore, Jay Last, Julius Blank, and Jim Gibbons moderated by Leslie Berlin.

Scroll down to the botton of the page to access the video:
http://svarchive.stanford.edu/newsandevents.html
Also linked from:
http://silicongenesis.stanford.edu/
Computer History Museum, February 27, 2006
"The Rise of Silicon Valley: From Shockley Labs to Fairchild Semiconductor"
Panel with Jim Gibbons, Jay Last, Hans Queisser, and Harry Sello moderated by Michael Riordan.
Visit the Computer History YouTube Channel to watch the video at:
http://www.youtube.com/watch?v=WpyUf3kmtkg&feature=PlayList&p=6B12A0FACFA35D1F&index=1
Entered By: David Laws
September 24, 2006

Title: Yu, Albert - Interview
Author: Rob Walker
Created: September 15, 2005
Publisher: Silicon Genesis
Cataloguer:
Copyright:
Reference:
Albert Yu obtained his Ph.D. in Electrical Engineering from Stanford University and began his career at Fairchild Semiconductor's R&D facility in the Stanford Industrial Park. In this interview he mentions transferring a diode procees to the San Rafael plant. He was later recruited to Intel by Andy Grove, where he remained for a distinguished thirty-year tenure.
A transcript is available here:
http://silicongenesis.stanford.edu/complete_listing.html
This is one of the many interviews with pioneers of Silicon Valley conducted by Rob Walker in the Silicon Genesis oral histories series archived at Stanford University.
Entered By: David Laws
October 1, 2006

Title: "The Planar Process"
Author: Christophe Lécuyer
Created: 2006
Publisher: Nobel Web AB 2006
Cataloguer:
Copyright:
Reference:
A description with cross-section diagrams showing the major steps in manufacturing a semiconductor device using the planar process developed by Jean Hoerni at Fairchild.
http://nobelprize.org/nobel_prizes/physics/articles/lecuyer/planar.html
Entered By: David Laws
October 11, 2006

Title: Corrigan, Wilfred - Biography
Author: LSI Logic
Created: 2006
Publisher:
Cataloguer:
Copyright:
Reference:

This biography of Wilfred J. Corrigan, president and chief executive officer of Fairchild Camera and Instrument Corporation from 1974 to 1979, is posted on the LSI Logic website:
http://www.lsilogic.com/about/corrigan_bio.html
Entered By: David Laws
October 13, 2006

Title: Grove, Andrew - biographies and articles
Author: Intel Press Room
Created: 2006
Publisher:
Cataloguer:
Copyright:
Reference:
The following all link to the Intel website.
Intel Executive biography:
http://www.intel.com/pressroom/kits/bios/grove/bio2.htm
Articles about:
http://www.intel.com/pressroom/kits/bios/grove/articles.htm
Books written by:
http://www.intel.com/pressroom/kits/bios/grove/writings.htm
Selected technical papers, including early MOS papers written while at Fairchild R & D:
http://www.intel.com/pressroom/kits/bios/grove/papers.htm
Entered By: David Laws
October 26, 2006

Title: Lécuyer: "Making Silicon Valley"
Author: Christophe Lécuyer
Created: 2006
Publisher: The MIT Press, Cambridge, Massachusetts
Cataloguer:
Copyright:
Reference:
"Making Silicon Valley: Innovation and the Growth of High Tech, 1930-1970" describes the development of the electronic component industry on the San Francisco Peninsula. The book provides detailed descriptions of the early technology, people, and business development of Eitel-McCullough, Litton Industries, Fairchild Semiconductor and later Silicon Valley companies.
The volume includes a 19-page Biblography and 60-pages of Notes detailing the sources of quotations and data. Mr. Lécuyer was a historian at the Chemical Heritage Foundation at the time of publication.
References related to the Events listed on the right are found on the following pages:
2N709 switching transistor [193]
All transistor TV prototype [200]
Apollo Guidance Computer [235]
Bay joins [139]
Charleston Road [139]
Custom IC Design [247]
Customer Application focus [195, 239]
Double-diffused Mesa process [142]
DTL 930 Series developed [241 - 243]
First Planar IC demonstrated [158]
First Planar transistor demonstrated [150]
Fourth founder, Eugene Kleiner leaves [167, 202, 258]
Hoerni, Last, & Roberts leave to form Amelco [214]
Hoerni Planar process [150]

IBM places first order [142]
Last begins “microcircuit” development [157]
Micrologic diffused isolation developed [213]
Micrologic engineers found first MOS company [240]
Micrologic introduced [159, 214]
Micrologic team departs for Signetics [217]
Minuteman reliability problem [149]
Minuteman transistor order [159]
New South Portland plant [204]
Noyce conceives IC [157]
Palo Alto R&D [196]
Planar approved for Minuteman [161]
Rheem Semiconductor [153]
Shockley defectors resign [251]
Shockley dissidents plan [135]
Shockley Semiconductor opens [139]
TI announcement [157]
Walker's Wagon Wheel [275]
µA702 Operational Amplifier [249]
For more information, including a downloadable index, visit:
http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=10631
Entered By: David Laws
September 1, 2006

Title: The Rise of Silicon Valley: Shockley Labs to Fairchild Semiconductor
Author: Craig Addison
Created: February 2006
Publisher: SEMI
Cataloguer:
Copyright:
Reference:
Craig Addison, Senior Editor, Communications for SEMI wrote this essay on the legacy of Shockley Semiconductor for the organization's newsletter to mark the 50th anniversary of the founding of the company.
http://wps2a.semi.org/wps/portal/_pagr/103/_pa.103/248?startRow=1&dFormat=application/msword&docName=P037156
SEMI also co-sponsored a panel session on "The Rise of Silicon Valley: Shockley Labs to Fairchild Semiconductor" at the Computer History Museum on Monday, February 27, 2006. Read a summary of the event here:
http://www.computerhistory.org/events/index.php?id=1138162360
Watch the video here:
http://www.youtube.com/watch?v=WpyUf3kmtkg&feature=PlayList&p=6B12A0FACFA35D1F&index=1
Entered By: David Laws
September 24, 2006

Title: Swanson, Bob - Interview
Author: Rob Walker
Created: March 11, 2006
Publisher: Silicon Genesis
Cataloguer:
Copyright:
Reference:

"Bob Swanson was the founder of Linear Technology, a leader in the field of analog integrated circuits. He was a veteran of Transitron, Fairchild & National Semiconductor before founding Linear in 1981. In this 2006 interview, Bob describes the profitability of analog ICs, the advantages of Silicon Valley as a place to start a technology company and the importance of retaining the best engineers." [Abstract from the Silicon Genesis web site]
A video version of the interview in RealMedia format is avilable at:
http://silicongenesis.stanford.edu/complete_listing.html
A transcript of interview is available at:
http://silicongenesis.stanford.edu/transcripts/swanson.htm
This is one of the many interviews with pioneers of Silicon Valley conducted by Rob Walker in the Silicon Genesis oral histories series archived at Stanford University
Entered By: David Laws
October 1, 2006

Title: Lojek: "History of Semiconductor Engineering"
Author: Bo Lojek
Created: October 2006
Publisher: Springer
Cataloguer:
Copyright:
Reference:
In this book, the author argues that the group of inventors of the integrated circuit was much broader than Jack Kilby and Robert Noyce. This illustrated account is a personal recollection of the development of integrated circuits and personalities - such as Russell Ohl, Karl Lark-Horovitz, William Shockley, Carl Frosch, Lincoln Derick, Calvin Fuller, Kurt Lehovec, Jean Hoerni, Shelton Roberts, Jay Last, Issy Haas, Bob Norman, Dave Allison, Jim Null, Tom Longo, Bob Widlar, Frank Wanlass, Federico Fagin, and Dave Talbert.
Link to publisher's website:
http://www.springer.com/west/home?SGWID=4-102-22-168287404-0&changeHeader=true
Entered By: David Laws
September 25, 2006

Title: Video of Fairchild Founder's Panel
Author: Stanford Silicon Valley Archives
Created: October 4, 2007
Publisher: Stanford University
Cataloguer:
Copyright:
Reference:
The following page provides a link to the video of the Fairchild Founders panel of October 4, 2007:
http://svarchive.stanford.edu/newsandevents.html
A direct link to the file is:
http://vodreal.stanford.edu/sul/sgp/fair50th.ram
Users need to have Real Player 10.0 or later. Using SureStream technology this will stream at connect speeds for DSL-LAN 350K.
Entered By: David Laws
November 1, 2007

Discussions

There are no discussions for this company in the collection

Semiconductor History

Company Details

Name: Semiconductor History
Sector: Semiconductor Sector

Description

Semiconductor History Information resource pages

This site was created in late 2006 as working site for contributors to review and edit information used in the development of "The Silicon Engine," the Computer History Museum's on-line "Timeline of Semiconductors in Computers" exhibit. That website was unveiled in the fall of 2007 and can viewed at: http://www.computerhistory.org/semiconductor/welcome.html

The site is now serving as a repository of information and documents that are of interest to members of the Semiconductor Special Interest Group (Semi SIG) of the museum.

Items posted under the "Documents" tab comprise original works created or collected by SIG members and reprints of previously published articles, papers, etc. submitted to the SIG (denoted Reprint). The latter are believed to be available for public posting. If this is not the case, copyright owners should advise the Facilitators listed below to request their removal.

Facilitators

- David Laws - Email

Statistics

Contributors (0), Events (0), Stories (0), Documents (62), References (0), Discussions (0 threads, 0 posts)

Entered By: Luanne Johnson
December 16, 2006

Contributors

Contributor David Laws

Date Joined 1964

Job Description

I entered the semiconductor business with the Mullard subsidiary of Philips in the UK in 1964. I moved to SGS-Fairchild in marketing and field sales positions in the UK until 1968 when I joined Fairchild Semiconductor in Mountain View, CA. There I worked in a variety of sales and marketing roles most significantly Product Marketing Manager for Bipolar Memory. Life after Fairchild included 11 years at Advanced Micro Devices in Sunnyvale where I ran the PAL business for several years. My last position was Vice President, Business Development. Moving on to Altera Corporation I was the first Marketing Vice President and after that the first CEO at QuickLogic.

Accomplishments

Helped to change the world.

Date Left 1998

Statistics

Documents (62)

Date Entered December 16, 2006

Timeline

There are no events for this company in the collection

Stories

There are no stories for this company in the collection

Documents

Title: A Stepping Element Transistor
Author: L. A. D'Asaro
Created: 1959
Publisher: Bell Telephone Labs
Donated By: L. A. D'Asaro
Filename: doc-4a49291b450b1.pdf (Size: 2.30 MB)
Pages:
Cataloguer:
Copyright:
Description: Ths "A Stepping Element Transistor" paper desceribes work done by Arthur D'Asaro and Ian Ross on a single-chip silicon counting function for telephone system appications in 1955 at Bell Labs.

Entered By: David Laws

June 29, 2009

Title: First Micrologic Device - Mask Design and Die photo
Author: Lionel Kattner and others
Created: 1960 ca.
Publisher: Fairchild Semiconductor
Donated By: Lionel Kattner
Filename: doc-4810de9d30afd.pdf (Size: 951 KB)
Pages: 6
Cataloguer:
Copyright:
Description: The attached pdf includes the scan of a layout for the mask design of the first Micrologic Type "F" flip-flop (μLF), a photograph of an experimental metal version of one of the physically-isolated devices, and an overlay drawing showing how this metal pattern mapped onto the final layout. The originals of these items from circa 1960 were donated to the museum collection by Lionel Kattner, one of the engineers who worked on the project. A data sheet from 1962 shows the physical and electrical specifications of the device.

Entered By: David Laws
April 24, 2008

Title: Kilby "flying-wire" Solid Circuit
Author:
Created: 1960 ca.
Publisher: CHM
Donated By:
Filename: doc-496a554847384.jpg (Size: 340 KB)
Pages: 1
Cataloguer:
Copyright:
Description: This is a photograph of a Texas Instruments' Solid Circuit circa 1960 mounted in an open-top flat package. It comprises multiple etched mesa active and passive elements interconnected with gold "flying-wires" as developed by Jack Kilby. The function is unknown. The device is in the collection of the Computer History Museum. (No accession number is available as of 1.11.09)
See Kilby's paper “Invention of the integrated circuit,” IEEE Transactions in Electron Devices, Vol. ED-23, No. 7 (July 1976) pp. 648-654.

Entered By: David Laws
January 11, 2009

Title: Texas Instruments SN 502 Flip Flop data sheet
Author: TI Documentation
Created: 1960 ca.
Publisher: Texas Instruments
Donated By: D. C. McKenzie
Filename: doc-495ea40ca30d6.jpg (Size: 652 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
The SN502 flip flop was the first commercial “Solid Circuit” introduced by TI at the IRE Show in New York in March 1960. Using an etched mesa structure the individual circuit components were

hand connected with “flying wires.” According to Frank Emery who worked as a graduate student for Jack Kilby, the company shipped “about 10” units through August of that year.

The attached photograph of a data sheet that accompanied each shipment was supplied by D. C. McKenzie with the following note: “This is a picture of the first datasheet used at TI for IC's ("Solid Circuits" as we called them). This is the datasheet for the SN502. We called it "TIFF" for 'Texas Instruments Flip Flop'. Each unit was hand tested and the results were hand written in on the datasheet. The datasheet was 3.75" wide and 6" long. It was folded over and on one side was the schematic of the F/F and the other side was the "data" from the device signed by the operator (technician) who took the data. The original circuits sold for $450.00, not a bad 'asp', but we still lost money with every one we shipped! This was in late 1960 - early 1961.”

Entered By: David Laws
January 2, 2009

Title: State of the Art in "Solid Circuits" [Book Reprint]
Author: G. W. A. Dummer and J. Granville
Created: 1961
Publisher: John Wiley
Donated By:
Filename: doc-48065285c771c.pdf (Size: 6.25 MB)
Pages:
Cataloguer:
Copyright:
Description: "Miniature and Microminiature Electronics" (New York: John Wiley and Sons, 1961) by G. W. A. Dummer and J. Granville describes the three mains systems of microminiaturization being pursued by semiconductor and electronic systems manufacturers through early 1960. It includes micromodules (stacked individual components; microcircuits (flat or evaporated components); and solid circuits (integrated components or “molecular” electronics). Pages 263-300 (shown on the attached pdf) cover the state of the art in semiconductor-based circuit miniaturization technology in 1960 with descriptions of work at TI, Plessey, RCA, the Royal Radar Establishment (RRE), and Westinghouse. No details had been released by Fairchild at the time of writing.

Entered By: David Laws
April 16, 2008

Title: Signetics Founding History
Author: Lionel Kattner
Created: 1961 ca.
Publisher:
Donated By:
Filename: doc-47bf7284ebb0c.pdf (Size: 1.84 MB)
Pages: 3
Cataloguer:
Copyright:
Description: The attached summary of the founding of Signetics Corporation in 1961 was written by Lional Kattner, one of the four founders of the company. The document was included in the donation of Signetics historical material to the museum in February 2008 by Donald Liddie.

Entered By: David Laws
February 22, 2008

Title: MARTAC 420 Multipurpose Digital Control Computer
Author: Martin Company Marketing Dept.
Created: 1962
Publisher: Martin Company
Donated By: Jan Schink Dennison
Filename: doc-495ea82db08fa.pdf (Size: 8.42 MB)
Pages: 10
Cataloguer:
Copyright:
Description: Brochure describing the features of the MARTAC 420 Multipurpose Digital Control Computer. MARTAC 420 was one of the first computers designed with Fairchild Micrologic digital integrated circuits. It devotes one page to the benefits of monolithic integrated circuits compared to discrete module implementations.
See also paper: "Use of Integrated Circuitry in a Digital System."

Entered By: David Laws
January 2, 2009

Title: MARTAC 420 - "Use of Integrated Circuitry in a Digital System."
Author: Lloyd Thayne
Created: 1962 ca.
Publisher:
Donated By: Jan Schink Dennison
Filename: doc-495ea5ff33faa.pdf (Size: 5.75 MB)
Pages: 10
Cataloguer:
Copyright:
Description: This paper describes the design of the MARTAC 420 computer. One of the first digital computers implemented with Fairchild Micrologic integrated circuits.
See also the MARTAC 420 brochure posted on this site

Entered By: David Laws
January 2, 2009

Title: Texas Instruments' ad for Series SN 51 DCTL ICs
Author: TI Marketing
Created: 1962 ca.
Publisher:
Donated By: D. C. McKenzie
Filename: doc-495e9e6502823.JPG (Size: 277 KB)
Pages:
Cataloguer:
Copyright:
Description:
Texas Instruments' ad for Series SN 51 DCTL ICs
The attached low-res image of a Texas Instruments' advertisement for a "Production Application of Fully Integrated Circuits" features SN 51 Series DCTL devices. The date is unknown but is probably circa 1962. It was supplied by D.C. (Mac) McKenzie at the same time that he donated SN275 devices from the application to the museum collection. The system is the Litton Data Systems AN/ASA-27 radar computer indicator carried aboard the Navy's W2P-1 early warning radar aircraft. Mac believes that "this was the first full scale commercial application of IC's ever."
I asked Mac about the function of the unit marked SN 275 as this was probably one of the "customized variations using TI's master slice technique" noted in the ad. Per his note:
"Regarding the material I gave you; sadly, I do not remember what type of device the SN275 was.

The four IC's mounted on the module board were F/F's, if my memory serves me right. There were eight of the modules on the circuit board we were to replace. They took the place of the core memories that were running so hot that they destroyed the card they were on. Some of the modules were F/F's and others were interface circuits to make our card a plug in replacement for the board we were replacing. The SN275 may have been one of the interface circuits. This was a program TI did for Litton Data Systems. Litton was building the Marine Tactical Data System to go with the AWACS aircraft. That is the airplane that has the big radar antenna on top of it and it sends long range radar data back to some home base. As far as I know, they are still in operation. The project started in about 1961. See the photo of the project I have attached. I ran the program and it was what brought me to Signetics. Long story for another time. If you blow up the attached picture, you can read about the program, I hope."

Entered By: David Laws
January 2, 2009

Title: The Next Revolution in Electronics [Article Reprint]
Author: Business Week editors
Created: April 14, 1962
Publisher: McGraw Hill
Donated By: Jan Schink Dennison
Filename: doc-4803f210c4c08.pdf (Size: 21.33 MB)
Pages: 14
Cataloguer:
Copyright:
Description: This Business Week Special Report surveyed the industry to report on "new technologies [that] are forcing drastic changes on the fastest growing U.S. industry - with smaller-than-ever devices tackling bigger jobs." Describes integrated circuit programs at Fairchild, RCA, Sperry, TI and Westinghouse.

Entered By: David Laws
April 14, 2008

Title: MAGIC – An Advanced Computer for Spaceborne Guidance Systems [Paper Reprint]
Author: A. H. Faulkner, F. Gurzi, and E. L. Hughes
Created: October 1962 ca.
Publisher: IRE
Donated By: Jan Schnick Dennison
Filename: doc-4810f8de6e488.pdf (Size: 1.60 MB)
Pages: 12
Cataloguer:
Copyright:
Description:
The attached paper "MAGIC – An Advanced Computer for Spaceborne Guidance Systems"describes one of the first computers to be constructed almost entirely of integrated circuits by the AC Spark Plug Division of General Motors in El Segundo, California. The system used six different Fairchild Micrologic device types for a total of 2,098 packages. It was presented at the Spaceborne Computer Engineering Conference of the IRE in 1962.

Entered By: David Laws
April 24, 2008

Title: "IBM First in IC Memory"
Author: Paul Castrucci et al

Created: 1965 ca.
Publisher: IBM Corporation
Donated By: Paul Castrucci
Filename: doc-4886394be4015.pdf (Size: 2.06 MB)
Pages: 8
Cataloguer:
Copyright:
Description:
This pdf file contains images and text related to the SP95 program established at IBM in 1965. SP95 was a project at the East Fishkill, NY facility that fabricated the component development department's first monolithic integrated circuit, a 16-bit, system-protect memory array for the System 360 Model 95. Phase 2 of the program led to 64 and 128-bit devices that paved the way for IBM's transition from core to semiconductor main memory. Paul Castrucci was a semiconductor pilot line manager at East Fishkill. Later he was Plant Manager of the Essex Junction semiconductor facilty near Burlington, Vermont.

Entered By: David Laws
July 22, 2008

Title: SDS 8-bit RAM designed for Sigma 7 in 1965
Author: Gene B. Potter, et al.
Created: April 4, 1966
Publisher: McGraw Hill
Donated By: Gene Potter
Filename: doc-4b1dac3295c81.pdf (Size: 12.43 MB)
Pages: 13
Cataloguer:
Copyright:
Description:
Copy of the article "Integrated scratch pads sire new generation of computers" from "Electronics" magazine (April 4, 1966) describing an 8-bit RAM (178 components on a single 104 x 95 mil chip) designed for the SDS Sigma 7 computer and fabricated by Signetics in 1965. Also includes the first page of the article published in the Russian edition of the magazine.

Entered By: David Laws
December 7, 2009

Title: Semiconductor Family Tree [Article Reprint]
Author: Don Hoefler
Created: July 8, 1968
Publisher: Electonic News
Donated By:
Filename: doc-47eaa452be50e.pdf (Size: 9.20 MB)
Pages: 4
Cataloguer:
Copyright:
Description:
The attached article "Semiconductor Family Tree" by Don Hoefler from Electronic News on July 8, 1968 was one of the first published genealogies of Silicon Valley. It was used as the basis of a poster created by SEMI in 1977 and reprinted and updated several times in succeeding years. The source of the information is quoted as Wilkinson, Sedwick and Yelverton.

Entered By: David Laws
March 26, 2008

Title: RCA - Complementary MOS Memory Arrays
Author: C. Hanchett, S. Katz, & A. K. Yung
Created: October 1968
Publisher: RCA Electronic Components
Donated By: Richard Ahrons
Filename: doc-482bbb4f65e89.pdf (Size: 2.71 MB)
Pages: 5
Cataloguer:
Copyright:
Description:
The attached paper "Complementary MOS Memory Arrays" presented at the Government Microcircuits Applications Conference in October 1968 describes pioneering work in the use of CMOS technology for memory arrays. The included photograph of a developmental 288-bit static RAM shopws a device donated to the musuem collection by Richard Ahrons who worked at RCA at that time.

Entered By: David Laws
May 14, 2008

Title: Four Phase System IV70 and AL1 MPU Chip
Author: Photographers unknown
Created: 1969 ca.
Publisher:
Donated By: Cloyd Marvin
Filename: doc-4946dd73f1d80.pdf (Size: 790 KB)
Pages: 2
Cataloguer:
Copyright:
Description:
Photographs of the Four Phase Systems AL1 8-bit processor chip and the System IV that it powered. Work began on the AL1 in October 1968 and demonstrated working devices in March 1969.
Following link is to a presentation given by Lee Boysel at the University of Michigan College of Engineering on 9.12.07 describing his work on MOS ROMs, DRAMs, ALUs, and Micrprocessor slices at Fairchild and Four Phase in the late 1960s and early 70s: http://inst-tech.engin.umich.edu/media/index.php?sk=ece-inv-lectures&id=1036

Entered By: David Laws
December 15, 2008

Title: DEC MOS-LSI Review of the Industry 1971-73
Author: Roger Dow, et. al.
Created: 1971
Publisher: Digital Equipment Corporation
Donated By: Al Kossow
Filename: doc-47bb9eeded261.pdf (Size: 1.71 MB)
Pages: 22
Cataloguer:
Copyright:
Description:

The pdf above contains a series of internal memos written by Digital Equipment engineers following a survey of US MOS-LSI semiconductor vendors in the period 1971-73 with the intent of identifying a manufacturer to work with on a DEC designed microprocessor.

Entered By: David Laws
February 19, 2008

Title: History of the Semiconductor Industry (Reprint)
Author: Jerry Eimbinder - editor
Created: 1972 ca.
Publisher: Circuit News
Donated By:
Filename: doc-481bb1165dc59.pdf (Size: 11.20 MB)
Pages: 26
Cataloguer:
Copyright:
Description:
A reprint of several articles published in the industry newspaper "Circuit News" (Jericho, New York) in the early 1970s:
Chapter I - "The Invention of the Transistor"
Chapter II - "The Invention of the Field-Effect Transistor"
Chapter III - "Shockley Labs is formed in Palo Alto"
Chapter IV - "Traitorous Eight Leave Shockley Labs"
Chapter V - "The Birth of Texas Instruments"

Entered By: David Laws
May 2, 2008

Title: Signetics - First Annual report
Author: Signetics Corporation
Created: 1974
Publisher:
Donated By:
Filename: doc-47eaa6b4ba885.pdf (Size: 11.82 MB)
Pages:
Cataloguer:
Copyright:
Description:
The first annual report issued by Signetics after its IPO in 1973 is atthced.

Entered By: David Laws
March 26, 2008

Title: Sutherland letter to Xerox proposing VLSI project
Author: Ivan Sutherland
Created: January 26, 1976
Publisher:
Donated By: Lynn Conway
Filename: doc-4828d4e702e18.pdf (Size: 727 KB)
Pages: 4
Cataloguer:
Copyright:
Description:

The letter on the attached pdf file was written by Ivan Sutherland, at that time a professor at Caltech, to his brother Bert Sutherland, a manager at the Xerox Palo Alto Research Center. This document stimulated the VLSI design project at Xerox and the 1979 Conway-Mead text "Introduction to VLSI Systems" based on the results of that work.
The letter was included in Lynn Conway's donation of documents to the museum in May 2008. For more information visit: http://ai.eecs.umich.edu/people/conway/VLSI/VLSIarchive.html
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Entered By: David Laws
May 12, 2008

Title: Kilby - "Invention of the IC"
Author: Jack Kilby
Created: July 1976
Publisher: IEEE
Donated By:
Filename: doc-496d289787271.pdf (Size: 897 KB)
Pages:
Cataloguer:
Copyright:
Description:
Jack Kilby's paper on the "Invention of the Integrated Circuit" describes the work of many organizations that led to the development of ICs at TI and Fairchild. It was published in IEEE Transactions on Electron Devices in July 1976. This copy is from the University of Wisconsin-Madison, College of Engineering website at:
http://www.engr.wisc.edu/news/headlines/pics/kilby.pdf

Entered By: David Laws
January 13, 2009

Title: The Foundation of the Silicon Age [Article Reprint]
Author: Ian M. Ross
Created: September 1977
Publisher: Bell Labs Technical Journal
Donated By:
Filename: doc-47bba0e6a2a2f.pdf (Size: 301 KB)
Pages:
Cataloguer:
Copyright:
Description:
This paper was written by Ian Ross, a former president of Bell Labs, to mark the 50th anniversary of the invention of the transistor. It describes the major technological hurdles that had to be overcome to bring the transistor into volume production.

Entered By: David Laws
February 19, 2008

Title: Robert Noyce Intel ID Card
Author:
Created: 1980 ca.
Publisher:
Donated By: Ann Bowers Noyce
Filename: doc-4b1d9b738d851.pdf (Size: 978 KB)
Pages:

Cataloguer:
Copyright:
Description:
Intel co-founder Robert Noyce's Intel ID card on a copy of the memory book published by SEMATECH following his DEATH IN 1990.

Entered By: David Laws
December 7, 2009

Title: G. Moore presentation on "Business Acumen"
Author: Gordon Moore
Created: January 1982
Publisher:
Donated By: Mark Olson
Filename: doc-48b056c8c36cb.pdf (Size: 1.16 MB)
Pages:
Cataloguer:
Copyright:
Description:
Mark Olson served as product manager for many of Intel's peripheral chips in the late 1970s. Mark recently submitted the attached pdf document and following comments to the museum. "Gordon Moore taught a class on what I call "Business Acumen" prior to the SLRP season of 1982. I was fortunate enough to attend that session, and I kept the material. It offers interesting insight into Gordon's [characteristically highly analytical] thoughts on business before Intel's success was assured by the PC business."

Entered By: David Laws
August 23, 2008

Title: "The Development of Monolithic Integrated Circuit Memory Chips at IBM Corporation"
Author: Michael R. Rappa
Created: 1984 ca.
Publisher: Strategic Management Research Center, University of Minnesota
Donated By: Paul Castrucci
Filename: doc-48863cc8505a8.pdf (Size: 4.20 MB)
Pages: 28
Cataloguer:
Copyright:
Description:
This pdf file contains a copy of a paper that describes the the SP95 project at the East Fishkill, NY facility that fabricated IBM's first monolithic integrated circuit, a 16-bit, system-protect memory array for the System 360 Model 95. Phase 2 of the program led to 64 and 128-bit devices that paved the way for IBM's transition from core to semiconductor main memory that was described in 1971 as the "biggest technology push in IBM's history.

Entered By: David Laws
July 22, 2008

Title: Intel 386 ad - It was worth the wait
Author:
Created:1985
Publisher:

Donated By:
Filename: doc-496be57e692f7.pdf (Size: 2.76 MB)
Pages:
Cataloguer:
Copyright:
Description:
pdf of an Intel advertisement for the 386

Entered By: David Laws
January 12, 2009

Title: Good King Jerry and his Dragonslayers
Author: John Greenagel
Created: January 1987
Publisher: Advanced Micro Devices
Donated By: Ed Turney
Filename: doc-4910e90eea01c.pdf (Size: 4.55 MB)
Pages:
Cataloguer:
Copyright:
Description:
The story, published in a special edition of the "AMD Insights" employee magazine January/February 1987, told in poetic words and bold color illustrations of how good King Jerry established his kingdom of AMD and how he and his loyal dragonslayers defended their realm against marauding dragons.

The following note was received from John Greenagle on 11.28.08:

Wow! This link to the story of Good King Jerry and the Dragonslayers brought back many memories!

I wrote the story and Scott Allen oversaw the production of the book. It all started when Elliott Sopkin and I were summoned to a meeting with Jerry at his office in Beverly Hills . We had no idea about the subject of the meeting – but we had just been through the “STAUNCH” campaign. This was Jerry’s acronym for cost-cutting measures that had been imposed: Stress Those Actions Urgently Needed to Check Hemorrhaging.

Jerry said that the various efforts undertaken to deal with the industry downturn weren’t much fun: pay cuts, reduced hours, hiring freezes, travel restrictions, etc. He wanted a unique campaign that would be fun and would create incentives for employees to ‘slay the dragons that stood in the way of profitability.’ I believe he just watched the movie “Dragonslayer,” and almost certainly he had recently seen a Kellogg’s Rice Crispies commercial because he wanted a story built around three characters kind of like Snap, Crackle, and Pop. His characters, however, were named Rigor, Vigor, and Nimble.

The story and the accompanying illustrations are filled with numerous subtle references to inside AMD stuff. Susan Tanenbaum wielded a fairly heavy blue pencil and killed several of my favorite lines such as a comment that the numerous dragons in Sunny Valley may have explained why maidens were becoming harder to find. Elliott battled to keep a lot of the good stuff in the story, including a line about being ‘up to your ASICs in dragons.’
The total campaign was very extensive and the storybook was only the beginning. AMDers who worked in Sunnyvale will remember a huge mural on the wall of the 915 Building with a dead dragon. I believe the mural is still there, carefully preserved under a new paint scheme. It was impossible to photograph, even with an extreme wide-angle lens.

Anyway, thanks for providing the link. It was fun thinking about the good old days – even when the times weren't so great!
John Greenagel

Entered By: David Laws
November 4, 2008

Title: From Vacuum Tubes to Very Large Scale Integration: A Personal Memoir
Author: Joseph C. Logue
Created: 1988
Publisher: IEEE
Donated By:
Filename: doc-4a2d5e83b6f46.pdf (Size: 1.70 MB)
Pages:
Cataloguer:
Copyright:
Description:
This article by Joseph C. Logue traces his journey through the various different forms of electronics and how they were developed and used at IBM. It also illuminates some of the reasons why particular decisions about various technologies were taken and the longer term results of those actions. It includes information on an early integrated counter (1953) and an experiment in 1966 using TI discretionary wired LSI (120 gates) devices.

Entered By: David Laws
June 8, 2009

Title: Court Room Demonstration System 1969 AL1 Microprocessor
Author: Lee Boysel
Created: April 3, 1995
Publisher: Lee Boysel
Donated By: Cloyd Marvin
Filename: doc-4946dbc7a541f.pdf (Size: 641 KB)
Pages: 7
Cataloguer:
Copyright:
Description:
Lee Boysel, founder of Four Phase Systems Inc in 1968 and designer of the company's AL1 processor chip, prepared the attached document to show that the AL1 incorporated Texas Instruments claims in microprocessor patent filings made several years later.

Entered By: David Laws
December 15, 2008

Title: The Intel 4004 Microprocessor: What Constituted Invention? [Article Reprint]
Author: William Aspray
Created: 1997
Publisher: IEEE Annals of the History of Computing
Donated By:
Filename: doc-47bd093e9dd2c.pdf (Size: 1.08 MB)
Pages: 12
Cataloguer:
Copyright:

Description:
This paper investigates the context for the development of one of the earliest microprocessors, the Intel 4004. It considers the contributions Intel employees, most notably Marcian E. “Ted” Hoff, Jr., and Federico Faggin, made and contributions other people made to this development who are not generally known, most notably Tadashi Sasaki and Masatoshi Shima.
From: IEEE Annals of the History of Computing, Vol. 19, No. 3, 1997

Entered By: David Laws
February 20, 2008

Title: “Turning potential into realities: The invention of the integrated circuit”
Author: Jack S Kilby
Created: December 8, 2000
Publisher:
Donated By:
Filename: doc-4a2d71778e54c.pdf (Size: 3.93 MB)
Pages:
Cataloguer:
Copyright:
Description:
Jack Kilby’s Nobel lecture December 8, 2000

Entered By: David Laws
June 8, 2009

Title: Technological Innovation in the Semiconductor Industry
Author: Robert R. Schaller
Created: 2004
Publisher:
Donated By:
Filename: doc-487ecec0af0da.pdf (Size: 6.76 MB)
Pages: 859
Cataloguer:
Copyright:
Description:
This 800 plus page Ph.D. thesis by Robert R. Schaller of George Mason University written in 2004 includes chapters on “The History and Evolution of Integrated Circuit Innovation” (Ch 6),” The Invention of the Microprocessor, Revisited” (Ch 7), and an Appendix on “Moore's Law Retrospective from 2004” that are well documented with numerous useful references.

Entered By: David Laws
July 16, 2008

Title: "How Europe missed the Transistor"
Author: Michael Riordan
Created: November 2005
Publisher: IEEE Spectrum
Donated By:
Filename doc-4b1beb566e8e8.pdf (Size: 945 KB)
Pages: 6
Cataloguer:
Copyright:
Description:

The most important invention of the 20th century
was conceived not just once, but twice. Article by Michael Riordan on the invention of the Transistron (the European transistor) by German scientists in 1948.

Entered By: David Laws
December 6, 2009

Title: General Micro-electronics, Inc.
Author: Phil Ferguson
Created: January 2006
Publisher:
Donated By: Phil Ferguson
Filename: doc-47bc675bcad98.pdf (Size: 83 KB)
Pages: 4
Cataloguer:
Copyright:
Description:
Notes by the former CEO of the first MOS IC company, General Micro-electronics on the founding and activities of the company prior to its sale to Philco-Ford in 1966.

Entered By: David Laws
February 20, 2008

Title: Major Historical Events in Packaging, Assembly & Test
Author: Gerald K. (Skip) Fehr
Created: May 14, 2006
Publisher:
Donated By:
Filename: doc-47dee56b1d0bd.pdf (Size: 641 KB)
Pages: 2
Cataloguer:
Copyright:
Description:
Skip Fehr is a member of the Packaging, Assembly & Test working group of the Semiconductor Special Interest Gruop (Semi SIG) of the Computer History Museum. He prepared the attached is of major historical events to inform the development pages on this topic on the "Silicon Engine" website.

Entered By: David Laws
March 17, 2008

Title: Wendell Sander - interview notes by Jeff Katz
Author: Jeff Katz
Created: July 16, 2006
Publisher:
Donated By:
Filename: doc-47e06406133ec.pdf (Size: 25 KB)
Pages:
Cataloguer:
Copyright:
Description:
Jeff Katz is a member of the steering committee of the Semiconductor Special Interest Group (Semi SIG) of the Computer History Museum. Jeff recorded the attached notes during an

interview with Wendell Sanger on July 16, 2006. Wendell worked on gate array and static memory devices at Fairchild Semiconductor R&D in the late 1960s. At Apple computer he worked on many rprojects including the Apple III and the iPOD.

Entered By: David Laws
March 18, 2008

Title: Analog IC Milestone notes
Author: David Laws
Created: August 2006
Publisher:
Donated By:
Filename: doc-4803f6cd478a1.pdf (Size: 19 KB)
Pages: 3
Cataloguer:
Copyright:
Description:
The attached Analog IC Timeline notes prepared during the development of the Silicon Engine website are substantially derived from Kent Lunberg's "Op Amp History" lecture slides.

Entered By: David Laws
April 14, 2008

Title: On the development of TTL at Sylvania and a 16-bit RAM at Transitron
Author: David Laws
Created: August 9, 2006
Publisher:
Donated By: David Laws
Filename: doc-47be05a3a124b.pdf (Size: 112 KB)
Pages: 3
Cataloguer:
Copyright:
Description:
Notes on an interview with Dr. Thomas A. Longo on the development of TTL at Sylvania and a 16-bit RAM at Transitron held in Palo Alto, California on Wednesday August 9, 2006.

Entered By: David Laws
February 21, 2008

Title: Jeff Kalb - Interview notes
Author: Stan Bruederle
Created: August 20, 2006
Publisher:
Donated By:
Filename: doc-4803f3ee6b8d1.pdf (Size: 12 KB)
Pages: 2
Cataloguer:
Copyright:
Description:
These notes were prepared by Stan Bruederle of Gartner Dataquest following a telephone conversation with Jeff Kalb on his early IC design career at TI and National Semiconductor.

Entered By: David Laws

April 14, 2008

Title: The Materiality of Microelectronics [Article Reprint]
Author: Christophe Lécuyer and David C. Brock
Created: September 2006
Publisher: Routledge
Donated By:
Filename: doc-47bba6f8808d6.pdf (Size: 105 KB)
Pages: 24
Cataloguer:
Copyright:
Description:
This paper describes a 'materials centered' approach to the history of microelectronics with focus on developments in the techniques of crystal growing from:
History and Technology
Vol. 22, No. 3, September 2006, pp. 301–325

Entered By: David Laws
February 19, 2008

Title: Digital Watch history report
Author: Douglas Fairbairn
Created: September 20, 2006
Publisher:
Donated By:
Filename: doc-47dee3c2eb009.pdf (Size: 5.79 MB)
Pages:
Cataloguer:
Copyright:
Description:
Douglas Fairbairn is a member of steering committee of the Semiconductor Special Interest Group (Semi SIG) of the Computer History Museum. He prepared the attached notes on the history of the digital watch to inform the development of the System on Chip (SOC) page of the "Silicon Engine" website.

Entered By: David Laws
March 17, 2008

Title: Semiconductor Memory milestone notes
Author: David Laws and Jeff Katz
Created: November 2006
Publisher:
Donated By:
Filename: doc-4803f82fa3ba8.pdf (Size: 73 KB)
Pages:
Cataloguer:
Copyright:
Description:
The attached table of key milestones in the history of semiconductor memeory devices was developed for use in the Silicon Engine website project.

Entered By: David Laws
April 14, 2008

Title: Pete Thomas - interview notes by Jeff Katz
Author: Jeff Katz
Created: November 7, 2006
Publisher:
Donated By:
Filename: doc-47e0611a07b8c.pdf (Size: 16 KB)
Pages:
Cataloguer:
Copyright:
Description:
Jeff Katz is a member of the steering committee of the Semiconductor Special Interest Group (Semi SIG) of the Computer History Museum. Jeff recorded the attached notes during an interview with Pete Thomas on November 7, 2006.
Peter discussed his recollections of memory systems development at Fairchild Communications (Systems) Division in the early 1970s and at Intel Memory Systems Division mid 70s to early 80s.

Entered By: David Laws
March 18, 2008

Title: Signetics Corporation - Timeline of Key Events
Author: Donald F. Liddie
Created: December 28, 2006
Publisher:
Donated By: Don Liddie
Filename: doc-47cca1db3fe69.pdf (Size: 57 KB)
Pages:
Cataloguer:
Copyright:
Description:
This timeline of key events in the history of Signetics Corporation was compiled by Don Liddie, an employee of the company for 39 years who retired as Executive Vice President in 1995. Signetics was founded in 1961 as the first company exclusively devoted to building integrated circuits.

Entered By: David Laws
March 3, 2008

Title: Rose Semiconductor Packaging Collection
Author: Daniel J. Rose
Created: 2007
Publisher: Rose Associates, Newark CA
Donated By: Rose Associates, Newark CA
Filename: doc-4810f4be2c67c.pdf (Size: 2.94 MB)
Pages: 12
Cataloguer:
Copyright:
Description:
The document in the attached pdf “A Semiconductor Packaging Hardware Donation to Semiconductor Equipment and Materials International (SEMI)” was prepared by Daniel J. Rose to accompany his donation of a collection of packing hardware for semiconductors to SEMI. SEMI transferred this collection to the Computer History Museum in 2007.
This collection of packaging hardware illustrates the history of packaging technology, beginning in the late 1940s, with the evolution of the simple transistor. In the late 1950s, with the invention of

the integrated circuit (IC), technology moved on through the 1960s, with the evolution of sophisticated packaging hardware. Progress continued into the 1970s, with extremely complex packaging hardware. Further sophistication developed through the 1980s and 1990s, and there are several samples of this technology in the collection.

Entered By: David Laws
April 24, 2008

Title: "Monolithic Concept and the Inventions of Integrated Circuits by Kilby and Noyce"
Author: Arjun N. Saxena
Created: May 20, 2007
Publisher: Nano Science and Technology Institute
Donated By:
Filename:oc-49ba93ef59fb3.pdf (Size: 1.18 MB)
Pages:
Cataloguer:
Copyright:
Description:
In "Monolithic Concept and the Inventions of Integrated Circuits by Kilby and Noyce" Dr. Saxena argues that "The debate over who invented what kind of IC will be resolved by the facts presented in this paper. In some respects, Kilby and Noyce have been denied their due recognition, and in some other respects they have been given more credit in the entire field than they are due. It will become clear that the key concepts for the monolithic-IC were first documented by Noyce, even though the reduction to practice of his invention was done by others, and it depended crucially on Hoerni's and Lehovec's inventions. While Kilby's invention was not for the monolithic-IC, he did anticipate some of the monolithic concepts for the devices and their isolation in an IC. But Kilby missed the key concepts of monolithic interconnects."
The paper was presented at the Nano Science and Technology Institute Annual Conference May 20-24, 2007, Santa Clara Convention Center, California, USA

Entered By: David Laws
March 13, 2009

Title: Joel Karp - interview notes by Jeff Katz
Author: Jeff Katz
Created: June 4, 2007
Publisher:
Donated By:
Filename: doc-47e05e3d76fe5.pdf (Size: 40 KB)
Pages:
Cataloguer:
Copyright:
Description:
Jeff Katz is a member of the steering committee of the Semiconductor Special Interest Group (Semi SIG) of the Computer History Museum. Jeff recorded the attached notes during an interview with Joel Karp on June 4, 2007 on the topic of the development of MOS Dynamic Random Access Memories (DRAMs). Joel was at Intel from shortly after its founding in mid 1968 through early 1973 where he worked on the development of Intel's first Silicon-Gate 256 bit MOS RAM (1101), the 1102 and 1103 1K DRAMs and the 2107 4K DRAM.

Entered By: David Laws
March 18, 2008

Title: Robert Palmer - interview notes by Jeff Katz
Author: Jeff Katz
Created: June 7, 2007
Publisher:
Donated By:
Filename: doc-47e061f8e4cec.pdf (Size: 22 KB)
Pages:
Cataloguer:
Copyright:
Description:
Jeff Katz is a member of the steering committee of the Semiconductor Special Interest Group (Semi SIG) of the Computer History Museum. Jeff recorded the attached notes during a telephone interview with Robert Palmer on June 7, 2007. Bob discussed his recollections of the development of Mostek's 4006 1K DRAM and the 4097 and 4027 4K DRAMs, for which he was the process and manufacturing manager. Bob was at Mostek from its founding in 1969 through its acquisition by United Technologies Corp in 1980, until it's acquisition by Thomson CSF (later ST Micro) in 1985.

Entered By: David Laws
March 18, 2008

Title: From Bell Labs to Silicon Valley [Article Reprint]
Author: Michael Riordan
Created: October 2007
Publisher: The Electrochemical Society Interface
Donated By:
Filename: doc-47be5f8070a32.pdf (Size: 2.50 MB)
Pages: 6
Cataloguer:
Copyright:
Description:
From Bell Labs to Silicon Valley: A Saga of Semiconductor Technology Transfer, 1955-61*
Despite the fact that the Bell Telephone Laboratories had originated almost all the silicon technology eventually used to invent the integrated circuit, or microchip, this revolutionary breakthrough occurred elsewhere — at Texas Instruments, Inc. and Fairchild Semiconductor Corporation.
Article from: The Electrochemical Society Interface, Fall 2007, pages 36-41 by Semiconductor Special Interest Group member Michael Riordan.

Entered By: David Laws
February 21, 2008

Title: "The Untold 8 Year History of the Microprocessor's Origins"
Author: Lee Boysel
Created: October 12, 2007
Publisher:
Donated By:
Filename: doc-490b7b41ebafe.pdf (Size: 1.81 MB)
Pages: 16
Cataloguer:
Copyright: Lee Boysel
Description:
"The Untold 8 Year History of the Microprocessor's Origins" is a presentation given by Lee Boysel at his alma mater, the University of Michigan, in 2007. It includes chip photographs of an MOS

DRAM (256-bits) he designed at Fairchild in July 1968 and the AL1 8-bit microprocessor slice produced at Four Phase Systems in March 1969.
The original is posted at:
http://inst-tech.engin.umich.edu/media/index.php?sk=ece-inv-lectures&id=1036

Entered By: David Laws
October 31, 2008

Title: The Silicon Dioxide Solution [Article Reprint]
Author: Michael Riordan
Created: December 2007
Publisher: IEEE Spectrum
Donated By:
Filename: doc-47bd0ac1dd7e8.pdf (Size: 8.18 MB)
Pages: 6
Cataloguer:
Copyright:
Description:
How physicist Jean Hoerni built the bridge from the transistor to the integrated circuit. Written by Michael Riordan, a member of the Steering Committee of the Semiconductor Special Interest Group of the Museum.

Entered By: David Laws
February 20, 2008

Title: Semiconductor Bonding Wire Report
Author: Rudi Griffin & Gerald K. (Skip) Fehr
Created: March 17, 2008
Publisher:
Donated By:
Filename: doc-47fbf3645298c.pdf (Size: 6.24 MB)
Pages: 10
Cataloguer:
Copyright:
Description:
This report on the development of Semiconductor Bonding Wire technology was prepared by Rudi Griffin & Gerald K. (Skip) Fehr of the Semiconductor Special Interest Group, Packaging, Assembly and Test Working Group.

Entered By: David Laws
April 8, 2008

Title: Bob Norman's Story
Author: Robert H. Norman
Created: July 10, 2008
Publisher:
Donated By:
Filename: doc-4877827ce6482.pdf (Size: 125 KB)
Pages: 2
Cataloguer:
Copyright:
Description:

The attached letter from Robert H. Norman written to his nephew Kevin in July 2008 describes his introduction to electronics and subsequent contributions to the development of Micrologic integrated circuits at Fairchild Semiconductor and their use in the Apollo computer.

Entered By: David Laws
July 11, 2008

Title: Need for miniaturization and invention of the silicon integrated circuit
Author: Charles Phipps
Created: September 2008
Publisher:
Donated By:
Filename: doc-49bdd88e0e075.pdf (Size: 36 KB)
Pages: 5
Cataloguer:
Copyright:
Description:
Text of a talk given by Charles Phipps on September 11, 2008 at a TI seminar marking the 50th anniversary of Jack Kilby's contribution to the invention of the IC. Includes a description of the management process and decisions involved in the development of the integrated circuit business at the company.

Entered By: David Laws
March 15, 2009

Title: "Bob Norman's Random Memories of Silicon Valley Daze"
Author: Robert H. Norman
Created: October 28, 2008
Publisher:
Donated By:
Filename: doc-490b79e506273.pdf (Size: 124 KB)
Pages: 2
Cataloguer:
Copyright: Robert H. Norman
Description:
"Bob Norman's Random Memories of Silicon Valley Daze" are transcribed from an e-mail with a collection of tid-bits from his experiences in the Valley in the 1960s.

Entered By: David Laws
October 31, 2008

Title: Mask Making facility at GM-e (1964)
Author: Dan Borrer
Created: November 1, 2008
Publisher:
Donated By: Dan Borrer
Filename: doc-490cbbe5590f9.doc (Size: 48 KB)
Pages:
Cataloguer:
Copyright:
Description:
This Mask making method used at General Micro-electronics in 1964 was developed by Gerry Henriksen, Chris Van Peski, Tice Vanos and Les Woods of Electromask, and I believe that

Signetics used one that was very similar to it, which was built and installed just before or after ours. The next mask making system developed by Electromask was the very first laser-interferometer-controlled step and repeat mask making camera system (the granite stage floated on air bearings), which was vastly superior to the David Mann lead-screw technology. The first of these was installed at Cartesian Corp.

Entered By: David Laws
November 1, 2008

Title: Automatic Test Equipment list of models
Author: Paul Sakamoto et al
Created: November 22, 2008
Publisher: TAP Committee of Semi SIG
Donated By:
Filename: doc-4931986f62a81.xls (Size: 64 KB)
Pages:
Cataloguer:
Copyright:
Description:
The attached spread sheet of historic Automatic Test Equipment (ATE) systems and manufacturers is a work in progress by the Test, Assembly and Packaging working group of the Semiconductor Special Interest Group of the museum. Contributors include Gerald K. "Skip" Fehr; Phil Burlison; Rudy Griffin, Paul Sakamoto, and Garry Gillette. It will be updated as more information is entered.

Entered By: David Laws
November 29, 2008

Title: Japanese Semiconductor Statistics
Author: Mr. Aihara
Created: 2009
Publisher: Society of Semiconductor Industry Seniors
Donated By:
Filename: doc-4b3a32d52baa6.pdf (Size: 53 KB)
Pages: 1
Cataloguer:
Copyright:
Description:
The attached file created by the Japanese Society of Semiconductor Industry Seniors (http://www.ssis.gr.jp/eg/ssiseg.htm) shows sales of major categories of semiconductor devices in Japan from 1957 to 2008.

Entered By: David Laws
December 29, 2009

Title: History of Transistors
Author: Jack Ward
Created: May 2009
Publisher: Transistor Museum
Donated By: Jack Ward
Filename: doc-4a2d6f1416aa8.pdf (Size: 1.01 MB)
Pages: 14
Cataloguer:

Copyright:
Description:
This pdf is a secial edition of the "History of Transistors" volume on "Germanium transistors used in digital computers from the 1950s/1960s" prepared for the Computer History Museum by the author.
For more information on the Transistor Museum visit: www.transistormuseum.com
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Entered By: David Laws
June 8, 2009

Title: Micrologic development notes
Author: Robert Norman
Created: June 24, 2009
Publisher:
Donated By:
Filename: doc-4b1082431f1e0.pdf (Size: 21 KB)
Pages:
Cataloguer:
Copyright:
Description:
Bob Norman designed the DCTL circuits for the first planar integrated circuits, Fairchild Micrologic, in late 1959 and 1960. He wrote the attached e-mail that contains several references and interesting information on the project.

Entered By: David Laws
November 27, 2009

Title: "The Silicon Engine" Artifact Exhibit Catalog
Author: David Laws
Created: June 30, 2009
Publisher: CHM
Donated By:
Filename: doc-4a77c51d61197.pdf (Size: 642 KB)
Pages: 14
Cataloguer:
Copyright:
Description:
“The Silicon Engine,” a new exhibit to celebrate the 50th anniversary of the integrated circuit (IC) at the Computer History Museum (CHM), opened on June 30, 2009. The above file is pdf of the artifact exhibit catalog
The exhibit draws on the Computer History Museum’s extensive collection of oral histories gathered from leading pioneers in the field of semiconductors. It features a multi-screen theater, which will show an 8-minute documentary on the invention of the transistor, its role as a building block of the integrated circuit, the rapid growth of semiconductors and the profound effect these technologies have had on modern life.
The exhibit also features artifacts from CHM’s collection and two personal viewing stations where visitors can select and view multiple excerpts of technology pioneers discussing their work and its impact. Kirsten Tashev, the Museum’s VP of Collections and Exhibits, and David Laws, of the Museum’s Semiconductor Special Interest Group, co-curated this exhibit.

Entered By: David Laws
August 3, 2009

Title: Microprocessor Marketing Wars
Author: Panel Participants
Created: November 20, 2009
Publisher: CHM
Donated By: David Laws
Filename: doc-4b1da510c69f6.pdf (Size: 1.54 MB)
Pages: 8
Cataloguer:
Copyright:
Description:
Copy of slides and notes created by the participants (listed on the first page) in preparation for a panel discussion on the Microprocessor Marketing Wars presented at the Computer History Museum on November 20, 2009.

Entered By: David Laws
December 7, 2009

References

There are no references for this company in the collection

Discussions

There are no discussions for this company in the collection