

The Origins of Silicon Valley: Roots in Ham Radio

Paul Wesling KM6LH,
H-P (retired), IEEE Life Fellow

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Bay-Net

Amateur Radio Club
& Repeater Network

WW6BAY



Classic Silicon Valley: 1976

Homebrew Computer Club

- Hobbyists meeting in Menlo Park and at SLAC



- Steve Wozniak and Steve Jobs 6502 (\$20)
- The Apple I (to sell to friends)



Neighbors; introduced by a friend

Classic Silicon Valley: 1976

- Wozniak-Jobs partnership
 - called it “Apple Computer Company”
 - Started in a **garage** in Los Altos
 - Now has largest stock market capitalization
 - Most **valuable brand** in the world

How could this happen?
Why in the SF Bay Area?

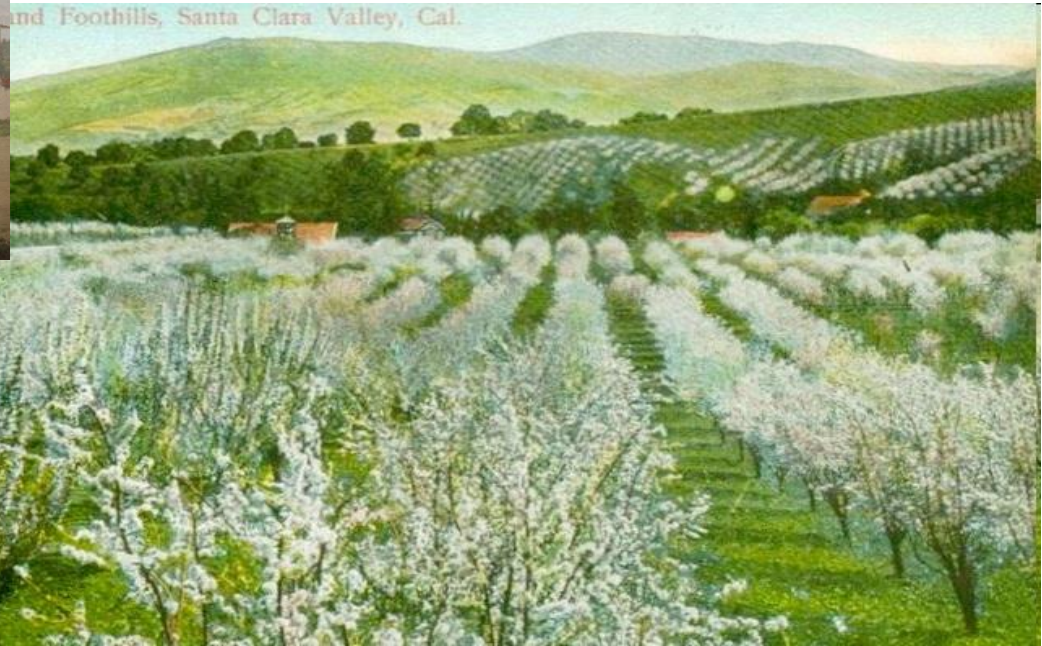


Before 1900 ...



The Santa Clara Mission

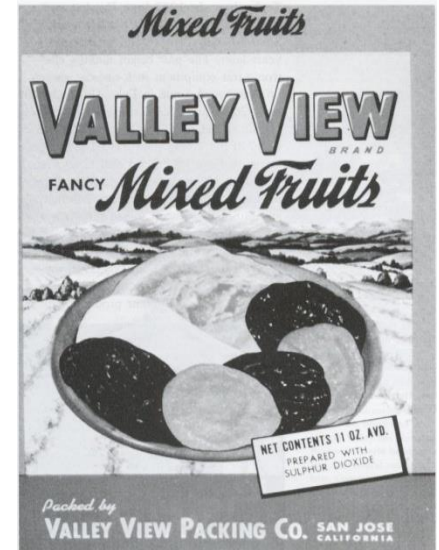
and Foothills, Santa Clara Valley, Cal.



“Valley of the Heart’s Delight”

Before 1900

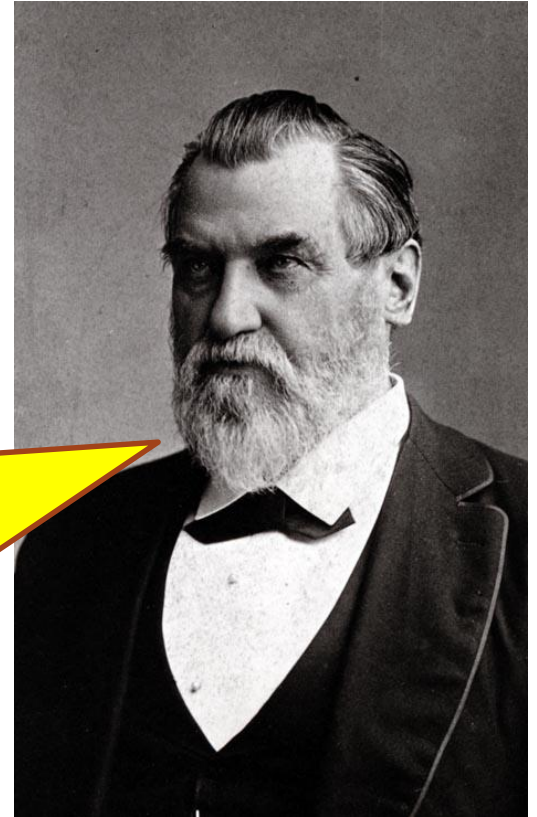
This was more typical ...



Late 1880's Prediction

“Some day you will see Palo Alto blooming with nearly all the flowers of the earth and the fruit and shade trees of every zone.... In the future we shall can this fruit and send it all over the globe in exchange for wealth ...”

... but soon *technology* was to overtake agriculture.



Senator Leland Stanford

Let's Go Back ...

■ Federal Telegraph

- Formed in 1909 in Palo Alto (by Cyril Elwell, a Stanford grad)
- **Lee de Forest** invented the audion in 1907
- Invented/patented oscillator, amplifier circuits while working at Federal Telegraph in Palo Alto, 1911-1913
- Pioneered continuous-wave radio



Improved triode

No. 841,288

L. DE FOREST.
WIRELESS TELEGRAPHY.
APPLICATION FILED APR. 17, 1906.

PATENTED JAN. 15, 1907.

2 841276-49827 1

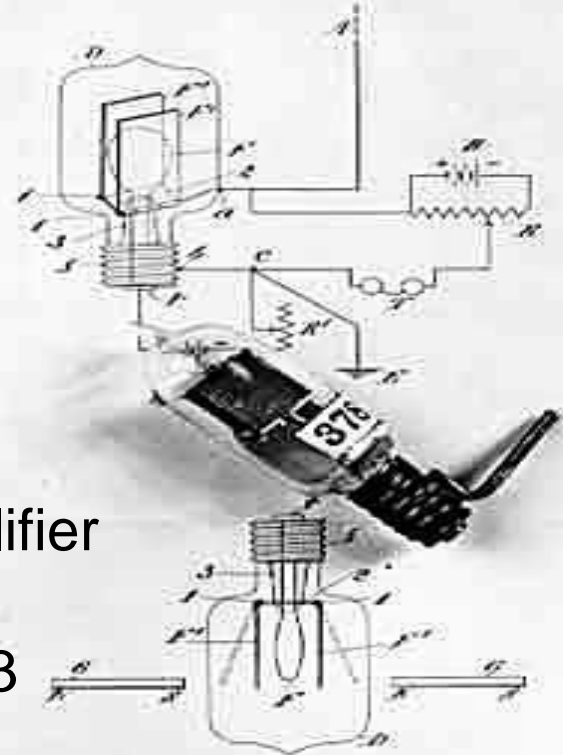
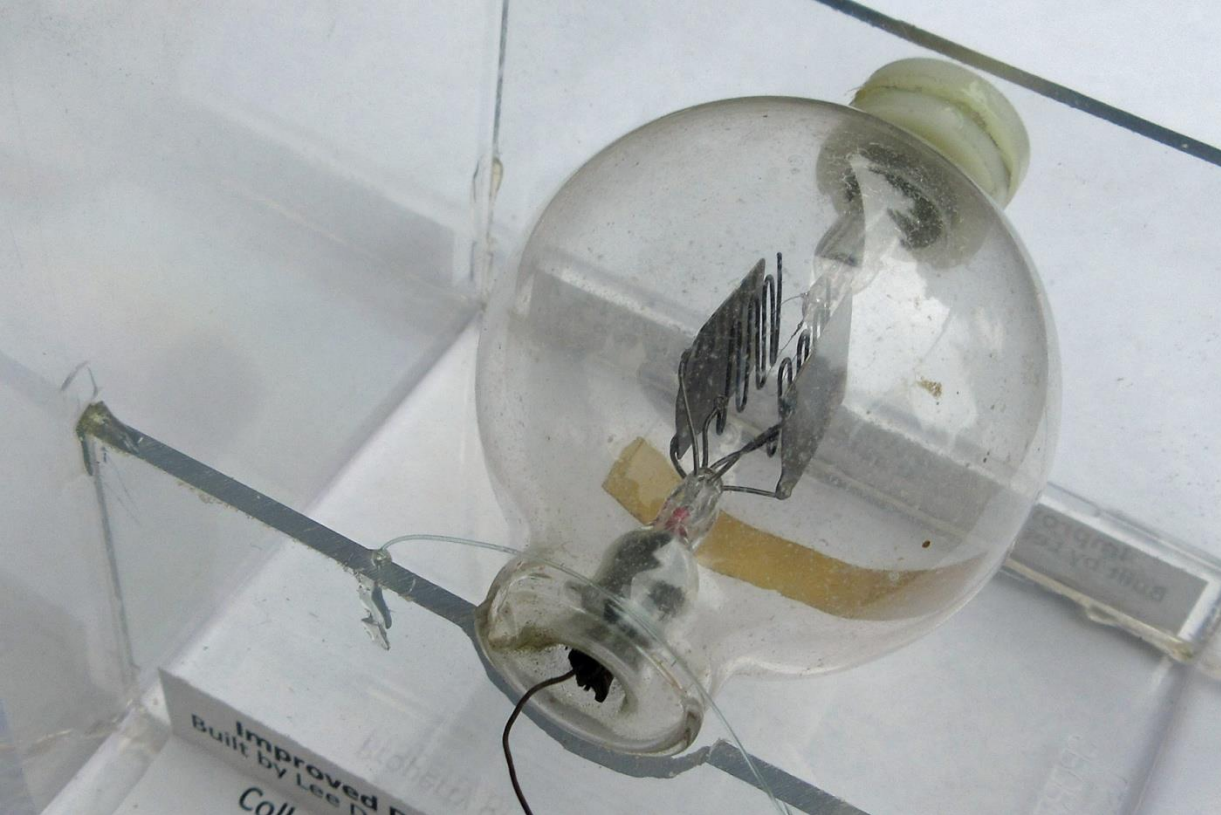


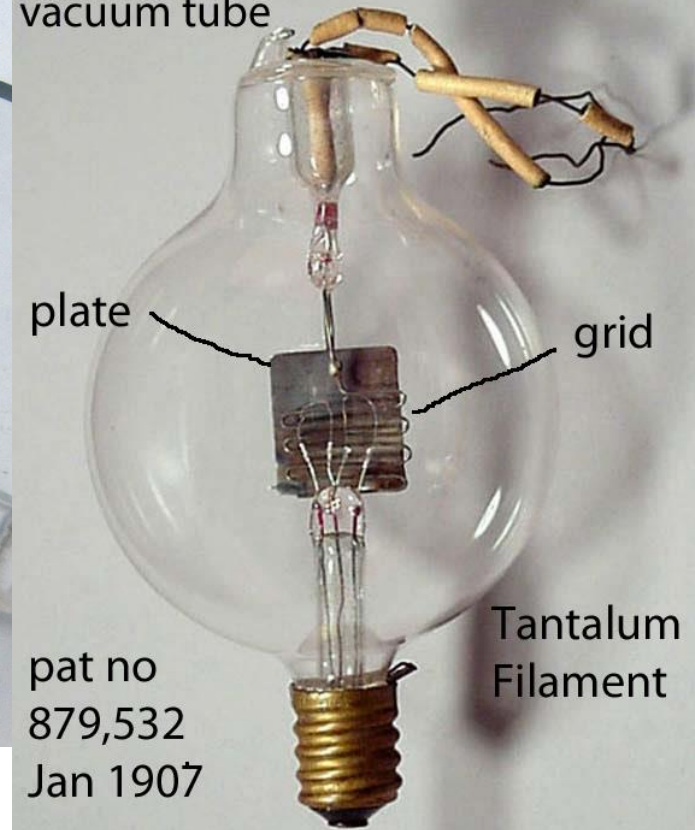
FIG. 2.



Improved Dual-Wing Grid Audion ca1913

Built by Lee De Forest at Federal Telegraph, Palo Alto
Collection of Leonard Fuller, Chief Engineer,
Federal Telegraph (1912-1919)
Property of Clark Canham, San Jose

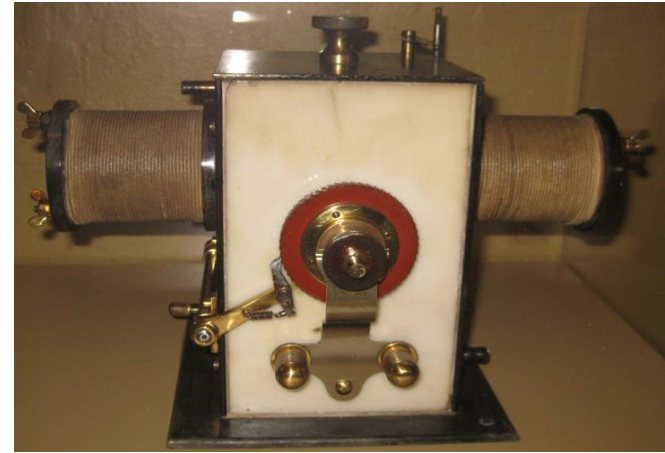
First successful three-element
vacuum tube



Single-Wing Grid Audion ca1912

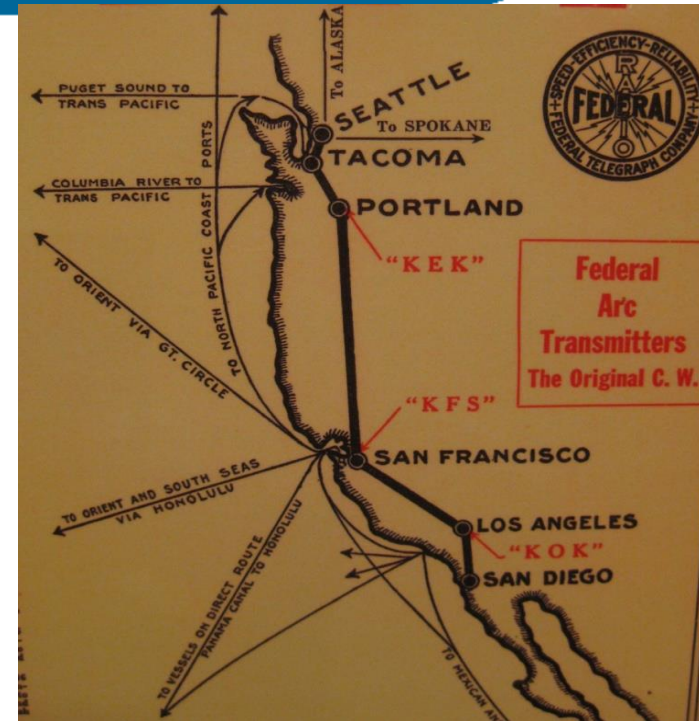
Federal Telegraph

- Poulsen Arc Transmitter, 1909
 - Demonstrated sending CW, voice
- Raised funds from “angel investors”, including David Starr Jordan, Stanford’s president (plus Marx, Branner)
- Demonstrated communication from S.F. to Honolulu in 1912 →
- **First venture capital**
- **Stanford’s Involvement**



Federal Telegraph

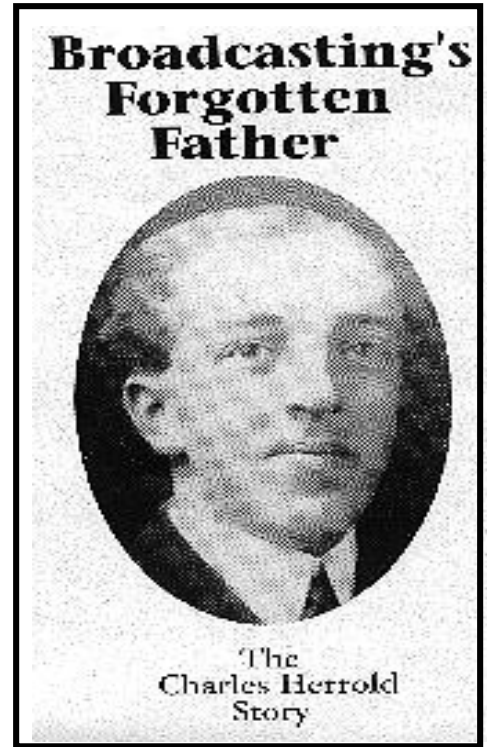
- By 1920s: three high-power stations that covered much of Pacific Ocean
- In support of maritime shipping companies
- California Historical Plaque in Palo Alto



Let's Go Back ...

■ 1st regular commercial radio broadcast

- Charles “Doc” Herrold
 - Early Stanford engineering student
 - Started a San Jose school near SJSU to teach radio arts (1909)
- First Commercial broadcast, San Jose, 1909 voice and music: “San Jose Calling”
- FN, then SJN, then KQW, **becomes KCBS**
740 AM, 106.9 FM (also founded KLIV)



Example: Early Roots of Entrepreneurial Technology

■ Otis Moorhead

- Early Stanford engineering grad
- Radio amateur & vacuum tube entrepreneur
- Established **Moorhead Laboratories**
 - In San Francisco in 1917
- Manufactured “bootleg” receiving tubes for radios
- A **patent-infringement lawsuit** put him out of business in the early 1920s.



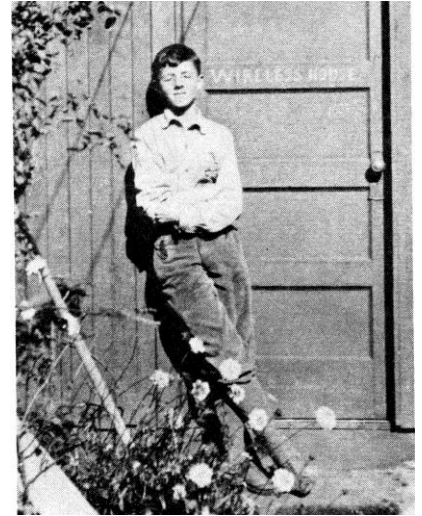
Defining Events

- Independent private **wealth**, from California gold rush
- Titanic Sinking in 1912
- World War I
 - Importance of **technology**
- US Navy “push” for ship-to-shore, other communications modes
- **Economics**: desire to replace expensive telegraph lines, undersea cables with the new “wireless” technology
- Brought frenzy of activity, funds to S.F. Bay Area



We Now Follow Three Pioneers

- **William Eitel**
- **Jack McCullough**
- **Charles Litton**
- Bay Area families with a strong history of entrepreneurship
- Born/raised here



Charles Litton, 11,
Outside his
“Wireless House”;
two 100’ towers

William Eitel

- Took shop classes at Los Gatos High School
- Worked in his father's quarry
 - ass't blacksmith, machine operator
- Visited shops of Hall-Scott Motor Car Co.
 - Operation of Complex machinery

William Eitel, W6UF
1908 - 1989



Bill Eitel in 1941 (Photo courtesy of Dave Atkins, W6VX)

Jack McCullough, Charles Litton

- Attended **California School of Mechanical Arts**
Now Lick-Wilmerding High School, San Francisco (private)
- Opened in 1895; free education for boys, girls
- One of the best West Coast **technical high schools**
 - Rigorous training in the mechanical trades
 - Gained "a realistic 'feel' of materials and processes" [Litton]

Jack McCullough, **W6CHE**
1908 - 1989



Jack McCullough, Charles Litton

- **McCullough** continued at a local junior college
- **Litton** enrolled in Stanford Engineering School:
 - Classes with strong practical flavor
 - Got BS in 1924
 - Grad work in communication engineering
 - Small department (3 instructors)
 - Took Stanford's first course on communication engineering fundamentals

Eitel, Litton, and McCullough

- Introduced to **amateur “ham” radio** through their families and friends in 1910’s, ’20’s
- **Ham Radio in the SF Bay Area**
 - Isolated; maritime orientation; major seaport
 - Shipping companies needed radio operators
 - Over 1,200 licensed amateurs
 - **10 percent** of US total (a **bubble**)

Ham Radio in SF Bay Area

- Active center of radio production in the 1910s, '20s
- Electronics firms:
 - **Remler** - made radio sets (“Radio **Elmer**” spelled backwards)
 - **Magnavox** - leading manufacturer of loudspeakers
 - **Heintz and Kaufman** Designed custom radio equipment
 - **Federal Telegraph** Produced radio transmitters in the 1910s
 - up to 1,000,000-watt transmitters in 1919.
 - Radio parts available to **local hobbyists**
 - Jobs for radio amateurs

Ham Radio Subculture

- **Camaraderie** and intense sociability
 - A way to make friends
 - Communicating "over the air" and face to face
- **Egalitarianism** and a democratic ideology
 - little heed to **distinctions of class**, education
 - Santa Clara County radio club, which Eitel chaired in the mid 1920s, had "**farm boys, Stanford students, Federal Telegraph technicians, and retired executives**"

Ham Radio Subculture

- Representatives of grass roots hobbyists
 - In contrast to large companies, monopolies
- Interest in extending radio technology
 - Built personal reputations: innovating new circuitry; clever transmitters; contacts with faraway lands
- Mix of competitiveness and collaboration

**A lot like Home Brew Computer Club,
and today's Silicon Valley ...**

Another Pioneer: Young Fred Terman

- San Bernardino, Glendale, then Stanford
- Herbert Hoover rented across the street; HH Jr; also Roland Marx, George Branner, Jack Franklin

HH Jr: “All three of us [*Fred, Jack*] were neighbors, and upon pushing the key of one of our imposing contraptions, would holler out the window to see if it had been received on the other side of the street.”



Herbert Hoover, Jr, ca 1923

Young Fred Terman

- “If you saw a 90 foot pole sticking up somewhere, you’d go and knock on the door and get acquainted with him.”
- Hung out at Federal Telegraph (a few blocks away), then worked there one summer



Fred Terman at 17, with his Ham radio

Following our Entrepreneurs ...

- Eitel, Litton, McCullough, ham friends
 - Experimented with **vacuum tubes**
 - Built their own parts, equipment
- Made notable contributions
 - 1924: Litton and the Stanford radio club made **first radio contact** with Australia, New Zealand
 - 1928: Eitel pioneered **10-meter waves** (30 MHz)
 - transcontinental communication

The Tube Business

- General Electric, Westinghouse, AT&T
 - All East Coast companies
 - Developed hi-power transmitting tubes in early 1920s
 - Difficulties in producing consistent, reliable ones
 - Required precise machining, glass blowing (Pyrex)
 - Exotic materials, sophisticated sealing techniques

Following our Entrepreneurs ...

- **Litton** got local job through a ham friend:

- Research at **Federal Telegraph**

- **Leonard Fuller** (Stanford's first Engineering PhD, 1919) had served as Chief Engineer
- Built up to 60 engineers
- Became sole supplier of radios to IT&T



- **Eitel** got local job through ham friend:

- Mechanic at **Heintz and Kaufman Inc**

- Heintz was a ham -- focus on HF radio equipment

- Recruited **McCullough** a year later

Federal Telegraph,
at Perham home,
916 Emerson St,
Palo Alto (1912)

The Tube Business in the '20s

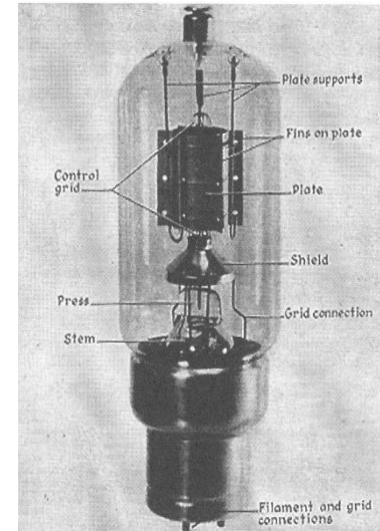
- Could not buy transmitting tubes on open market
 - Navy and GE set up **RCA** to ensure US dominance
 - Took over non-US companies: Telefunken, Marconi ...
 - RCA, GE, Western Electric, and Westinghouse
 - **Exclusive cross-licensing** of 2000 radio patents
 - Sole producers/distributors of power-grid tubes
 - Refused sale to Bay Area firms
 - Seen as threats to RCA, USA control
- So both companies needed to develop triodes
 - Litton, Eitel headed their tube shops

Tube Shops' Challenge

- Design around ~250 RCA patents
 - Enormously difficult task
- Hired locally (many were hams)
 - Eitel, Litton **collaborated** with each other (*novel!*)
 - Based on friendships over the years
- Worked closely with **patent attorneys**

Tube Shops' Challenges

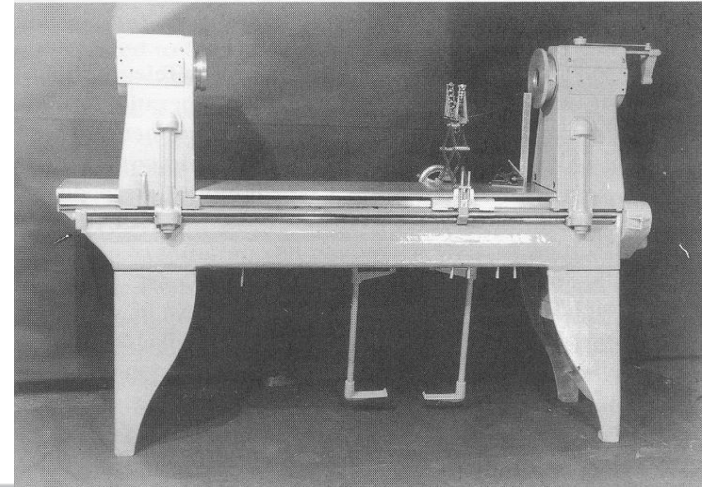
- Heintz, Eitel, and McCullough engineered a rugged **new** power tube:
 - New materials, manufacturing methods
 - Tube's plates of tantalum (avoid patents)
 - New shock-resistant seals
 - Create higher vacuums (better reliability)
- More reliable, longer life than RCA's tubes
- **Didn't infringe RCA's patents**



Heintz and Kauffman
354 Power Triode Tube

Tube Shops' Challenge

- Litton **invented** the glass lathe
 - For assembly, glass blowing, and sealing
 - Make complex tubes in large quantities
 - High repeatability, precision
- Built tube shop on **parents' property**



The US Depression

■ Formed Eitel-McCullough Inc (Eimac)

– To build high-power, high-frequency tubes

■ Financing:

– Harrison: real-estate agent in San Bruno

– Preddey: ran movie theaters in SF

– Eitel and McCullough brought their know-how

– Ownership, profits to be shared

Precursor to today's Menlo Park Venture-Capital Firms



EIMAC 150-T The Tube You Asked For Is Here At Last!
IN EVERY IMPORTANT FEATURE— UNSURPASSED

HERE is a tube, new and original in its design. It fills the most severe requirements of amateur practice. High output is obtained with low grid driving voltage and low plate voltages. Exceptionally high vacuum increases usable filament emission and prolongs tube life. Tantalum grid and plate construction means maintenance of high vacuum even when overloaded. Externally low inter-electrode capacitance for high efficiency at high frequencies. Isolated grid and plate leads, in conjunction with elimination of internal leads, insure freedom from arc-over or breakdown. Low voltage double-V filament reduces hum, increases filament ruggedness and life and increases mutual conductance. The large MOCSEK envelope, free from discoloration, allows maximum heat radiation without bulky physical dimensions. Improved 50-watt base insures rigidity and freedom from short-circuits. "Clamp" grid structure minimizes electronic shadowing effects on the plate.

Characteristics:
EIMAC-150-T Triode

fil. Voltage 5 V., fil. Current 10 A.;	Rated Plate Dissipation 150 W., Avn.
Factor 1; Max. Plate Current 200 Ma.	Plate Voltage 200-7500 Volts
Plate Resistance 2750-15000 Ohms	Max. Mutual Conductance 3600-15000
Normal Power Output 150W, 300W, 450W, 600 W, 750 W	PRICE \$24.95, Sold Only by Reputable Dealers.

More POWER per dollar! Fewer dollars per hour of useful life! The result of six years' experience exclusively building transmitting tubes for ship, mobile, portable and amateur use. Unconditionally guaranteed to be gas-free, and against mechanical defects for two years.

"COMPARE AND REFLECT"

EITEL-McCULLOUGH, INC.
San Bruno, California, U. S. A.



The US Depression

- Litton, Eitel, McCullough **cooperated** closely
 - Litton helped set up Eimac vacuum tube shop
 - Gave castings, engineering blueprints for lathe
 - **Freely exchanged** technical, commercial information
 - This reduced risks, for the two small tube-related businesses

**Like Jobs & Wozniak,
Homebrew Computer Club**

The US Depression

- 1936: **Frederick Terman** asked Litton to join Stanford EE dept as lecturer
 - Shared knowledge with staff, students
 - Sperry \$1000 Litton klystron grant: let Terman bring **Packard** to campus for grad studies
 - with Litton, Hewlett, others
- Formed Hewlett-Packard



Demonstrates University/Industry cooperation

Threats to Peace

- Growing threats from Japan and Germany
 - President Roosevelt rebuilt the Army, Navy
 - New electronic system: **RAdio Detection And Ranging (radar)**
- US NRL needed high-voltage high-frequency transmitting tubes for radar
 - Only Eimac's tube (the 50T) worked well at the high voltages and frequencies (200 MHz) needed
 - First order of 10,000 tubes in 1940 (3,000,000 during war)!



Eimac 50T

Tubes for Hams

- Transmitting Tube:
 - Eimac 3-500Z
 - Designed in 1968
 - 3000 volts; up to 110 MHz
 - Forced-air cooled
 - Full legal power (using 2)



Courtesy of Mike Yamamoto

- This one: built in Oct. 1980. Handle carefully!

The Klystron

- Russell and Sigurd Varian
- They worried about Germany
 - Hoped to use microwaves to detect planes
 - 1937: Moved to Stanford's labs to work with Hansen
 - developed the **klystron** in 1937
 - Used Litton's free **advice**
 - Used Hansen's theoretical assistance

Rus and Sig,
boys in Palo Alto



The Klystron - PA Times, Jan. 30, 1939

TWO ANNIVERSARIES



For Franklin Delano Roosevelt it was a birthday—his 57th—and the occasion for a nation-wide rally in behalf of a great humanitarian movement, the campaign against infantile paralysis. Dimes poured into the White House from individuals in every part of the nation while movie and stage stars gathered in Washington and other cities for birthday balls.

Meanwhile, across the Atlantic, Adolf Hitler celebrates the sixth anniversary of Nazi accession to power by going on the air with a warning to other nations to keep hands off Germany's development. A threat that she must have colonies, a denunciation of Bolshevism, and a defense of the policies which have raised a storm of protest among democratic nations of the world.



Palo Alto Times

AN INDEPENDENT NEWSPAPER

47th Year—No. 25

PALO ALTO, CALIFORNIA, MONDAY EVENING, JANUARY 30, 1939

5c copy—75c month
\$7.00 year in advance

Hitler Warns: Let Us Alone!

Denies Plan To Attack Other Lands

Anniversary Address Is Denunciation Of Bolshevism

By LOUIS F. LOCHNER
BERLIN, Jan. 30 (AP)—Adolf Hitler raised Germany's claim for colonies today and warned western powers against "interfering in matters concerning us alone."
Germany needs colonies for economic assistance, he told the Reichstag on the occasion of the sixth anniversary of the Nazi rise to power.
"If others do not believe this impair our rights," he continued.

He disclaimed any idea that Germany needed colonies "to set up armies there."
"I need not assure you that in the future also we shall tolerate no attempts at interference in matters concerning us alone with the purpose of preventing natural and sensible solutions."
Hitler ridiculed any idea that Nazi Germany was out to attack or divide up North or South America, Australia or the

NEW STANFORD RADIO INVENTION HERALDS REVOLUTIONARY CHANGES



SIGURD VARIAN

State Official Tells of Plan To Widen 101

Definite assurance that the



RUSSELL VARIAN

Klystron Harnesses Ultra Short Wave Transmission

By JULIUS L. JACOBS
An invention so breath-taking in its possibilities, that it may alter the future radio development of aeronautics, as well as telephone, telegraph, and television communication, was announced today by Dr. Ray Lyman Wilbur, president of Stanford University.

Born in the brain of a Pan-American Airways pilot as he flew the Latin-America route, the invention was developed and perfected of Stanford University. The university holds the patent on the amazing new apparatus, which has harnessed the forces of ultra-short-wave radio rights have been turned over to the Sperry Gyroscope Corporation, which will make possible the commercial development and production of the new discovery in radio technique.

By a \$25,000 gift to the Stanford physics department, last year, the gyroscope people made it possible for the inventors to improve the working model, which they hold the lease on the

Six Killed In Blizzard

CHICAGO, Jan. 30 (AP)—A paralyzing blizzard whipped across the southern Great Lakes states and the Ohio valley today, burying Chicago under one of the heaviest snowfalls on record.

Forecaster C. A. Donnel said if the storm continued all day the city might have snow totaling more than the existing record of 19.2 inches in March, 1939. The fall was one foot by noon. Six deaths were recorded in the storm area. Among them was Samuel F. Manning, 80, general secretary of the Chicago board of health, who apparently died of over-exertion.

There were three elevated train collisions in Chicago in which 50 persons were injured. In each instance a heavily loaded train crashed into the rear of another.

The storm was the worst in northern and central Illinois, northern Indiana and southern Michigan but spread northeastward into Pennsylvania and

Prison Farm Recommended By Grand Jury

Meeting in closed session with the Santa Clara County Board of Supervisors this morning the

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The Klystron

- Sperry (NY) invested, got exclusive rights
 - Bought lathes, welders, pumps from Litton
- Litton made klystrons for IT&T, for France
 - Transformed klystron from lab to production
 - Continuous-wave klystrons, VHF/radar triodes

SF Bay Area/Stanford was microwave hotbed

Wartime Expansion

- Progressive Approach to business
 - Egalitarian relations within, between companies
- Managerial techniques to thwart unions, keep employees happy, productive
 - **Profit-sharing**, tuition, cafeteria, medical clinics
 - “HP Way” philosophy

Similar to Hewlett-Packard, Fairchild, Intel, Tandem ...

Post-War Realignment

- RCA, others focused on TV, broadcast (NBC)
- Eimac developed new line of better tubes
 - Power tetrodes for high frequencies (4-150A, 4-250A)
- FCC's surprise shift of **FM radio** to VHF (88-108 MHz)
 - RCA, others' transmit tubes **wouldn't work** at VHF
 - RCA **copied** Eimac's tubes, which **did** work

EIMAC 4-250A
power tetrode



Reversal of Fortunes

- In 1947, Eimac sued RCA and GE
 - alleging patent **infringement**
 - GE, RCA lost lawsuit, halted production
 - Eimac transformed them into its own sales force and distribution network
 - Let them buy Eimac products and resell them under their own names



The “Big Dog” was now Silicon Valley!

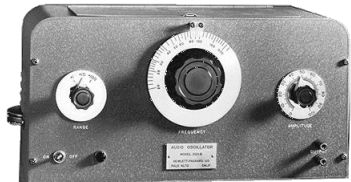
Charles Litton After the War

- Focus on higher-power klystrons
 - For physics research, linear accelerators
 - Scaled from 30 **kilowatts** to 30 **megawatts**
 - Transformed Stanford into a major player
 - 2-mile-long linear accelerator: physics research; cancer treatment today uses the Litton klystron
 - Developed **“Recipe” to build a firm:**
little initial capital; R&D contracts or a new idea;
engineering teams, a product line; go into production



Varian Associates

- 1948: Sold microwave measurement instrument plans to H-P for \$20,000
- Enabled Hewlett-Packard to enlarge its product line, increase revenues in 1950s
- Santa Rosa, Santa Clara divisions became Agilent (largest IPO in history), now Keysight



HP 200A Audio Oscillator

David Packard
and Bill Hewlett

Leonard Fuller,
Cyril Elwell,
Federal Telegraph

Ernest O. Lawrence,
UC-B Cyclotron

Philo Farnsworth with
first all-electronic TV tube

Charles "Doc"
Herrold, radio
broadcasting

Lee de Forest,
inventor of audion

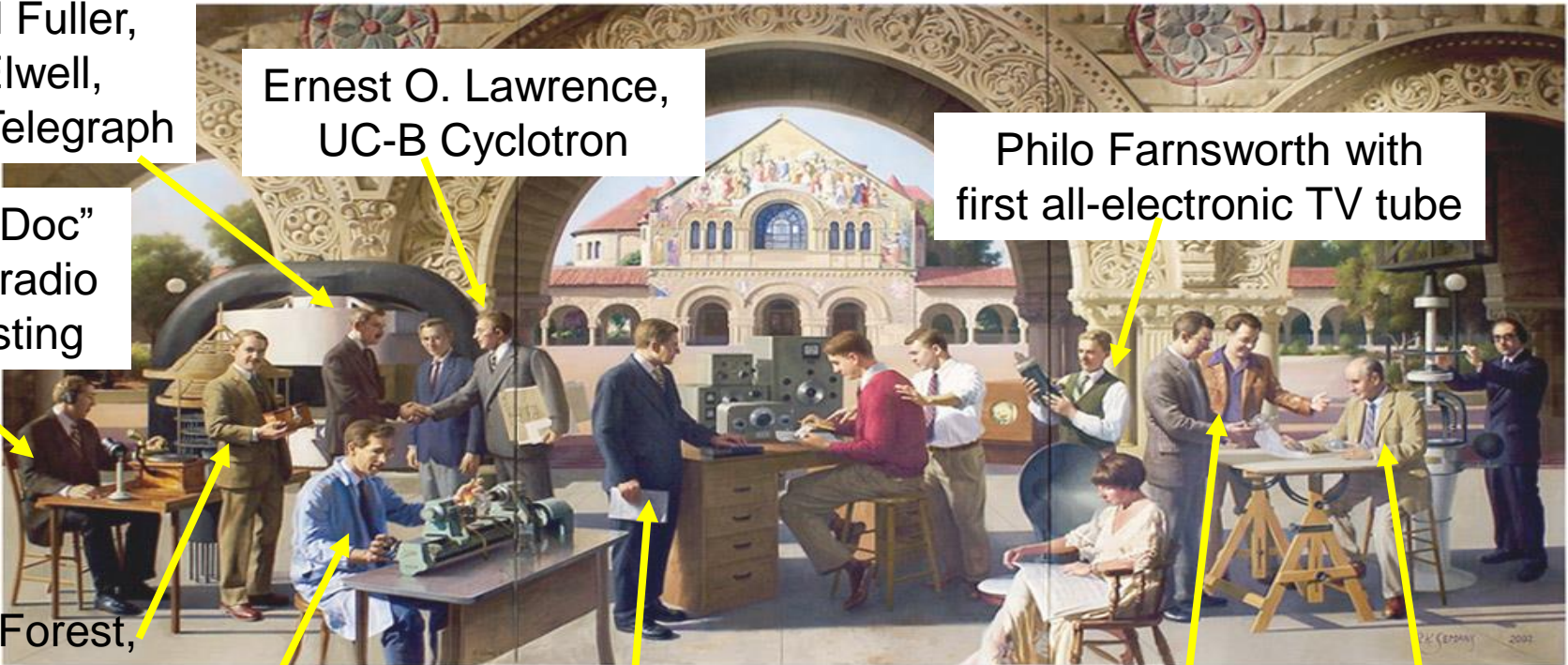
Charles Litton,
inventor of the
glass tube lathe

Frederick Terman, with
schematic, encourages
Hewlett and Packard to
start a company; client was
Walt Disney, for Fantasia

Jack McCullough & Bill
Eitel, cutting-edge
Eimac vacuum tubes

Ralph Heintz, short
wave radio pioneer

Robert Semans, 9' x 18' 3-panel mural;
Court House Plaza, Palo Alto, 2002



The Mural in Palo Alto



Fast Forward to 1950's

- William Shockley
Raised in Palo Alto;
went to Caltech, MIT
- Invented transistor
while at Bell Labs
- Developed to replace
vacuum tubes



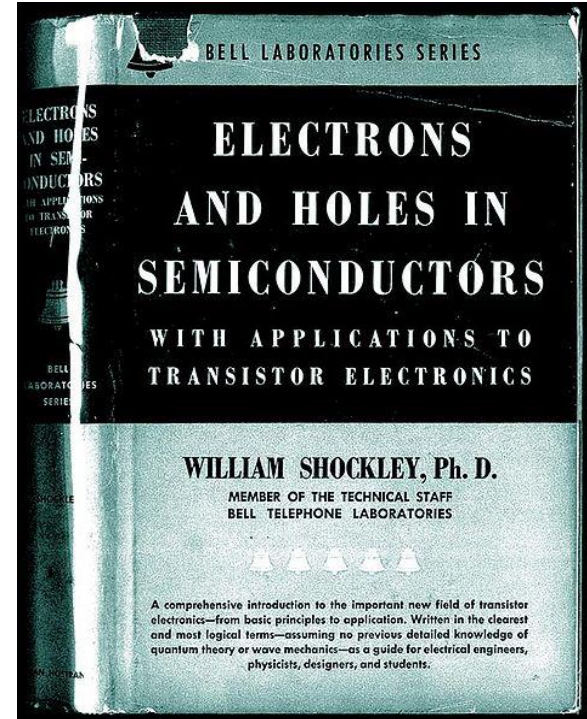
Bill Shockley, 8, in front
of home in Palo Alto



1948: William Shockley (seated),
John Bardeen, and Walter Brattain

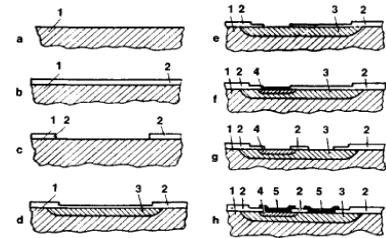
Fast Forward to 1950's

- William Shockley left the East Coast, returned to Caltech
 - Funding from Arnold Beckman
 - His mother, graduate of Stanford, lived in Palo Alto
 - 1955: Shockley Transistor, Mt View
 - “Traitorous 8” **left** him in 1957 to form **Fairchild**, with first real venture capital funding

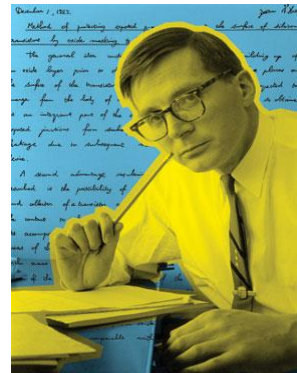


The Planar Process

- Developed by Dr. Jean Hoerni at Fairchild, 1959
- Required a special infrastructure:
 - **High-vacuum** technology
 - **Precise** furnaces
 - **Glass/quartz capability** and machinists
 - Ultra-pure gasses/water
- **Process control**; continuous improvement



Built on top of all of the capabilities developed here during the '20's, 30's, '40's



The Planar Process

It all happened here ...

At original Fairchild Semiconductor plant on Charleston Road, Palo Alto



The Planar Process

Isaac Asimov said this was

"the most important moment since man
emerged as a life form"

... perhaps with a bit of exaggeration.



At the end ... (1960's)

- Situation had changed dramatically
- Peninsula, Valley were major electronics centers
- Dev't, production of tubes, Semiconductors, ICs
 - Half of the microwave tubes
 - In every advanced weapons, space system
 - In a wide range of industrial goods (broadcast, TV, microwave ovens)
- SV was central to the US defense effort and to the US manufacturing economy

Why?

Silicon Valley Business Climate

- **East's** large, vertically integrated firms
 - Focus: *protecting* current products, markets
 - Slow to adjust to technology, market changes
- **SV:** highly fragmented, **decentralized** structure
 - **Specialized** firms, nimble/flexible, **engineering-driven**
 - Dense regional **network** of small & medium-size firms that support each other; draw from common work force
 - **California** (since 1870s) doesn't enforce **non-compete clauses**
 - Adapt **more rapidly** to change -- thrived in the new environment

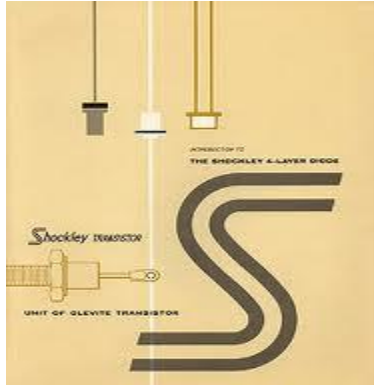
Silicon Valley Uniqueness

■ Practices, skills, and competencies:

- Developed over 100+ years
- Communities of hobbyists; collaboration/sharing
- Analog → digital → SW → biotech → mobile
→ Big Data → Deep Learning → VR → self-driving ...
- Large number of cutting-edge entrepreneurs
- Supported by Engineers and venture capitalists
- Local universities, research, development
- Supporting industries; Role models, expectations

Special Culture of Innovation

The '40's and '50's



AMPEX



SPACE SYSTEMS
LORAL

The '60's

AMD 

intel[®]

 *National
Semiconductor*

memorex[™]

intersil[™]

 **APPLIED
MATERIALS**[®]

frog design[™]

The '70's



parc[®]

A Xerox Company

ComputerLand[®]



ORACLE[®]



3COM

amdahl



CYPRESS

Genentech



The '80's



Adobe

intuit.



ALTERA



SANMINA-SCI®

Atmel®



CISCO™



ELECTRONIC ARTS™



Almaden Research Center



Symantec



Sun
microsystems



Logitech.



SiliconGraphics

MIPS
TECHNOLOGIES

ELECTRONICS
Fry's

The '90's and beyond

KLA Tencor
Accelerating Yield



YAHOO!



vmware

Palantir



**INTUITIVE
SURGICAL**

ebay



The PHP Company

Google

facebook



LinkedIn

**JUNIPER
NETWORKS**

Informatica
Information Security

PayPal

NETFLIX

bea
Think liquid.

NetApp



NVIDIA

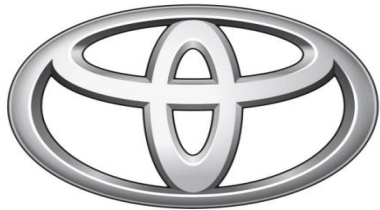


BROCADE



PANDORA

Major companies have moved here ...



TOYOTA

SAMSUNG

Walmart 

Biotech ... Stanford Recombinant DNA

\$200 million

Genentech

(1976)



One Codex



DNA Nexus



Counsyl



abbvie



Perlstein Lab



Transcriptic



Where is “Silicon Valley”?

"A map of **Silicon Valley** in 2013, which originally just included the Santa Clara Valley from Gilroy to Palo Alto. Today it is a **metaphysical space** stretching from San Jose to San Francisco and Berkeley."

A History of Silicon Valley, p. 264



Where is VC funding? (Spring 2014)



How Different are We?

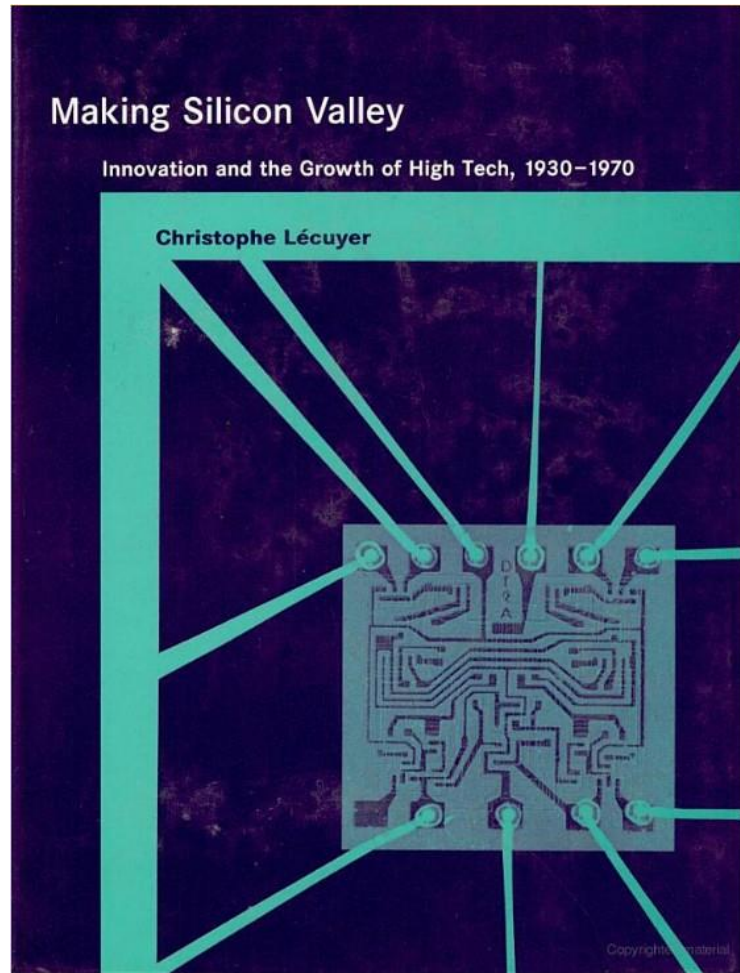
- “In Silicon Valley, great ‘**collaborators**’ are prized; in Washington, DC, they are hanged. When *they* say ‘**collaborator**’, they mean ‘**traitor**’; here [SV], they mean ‘**colleague**’.”

Thomas Friedman, NY Times, Jan 13, 2013

- It’s our **attitude** in Silicon Valley:
“**Failure** is a **feature**, not a bug.” “Move Fast, Break Things”
Tech start-up Failure Rate – typically 9 in 10 (in SV: 8 in 10)
- “The future is already here — it’s just not very evenly distributed.” William Gibson

Get the book!

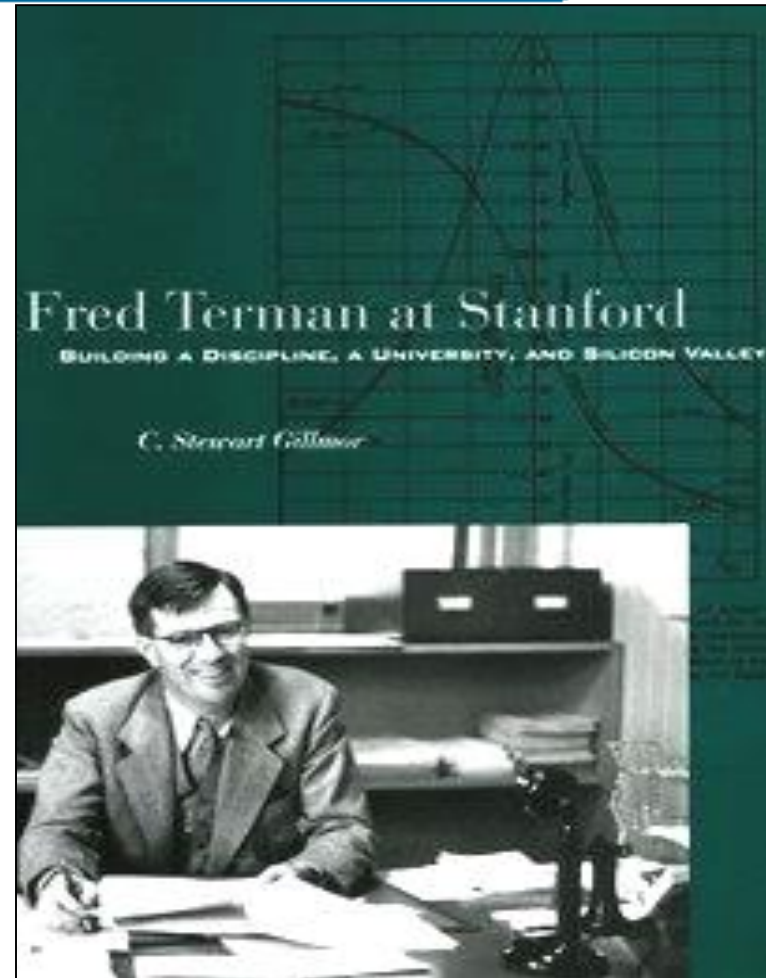
Learn MUCH more
about those early
days ...



More about that period ...

**Fred Terman at Stanford:
Building a Discipline,
a University, and Silicon Valley
by Stewart Gillmor**

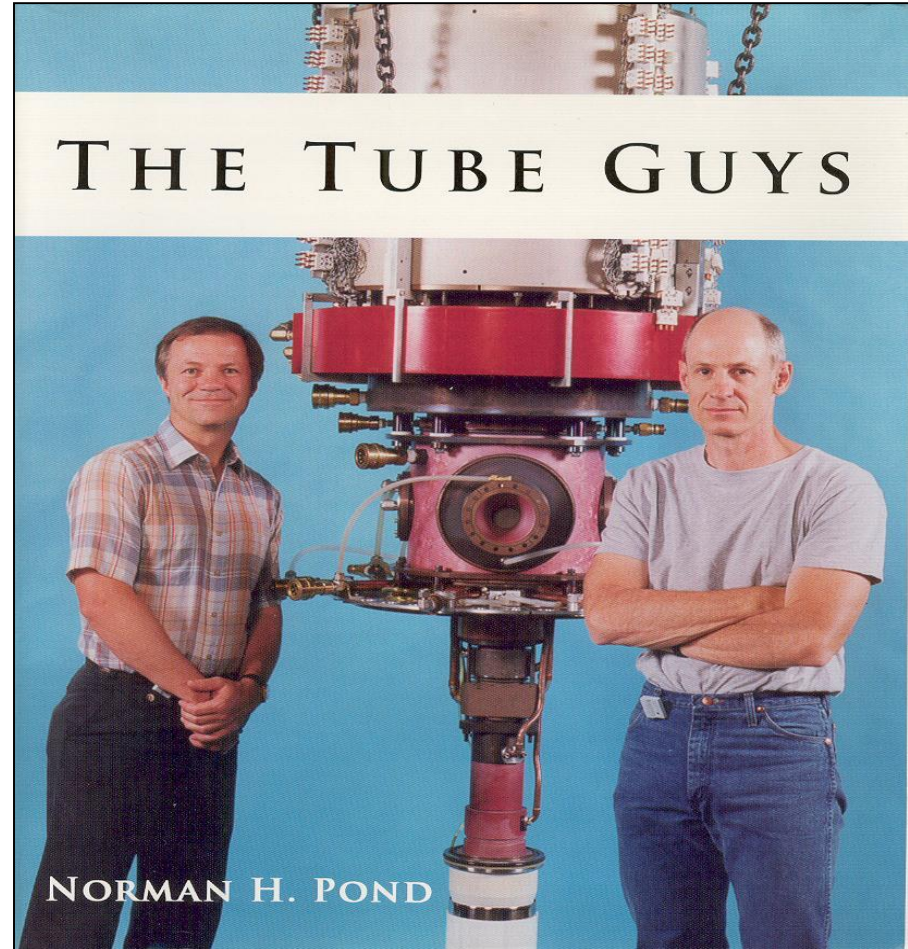
2004, ISBN 978-0804749145



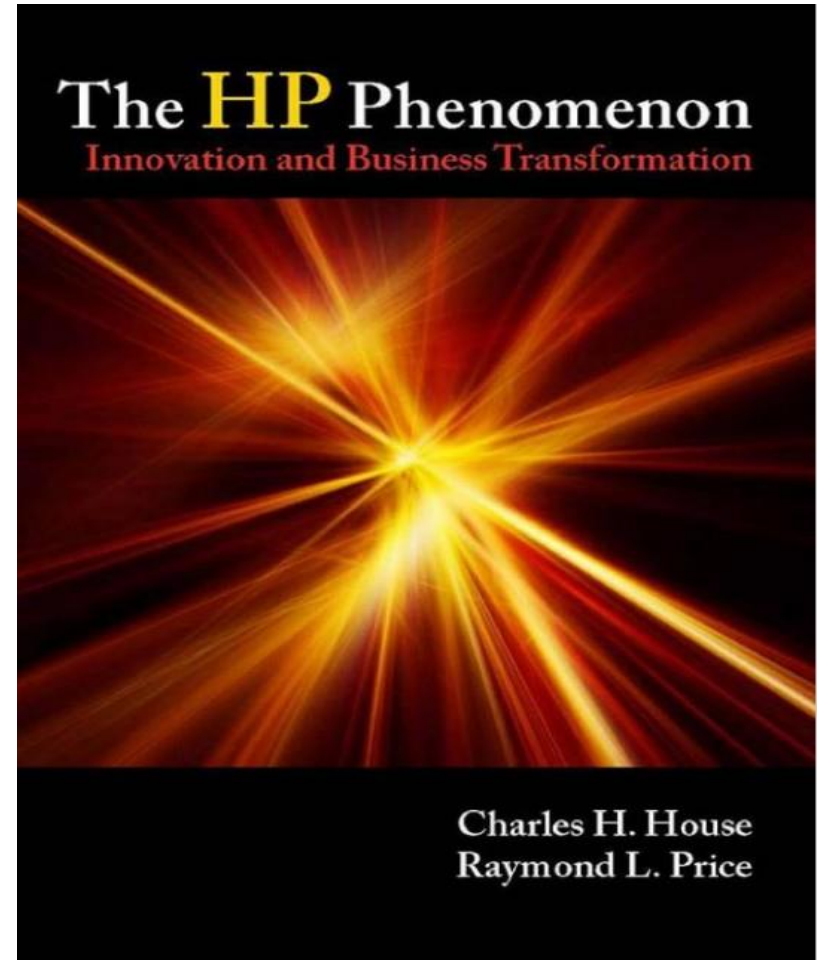
Another fun book

Norm Pond was president of
*Varian Associates (Sigurd
and Russell's company)*, then
formed Intevac and is CEO

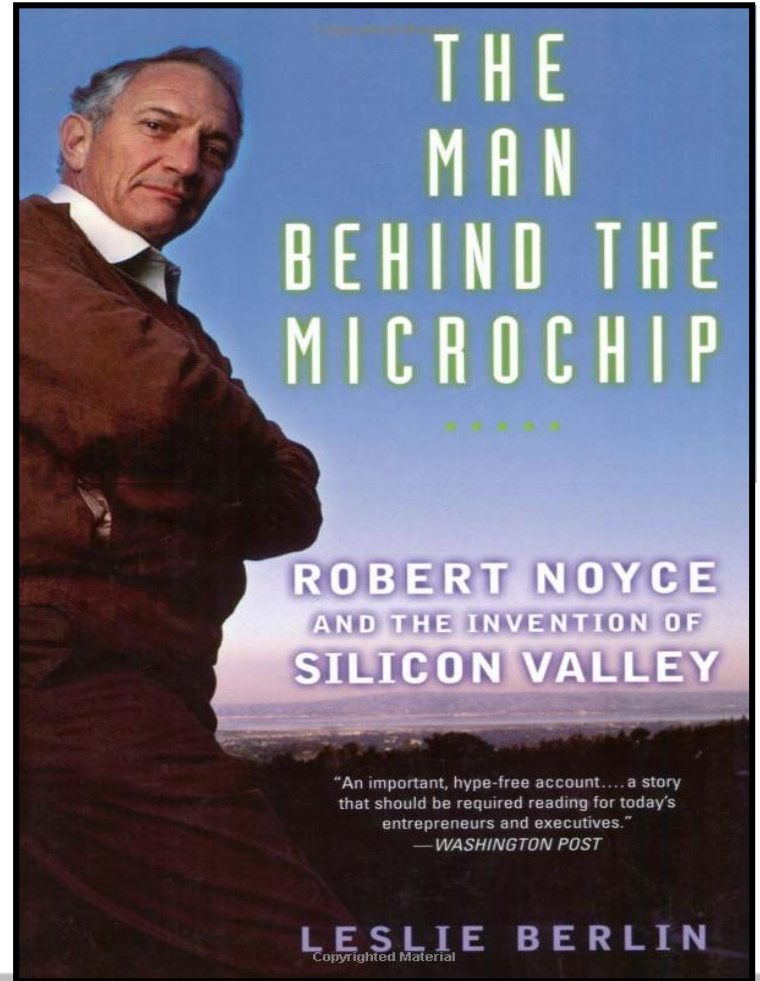
2008,
ISBN 978-0-9816923-0-2
www.russcochran.com



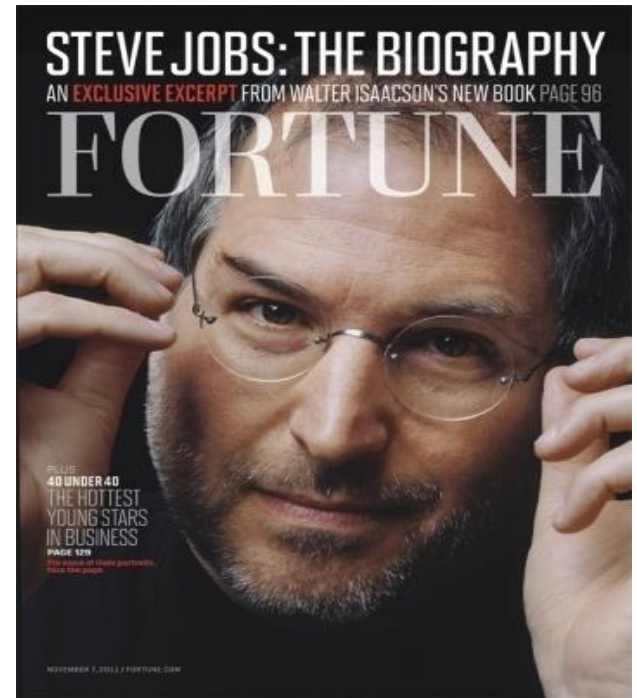
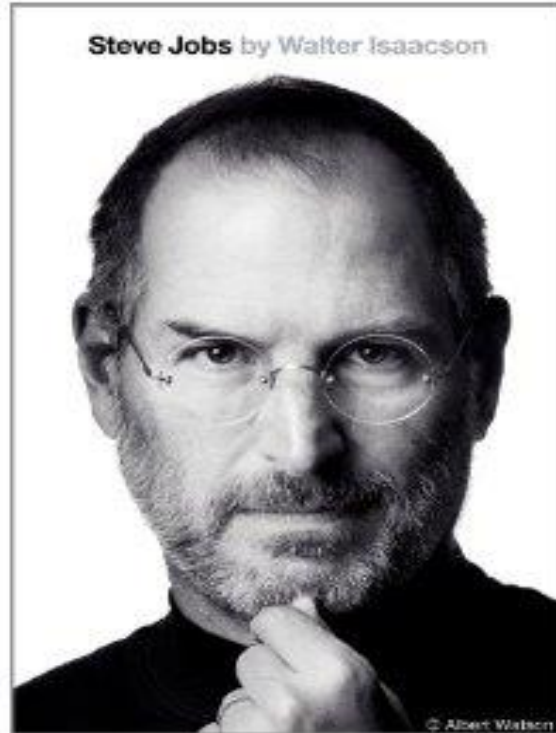
**To understand how H-P
was a product of
Silicon Valley, and
shaped its culture
through a number of
re-inventions
(1930s, up
through 2009)**



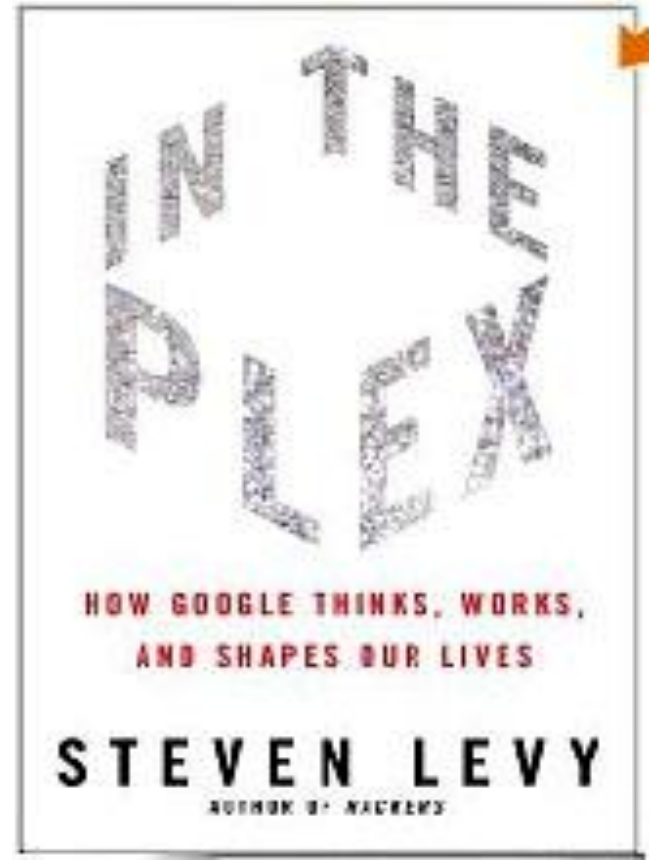
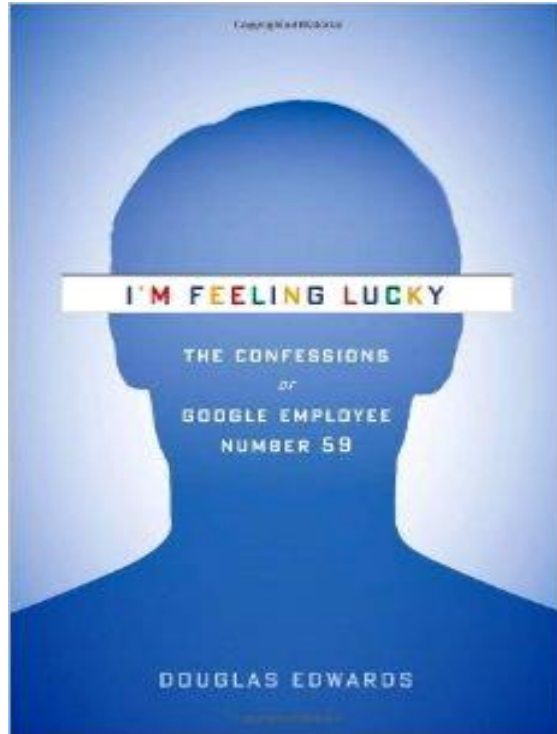
I also recommend
Leslie Berlin's recent
book on Bob Noyce



For another view of Silicon Valley



For a view of another Innovation Environment



On Netflix Streaming:

2011 video, 85 minutes

(SXSW Best Documentary)

**Covers funding and startup of
Apple, Intel, Cisco, Tandem,
Genentech, with views from the
key funders (Rock, Perkins ...)
and entrepreneurs (Moore,
Learner, Treybig ...)**

WRITING
THE CHECK
IS THE
EASY PART



SOMETHING VENTURED

RISK, REWARD, AND THE
ORIGINAL VENTURE CAPITALISTS

MIRALAN PRODUCTIONS PRESENTS A GELLER/GOLDFINE PRODUCTION
NARRATED BY PO BRONSON MUSIC BY LAURA KARPMAN EDITED BY JEN BRADWELL CARY WEIMBERG
EXECUTIVE PRODUCERS: PAUL HOLLAND MOLLY DAVIS
PRODUCERS: DAYNA GOLDFINE DAN GELLER CELESTE SCHAEFER SNYDER
DIRECTED BY DAN GELLER DAYNA GOLDFINE

SOMETHINGVENTURED.THEMOVIE.COM FACEBOOK.COM/SOMETHINGVENTURED.THEMOVIE TWITTER.COM/VENTUREMOVIE

Reviewing the Good Ol' Days **... how hams created this** **hub of technology development ...**

Download the slides and reading list (6 MB) at:

www.pwesling.com/docs/1902-wesling.pdf

For other Silicon Valley Technology History Talks/Interviews:

www.SiliconValleyHistory.com

p.wesling@ieee.org

QUESTIONS and STORIES?

- **Where you worked; who you knew**
- **What you recall from the mid-20th century**
- **Digging into more of the details**