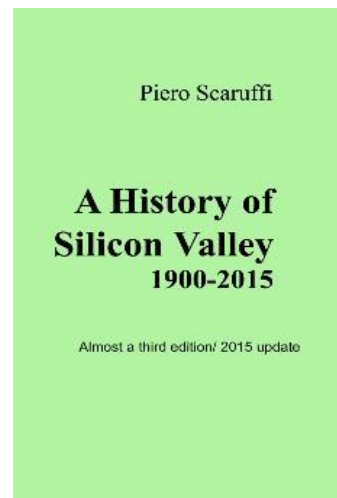


# A History of Silicon Valley

The Greatest Creation of Wealth in History  
(An immoral tale)

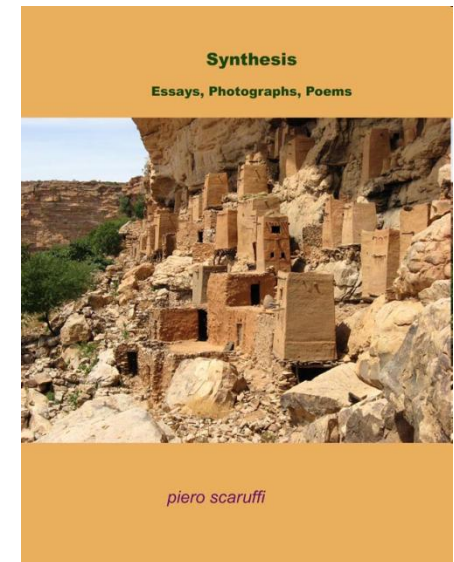
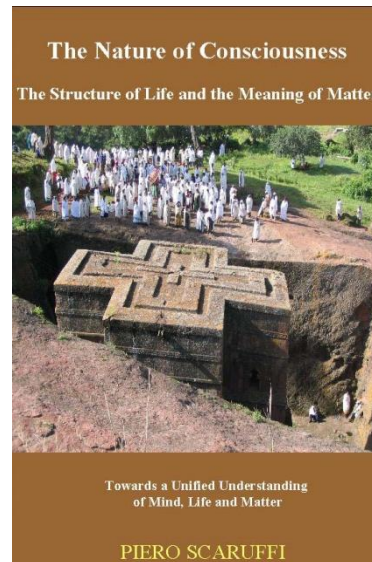
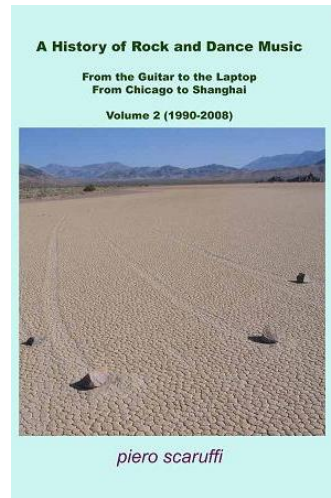
being a presentation by piero scaruffi  
[www.scaruffi.com](http://www.scaruffi.com)

adapted from the book “A History of Silicon Valley”



# Piero Scaruffi

- Cultural Historian
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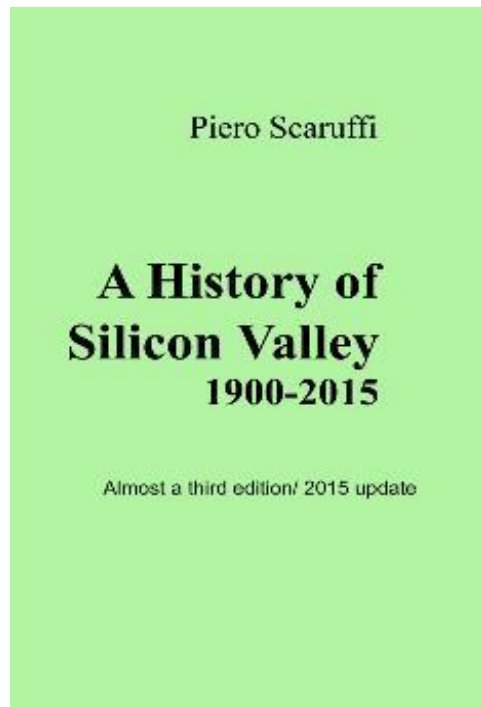


# This is Part 2

- See <http://www.scaruffi.com/svhistory> for the index of this Powerpoint presentation and links to the other parts
  - 1900-1960
  - The 1960s
  - The 1970s
  - The 1980s
  - The 1990s
  - The 2000s

# What the book is about...

- The book is a history of the high-tech industry in the San Francisco Bay Area (of which Silicon Valley is currently the most famous component)



# Semiconductors

- Fairchild Semiconductors' planar integrated circuit (1961)
- Fairchild Semiconductors employees: Don Farina, Don Valentine, Charles Sporck, Jerry Sanders, Jack Gifford, Mike Markkula
- Signetics (1961), first Fairchild spinoff
- Main customers of integrated circuits: the Air Force and NASA

# Life Sciences

- Stanford hires Carl Djerassi (1959), inventor of the birth-control pill
- Alejandro Zaffaroni's Syntex relocates to the Stanford Industrial Park (1963)

# Meanwhile elsewhere...

- New York
  - IBM 7000 transistorized series (1960)
  - IBM's SABRE (1960), the first online transaction processing, an adaptation of SAGE to automating American Airlines' reservation system
  - GE's IDS (1961), the first database management system
- Boston (MIT)
  - CTSS (1961), the first time-sharing system
  - "Spacewar" (1962), the first computer game
  - Ivan Sutherland's "Sketchpad" (1963), the first computer program with a GUI

# Meanwhile elsewhere...

- US Government
  - Paul Baran (Rand Corp): a distributed network of computers can survive a nuclear strike (1962)
  - Ted Nelson (Harvard Univ): hypertext (1965)
  - Joseph Licklider (DARPA's IPTO) funds Project MAC for A.I. at the MIT (1963) and Project Genie for time-sharing at UC Berkeley (1964)
  - Bob Taylor (NASA) funds Douglas Engelbart's ARC for human-computer interaction at the SRI
  - Bob Taylor (DARPA): Arpanet (1966)
  - Project MAC and the Arpanet further increase Boston's lead over the rest of the nation



# Integrated Circuits

- Exponential growth in chip density
  - Frank Wanlass at General Microelectronics (1964): CMOS, i.e. low power consumption, low heat and high density (i.e. semiconductors into digital watches and pocket calculators)
  - Lee Boysel at Fairchild (1966): four-phase clocking technique to create very dense MOS circuits
  - Federico Faggin at Fairchild (1968): silicon-gated MOS transistors (faster, smaller and low energy)
- Gordon Moore's law (1965): the processing power of computers will double every 12 (18) months

# Integrated Circuits

- Fairchild spinoffs: Amelco (Jean Hoerni), Molectro (James Nall), General Microelectronics (Don Farina), Intersil (Jean Hoerni); AMD (Jerry Sanders ), etc
- Texas Instruments, Motorola and RCA do not spawn a similar genealogical tree of spinoffs
- A self-sustaining manufacturing community that mixes Darwinian competition/selection with symbiotic cooperation
- The system exhibits a form of collective learning
- Few of the companies that had thrived in the age of microwave electronics survive to the age of the integrated circuit

# Integrated Circuits

- Role of the government
  - The military serves as both a munificent venture capitalist that did not expect a return (and not even co-ownership) and as an inexpensive testbed
  - NASA's Apollo mission to send a man to the Moon builds the Apollo Guidance Computer (1961-64), the first computer to use integrated circuits

# Culture

- San Francisco Mime Troupe (1959)
- Peter Voulkos' Funk Movement in ceramic sculpture (1959)
- Canyon Cinema (1961)
- Tape Music Center (1962)
- Esalen Institute (1962)
- Pop Art at UC Davis (1960)
- First public showing of computer art (San Jose, 1963)
- The Ali Akbar College of Music (1967)

# Culture

- SLAC (1962), the longest linear accelerator in the world
- Stanford Artificial Intelligence Laboratory (1963)

# Society

- Free Speech Movement (1964)
- Ken Kesey's Merry Pranksters (1964)
- First hippie festival (1965)
- The Diggers (1966)
- The "Summer of Love" (1966)
- Black Panther Party (1966)
- Monterey's rock festival (1967)
- Stewart Brand's "Whole Earth Catalog" (1968)
- The hippie phenomenon further increases immigration from other states
- All these movements are hostile to technological progress

# Society

- The Immigration Act (1965) greatly increases the quotas of immigrants allowed from various countries and allows immigration based on rare skills, such as software or hardware engineering
- Only 47 scientists immigrate to the USA from Taiwan in 1965, but in 1967 the number is 1,321
- Brain drain of engineers and scientists from Europe and especially the Far East towards the Bay Area

# Meanwhile elsewhere...

- IBM's System/360 (1964), a family of computers that are software-compatible and modular (the first "mainframe" computer), derived from the military Project Stretch (1956-61)
- The seven dwarfs: Burroughs in Detroit, Sperry Rand in New York (Univac , ERA, etc), Control Data in Minneapolis, Honeywell in New Jersey, NCR, General Electric and RCA in New York
- The "bunch": Burroughs, Univac, NCR, Control Data Corporation, and Honeywell



# Meanwhile elsewhere...

- New businesses
  - Software companies in Texas: EDS (outsourcing) and Uccel (the packaged product TMS)
  - Tymshare (1964) offers time-sharing services in Cupertino

# Meanwhile elsewhere...

- Small computers
  - DEC's PDP-1 (1960), an MIT spinoff funded by venture capitalists
  - SDS' 910 (1962), a Packard-Bell spinoff funded by venture capitalists
  - DEC's PDP-8 (1965) that uses integrated circuits
  - Olivetti's P101 (1965), a programmable electronic desktop computer
  - Texas Instruments' hand-held calculator (1967)
  - First computer manufacturer of the Bay Area: Hewlett-Packard, but their calculators are simply a natural evolution of an instrumentation product line

# Dynamic Memory

- Advanced Memory Systems (1968), Intel (1968) and Four Phase (1969): semiconductor computer memories instead of magnetic core memories
- Before the DRAM: the semiconductor firms make money by building custom-designed integrated circuits (small market but lucrative)
- The DRAM: a commodity sold in large numbers at a low price
- Constant downward pressure on prices
- Intel's i1103 is the first bestseller of the DRAM

# High-tech Creativity

- SRI
  - Doug Engelbart's NLS (1968): a graphical user interface and a hypertext system running on the first computer equipped with a mouse and connected to a remote computer
  - "Shakey the Robot" (1969)

# High-tech Creativity

- Xerox PARC (1970)
  - Alan Kay's Dynabook and Smalltalk
  - Not faster computation but better interaction
  - Casual, informal and egalitarian workplace
  - The equivalent for a workplace of the alternative lifestyle preached by the hippies

# High-tech Creativity

- Computer manufacturers
  - IBM Western Labs' floppy disk (1971): a cheap storage medium to load the 370 mainframe's microcode and replace the cumbersome tape units
  - HP/3000 (1972): one of the first computers to be completely programmed in a high-level language instead of assembly language
  - The PDP of DEC had introduced a "do-it-yourself" mindset in data centers. The HP/3000 pushed that mindset one floor up to the business offices.
  - Amdahl (1975): cheaper IBM-compatible mainframes

# High-tech Creativity

- Computer games
  - Nolan Bushnell's "Computer Space" (1971): a free-standing terminal powered by a computer
  - Atari's "Pong" (1972)

# Life Sciences

- Alejandro Zaffaroni's Alza (1968): biomedical industry
- Cetus (1971), the first biotech company of the Bay Area (to develop methods to process DNA)
- Paul Berg's team at Stanford University synthesizes the first recombinant DNA molecule (1972)
- Stanley Cohen (Stanford) and Herbert Boyer (UCSF) transfer DNA from one organism to



# Labor Fluidity

- California is blessed with an economy which mostly outperforms the rest of the USA
- California is an employee's market and not an employer's market
- California's law code forbids any labor contract that limits what an employee can do after quitting
- Silicon Valley engineers exhibit a preference for horizontal instead of vertical mobility, for hopping from job to job instead of following a career of promotion after promotion

# Labor Fluidity

- Job turnover and no protection for trade secrets foster an endless flow of knowledge throughout the community\spread
- Pervasive job mobility spreads knowledge quickly and efficiently
- Rapid dissemination of knowledge within an industry across companies, as well as in cross-fertilization of ideas across research groups.
- Status symbol of being an engineer like in no other region in the world (second to the status symbol of being an entrepreneur)

# Society

- Ronald Reagan's era (1967-75): the age in which citizens revolt against big government and taxation
- Post-hippy grass-roots environmentalist movement (Garrett Hardin's article "Tragedy of the Commons")
- Man and his Environment conference (1968)
- "Earth Day", a new international holiday (1970)
- The Reagan-ite establishment pressed to curb

# Meanwhile elsewhere...

- Arpanet
- Unix
- Remote Computing
- The Unbundling

# Meanwhile elsewhere...

- The Arpanet (1969): four nodes, three of which are in California (UCLA, SRI and UC Santa Barbara) run by BBN in Boston

# Meanwhile elsewhere...

- Unix:
  - Bell Labs' successor to the MULTICS time-sharing operating system (1971)
  - Rewritten in C, it can be easily ported across computers (1973)
  - AT&T is forbidden to enter the computer business and forced to share any non-telephone invention with the whole world
  - The Unix becomes a worldwide phenomenon



Dennis M. Ritchie (standing) and Ken L. Thompson (seated), inventors of UNIX, at Bell Labs in front of a DEC PDP-11 computer, ca 1970. Courtesy, Computer History Museum.

# Meanwhile elsewhere...

- Remote Computing
  - IBM's transactional system CICS for real-time transactions (1969)
- The Unbundling
  - Before the unbundling only SDS had charged customers for software
  - IBM forced to unbundle the application program of its mainframes (1969)
  - Free market for software applications
  - Software companies shift from the consulting business of custom applications to selling off-the-shelf packages

# Meanwhile elsewhere...

- Britain
  - Britain had the know-how (it had pioneered computers)
  - National long-term plan (NRDC)
  - Britain's computer industry self-destroyed within two decades
- Japan
  - Japan was experiencing the most spectacular economic boom in the world
  - National long-term plan (MITI)
  - Japan created a vibrant computer industry within the existing conglomerates (Fujitsu, Hitachi, NEC)



# Next...

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