An Invisible Woman: The Inside Story Behind the Microelectronic Computing Revolution in Silicon Valley[1,2]

Lynn Conway, Professor Emerita of EECS, University of Michigan, Ann Arbor

Keynote talk, ASEE virtual CoNECD Conference, Jan 25, 2021, 12-1 pm ET.

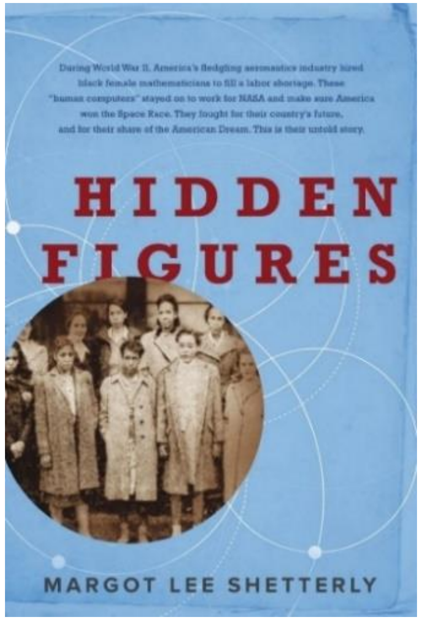
In 2015, US CTO Megan Smith raised profound questions about women's contributions in science, engineering and math being erased from history. In this talk we explore a case study of such erasure, and surface a very counter-intuitive conjecture about the underlying causes and effects.

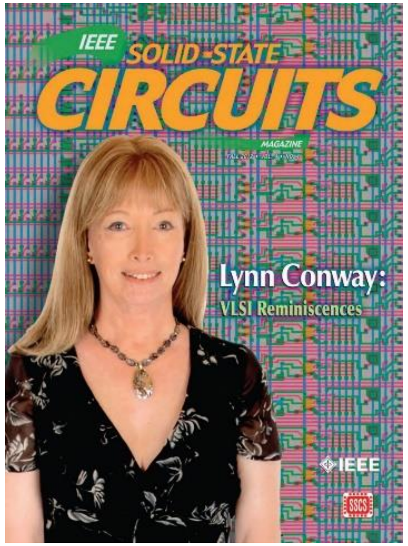
CoNECD

2021 Collaborative Network for Engineering and Computing Diversity

1. In remembrance of pioneering novelist Ralph Ellison, author of *Invisible Man*, 1952.
2. http://ai.eecs.umich.edu/people/conway/Memoirs/Talks/CoNECD-2021/Inside_Story_Talk.pptx & .pdf

Overview of Talk:





1. Visualize Past Erasures of Women's Contributions in STEM

2. The 'Inside Story' of:
(a) the VLSI Revolution and
(b) my 'Disappearance'

3. Investigation Into:
(a) What Happened
(b) Why Did It Happen

1. Let's first examine history's treatment of women's contributions in STEM . . .

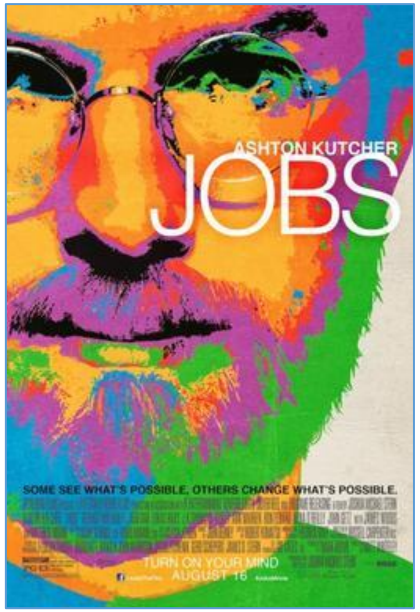
Link

In a widely-seen 2015 TV-interview, U. S. CTO Megan Smith reflected on how women in STEM are regularly erased from history . . .

http://www.youtube.com/watch?v=fHyRdAyqV5c&t=0m1s
http://boingboing.net/2015/05/08/cto-megan-smith-explains-how-w.html

Smith pointed out this example: There were four women on the Macintosh team in the 1980s . . .

But not a single one was cast in the 2013 biopic *Jobs*. Even worse, all seven men on the project had speaking roles in the film.



It's not just *harder* for women to break into STEM fields, but the many contributions they *do make* aren't celebrated. "It's debilitating to our young women to have their history almost erased," Smith explains.

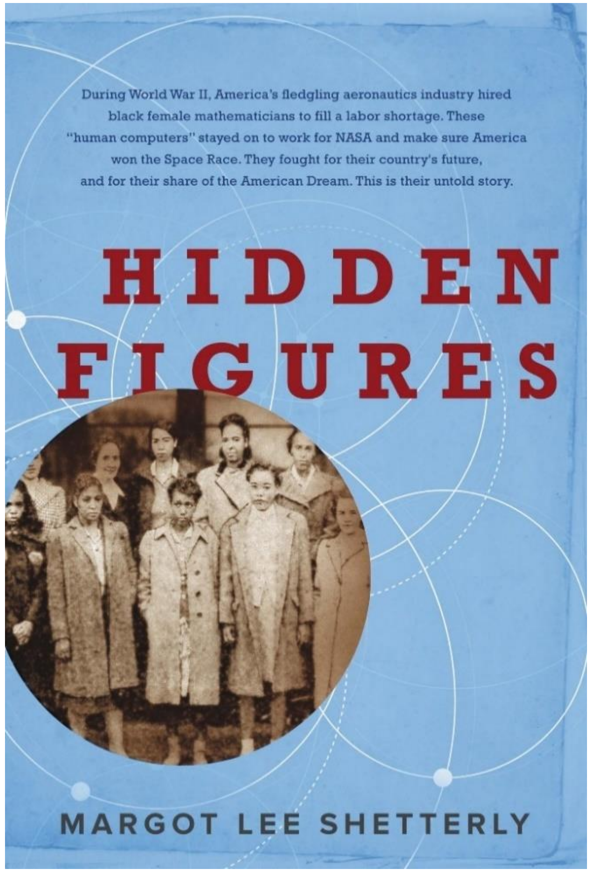
Smith also discussed the erasure of NASA mathematician Katherine Johnson, whose story was widely revealed in the 2016 book and movie "Hidden Figures":

Katherine Johnson, age 42, at her NASA Langley desk,1960

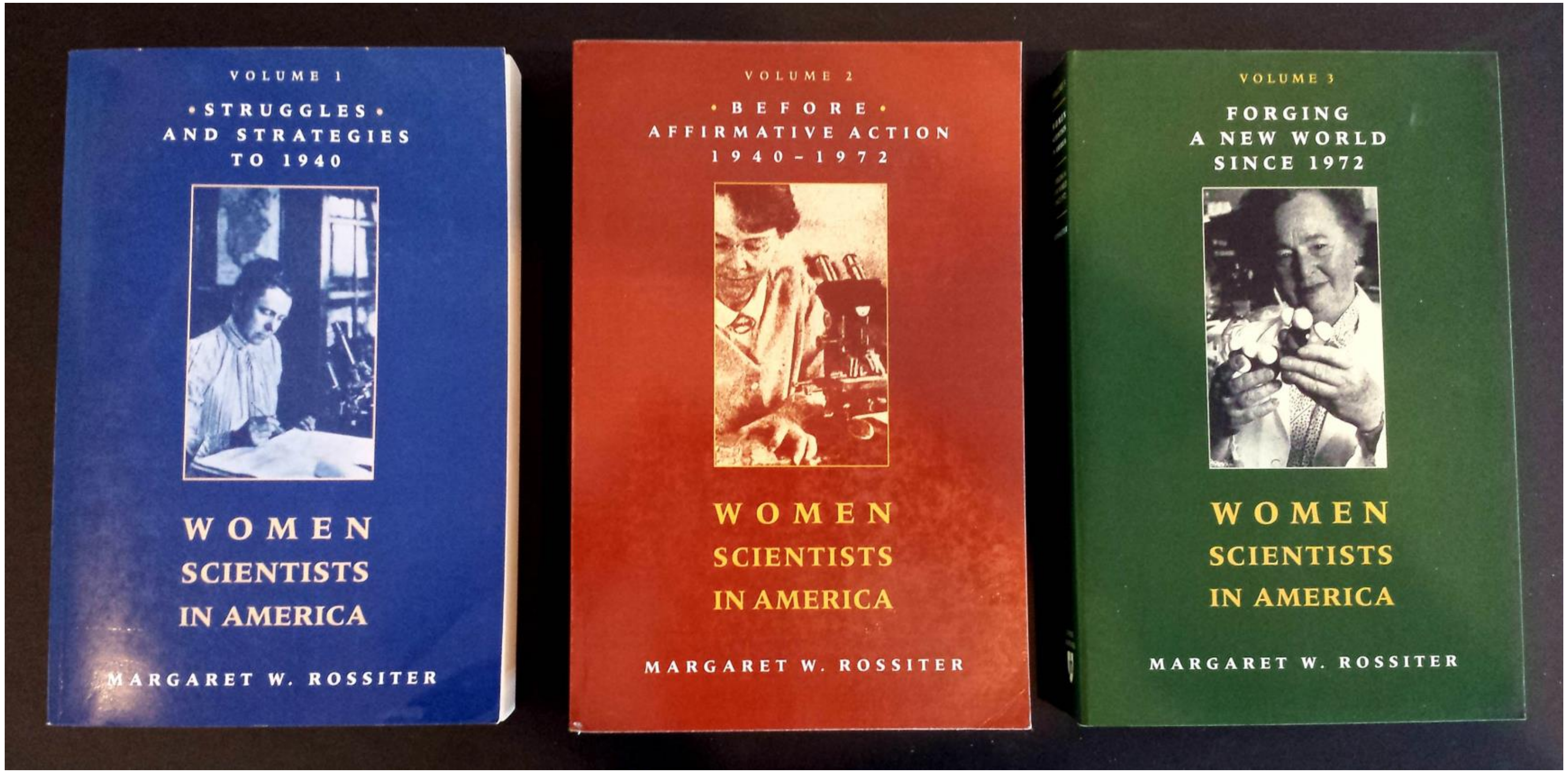
Hidden Figures: The Story of the African-American Women Who Helped Win the Space Race, Margot Lee Shetterly (2016)

Katherine Johnson at age 98
Photo by Annie Leibovitz for Vanity Fair, 2016

Fortunately, she lived long-enough to see her story told!



The effect is seen throughout the history of women in science, as discussed by science historian Margaret Rossiter in *Women Scientists in America* *(V 1-3):*



Margaret Rossiter coined the term "Matilda effect" for the repression and denial of women scientists' contributions, with their work often attributed to male colleagues.

This is similar to the "Matthew effect", as coined by sociologist Robert Merton, describing how eminent scientists get more credit than lesser-known researchers, even if their work is similar.

For example: An award will usually be granted to the most senior researcher in a project, even if a grad student did all the work.

2. NOW LET'S STUDY AN EXAMPLE ERASURE:
The revolution in Very Large Scale Integrated (VLSI) microchip design and manufacturing that began at Xerox PARC in 1976.

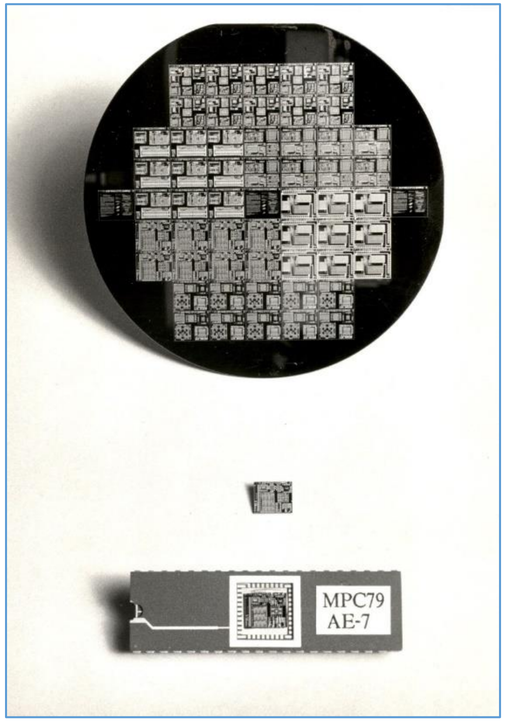
Link

‘Birth’ of modern networked personal-computing paradigm at Xerox PARC, 1972-78:

Authors:
Use new image and word-processing tools to create and share digital document files.

Laser Printers:
Print document patterns on paper media.

Results embedded-in:
Office-documents, magazines, books, etc.



‘Covert Birth’ of modern VLSI chip-design paradigm at Xerox PARC, 1976-80:

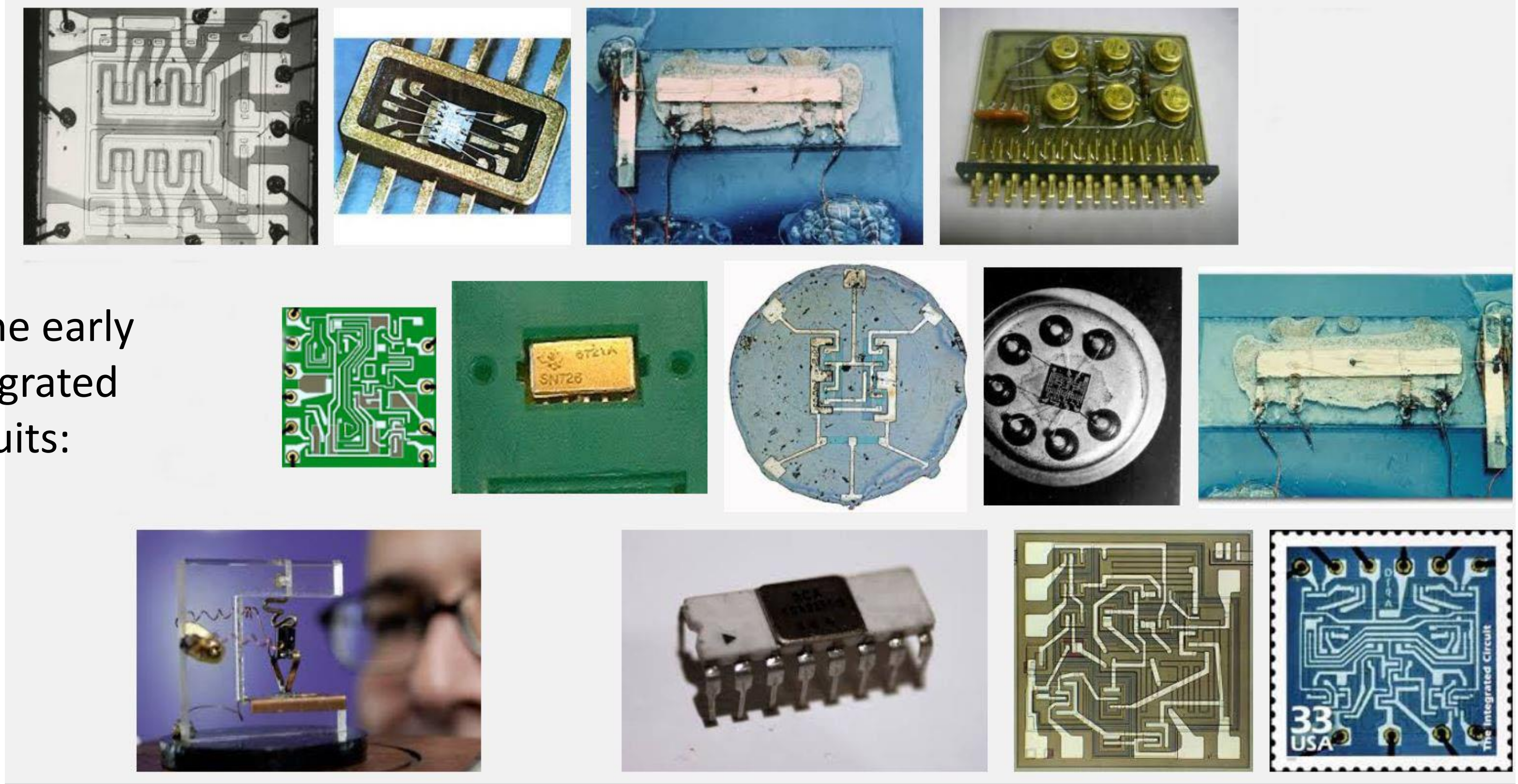
Chip-Designers:
Use new design methods and chip-design tools to create and share digital chip-layout files.

Foundries:
Lithographically ‘print’ chip-layouts on silicon wafers.

Results embedded-in:
Mobile-phones, laptops, autos, homes, internet servers, etc.

The stage had been set by the emergence of **integrated circuit** **technology** in the 1960's, enabling modest numbers of transistors and wiring to be 'printed' onto chips of silicon . . .

Some early integrated circuits:

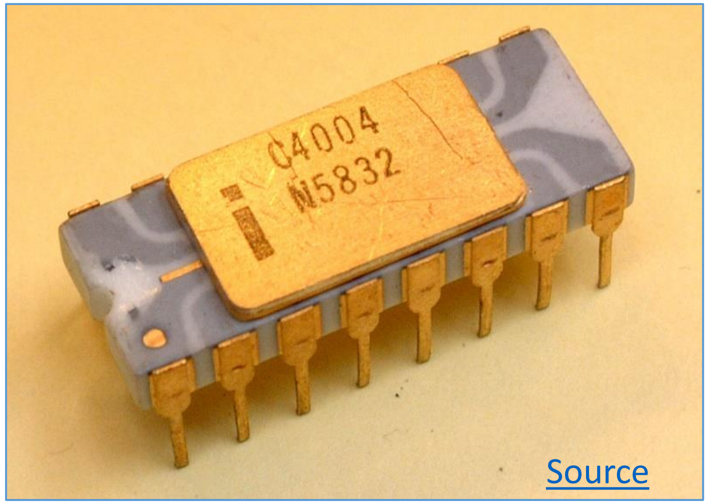


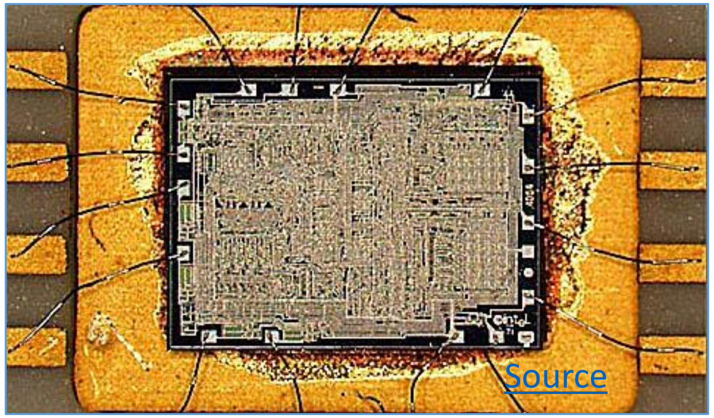
Snip from Goggle images

Rapid advances in optical/chemical lithography enabled the 'printing' of ever-finer features, and thus ever-increasing numbers of transistors could be printed on single chips.

A watershed was crossed in 1971
with the introduction of the Intel 4004, the first single-chip "microprocessor": a "computer processor on a chip" . . .

It contained 2300 transistors . . .





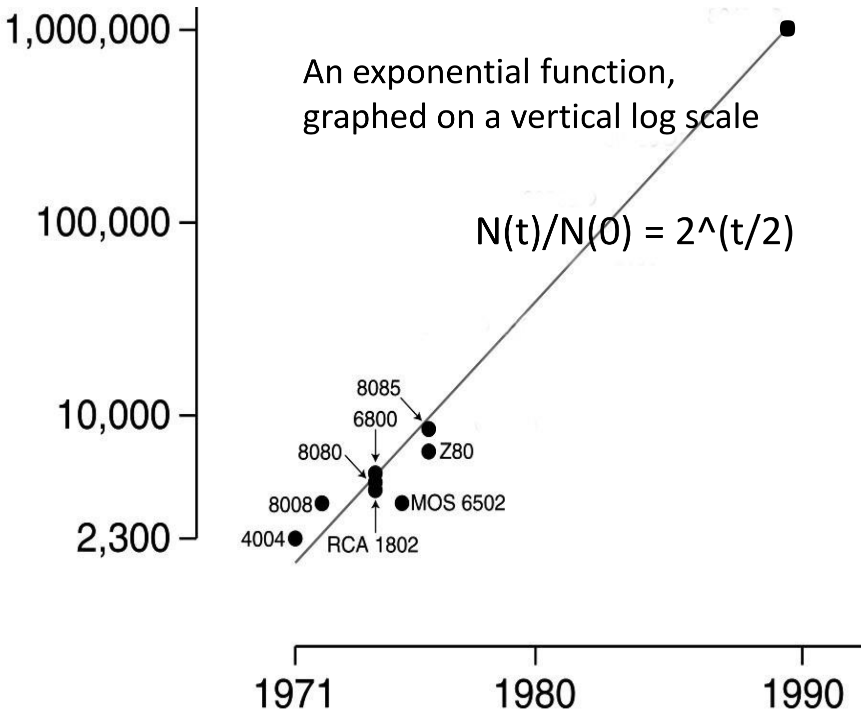
Intel's Gordon Moore observed that the number of transistors reliably printable on chips was roughly doubling every two years . . .

Carver Mead named this "Moore's Law" (clever career move, eh?) and his student Bruce Hoeneisen showed there were no physical limits to densities up to several million transistors/cm^2.

On looking ahead, we envisioned that by 1990 an entire "supercomputer" (of the day) could be printed on a single chip . . .

In 1976 this triggered a research effort at Xerox PARC and Caltech to explore how to enable such complex chips to be designed.

Moore's Law (as of 1976)



The stage was further set by seminal innovations in personal computing & networking:

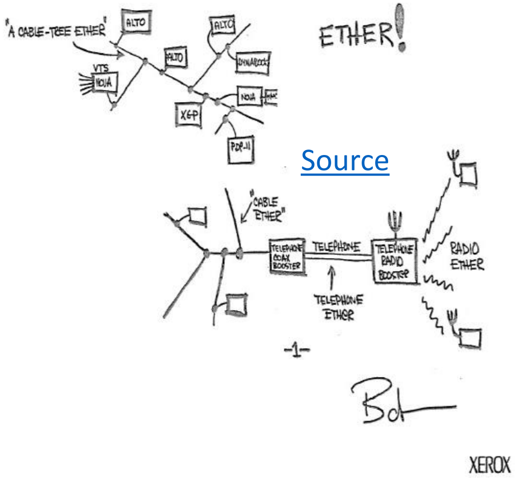
The innovation of the interactive-display, mouse-controlled "personal computer", the "Ethernet" local-area network, and the "laser printer" at Xerox PARC) . . .

And by the Dept. of Defense's "Arpanet" (the early internet), at DARPA . . .

Xerox Alto, 1973

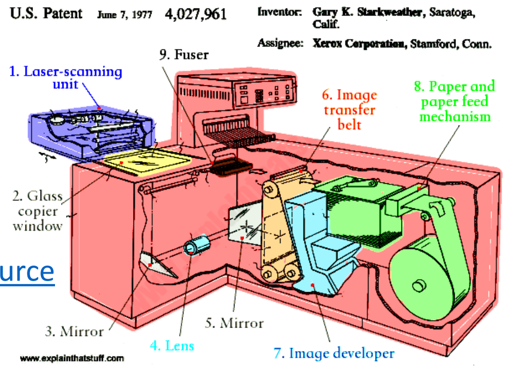
Wiki commons

Metcalfe's original Ethernet sketch, 1973



Source

Laser printer, 1971



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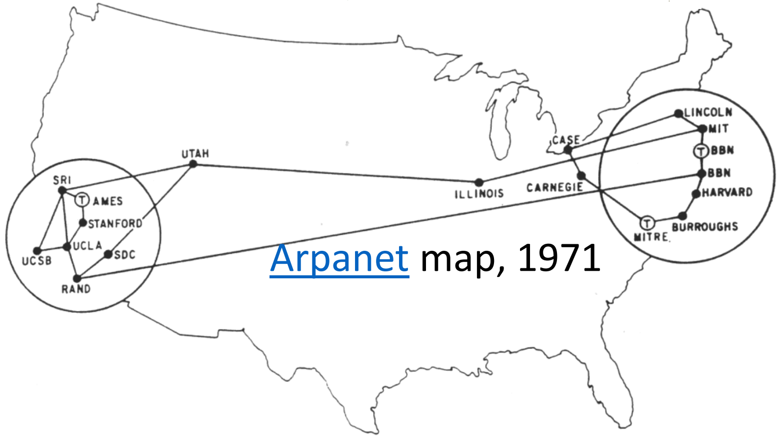

Arpanet map, 1971

A sudden disruptive breakout was triggered by a cluster of abstract innovations made by Lynn Conway at Xerox PARC . . .

Included was a set of scalable VLSI chip-layout design-rules, encoded as dimensionless inequality equations

These enabled digital chip designs to be digitally encoded, scaled, and reused as Moore's law advanced . . .

They also enabled chip design modules to be scaled and open-source shared . . .

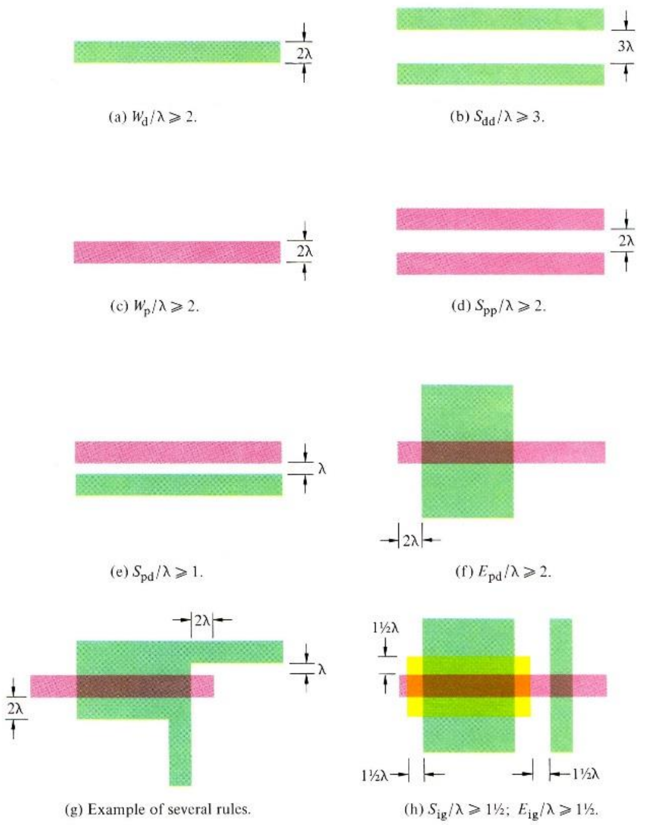

PLATE 2 *n*MOS design rules

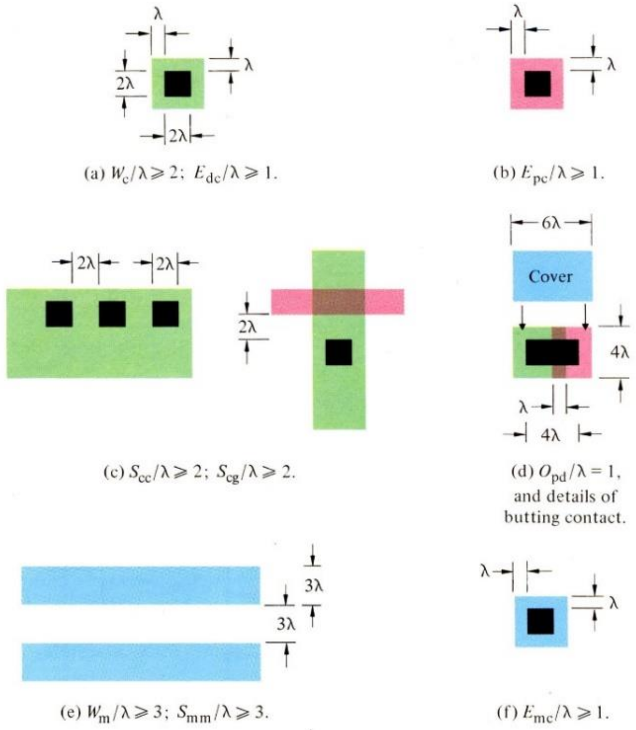

PLATE 3 *n*MOS design rules (continued)

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And an overall, meta-architectural, techno-social innovation:

As chip lithography scaled-down according to Moore's Law, and ever-more ever-faster transistors can be printed on individual chips as time passes, I envisioned launching the following "techno-social scripted-process":

STEP (i):

- **Use design tools on current computers to DESIGN chip-sets for more powerful computers.**
- **PRINT the more powerful chip-sets using foundries' next-denser fabrication processes.**
- **Use some of those chip-sets to UPDATE current computer-design computers & design tools.**

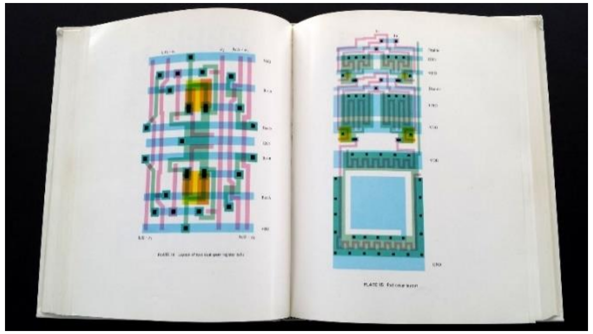
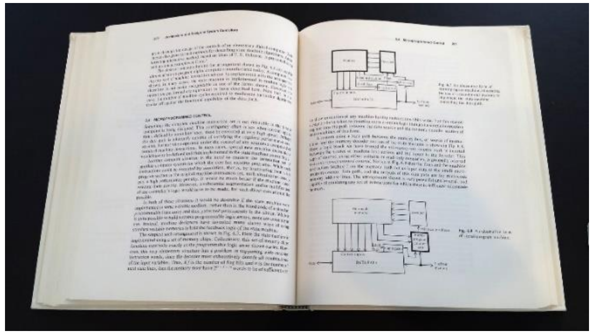
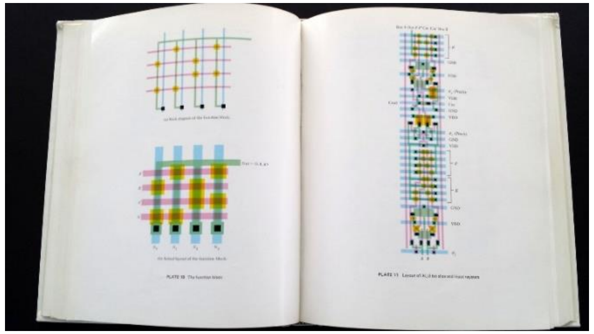
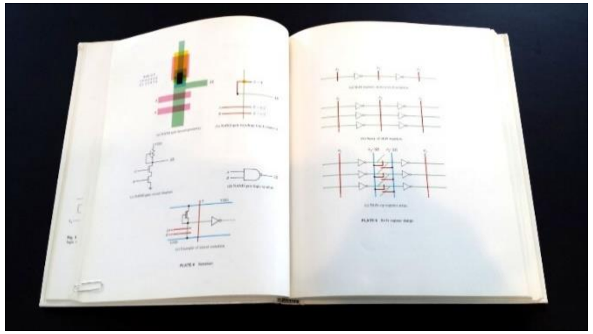
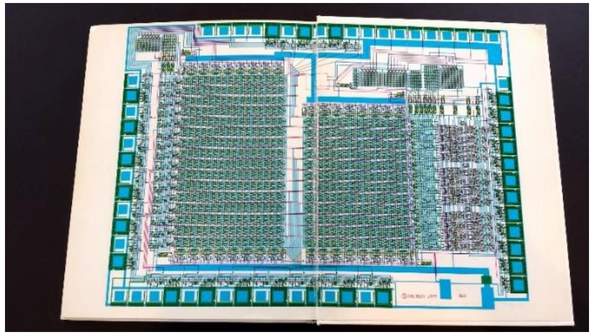
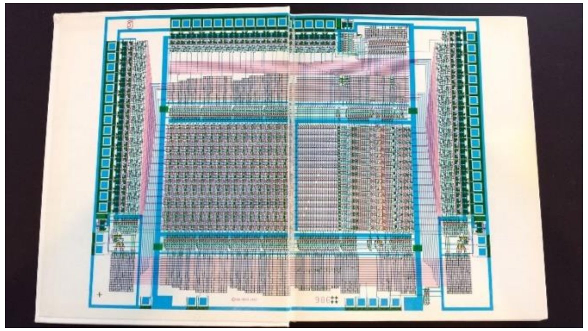
REPEAT (i) as STEP (i+1)

If ever-more engineers and design-tool builders did this (on an expanding number of increasingly powerful computers), the iterating techno-social expansion-process could exploratorily and innovatively-generate ever-more, ever-more-powerful, digital systems . . .

I.e., that techno-social process could **exponentiate!** (until Moore's Law saturated . . .)

But there was a big problem: Where would all these engineers/programmers come from, and how would they learn to do all this?

In 1977, to help spread the ideas, I began documenting the innovative new VLSI chip design methods in [an evolving computer-edited laser-printed textbook] . . .

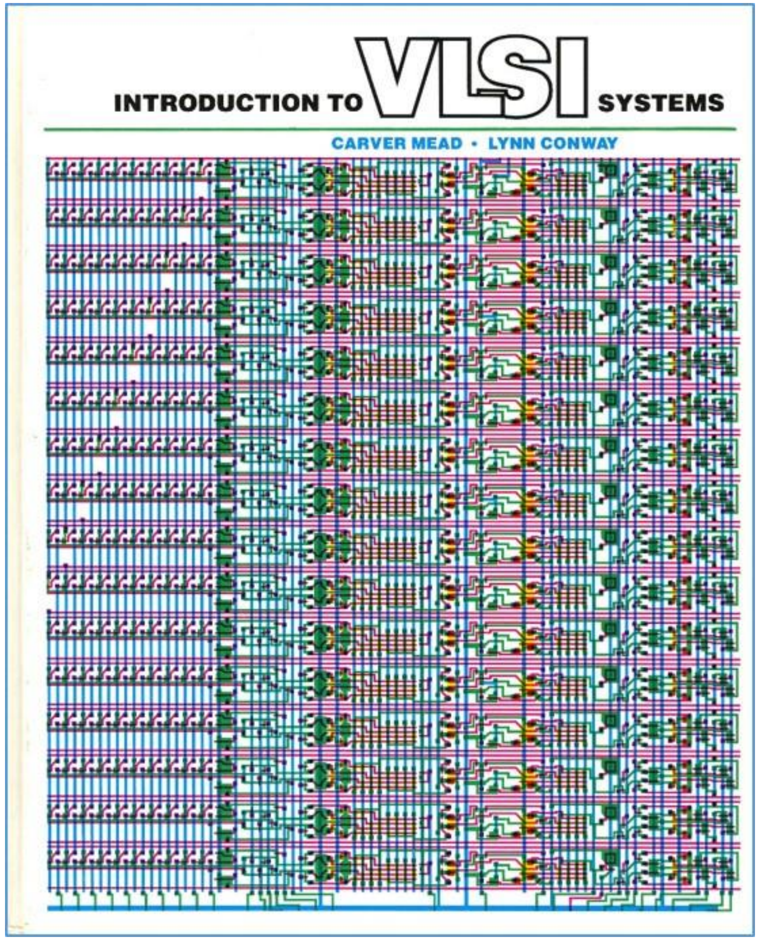
[Link]

Thus using PARC's Alto computers not only to help mechanize the evolution of chip designs . . . but also to help mechanize the evolution of the design-knowledge itself

That computer-edited evolving book, printed on PARC laser printers, became the draft of the seminal textbook . . .

Introduction to VLSI Systems
by Mead and Conway, 1980.

Later called "the book that changed everything" . . .



I introduced the new chip design methods in a special VLSI design course at MIT in 1978, following the 'script' Charles Steinmetz used to propagate his revolutionary AC electricity methods at Union College back in 1912.

THE M.I.T. 1978 VLSI SYSTEM DESIGN COURSE

by Lynn Conway

[Update: 11-14-07]

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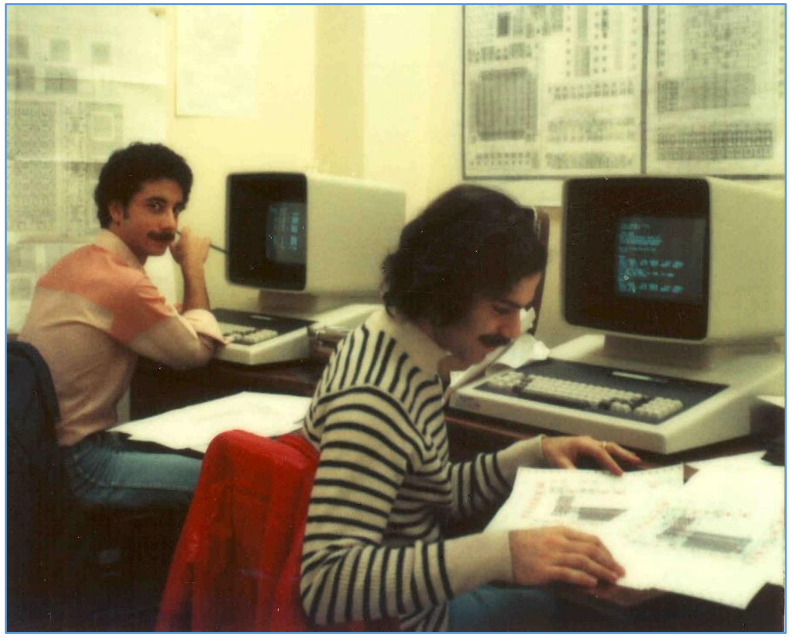
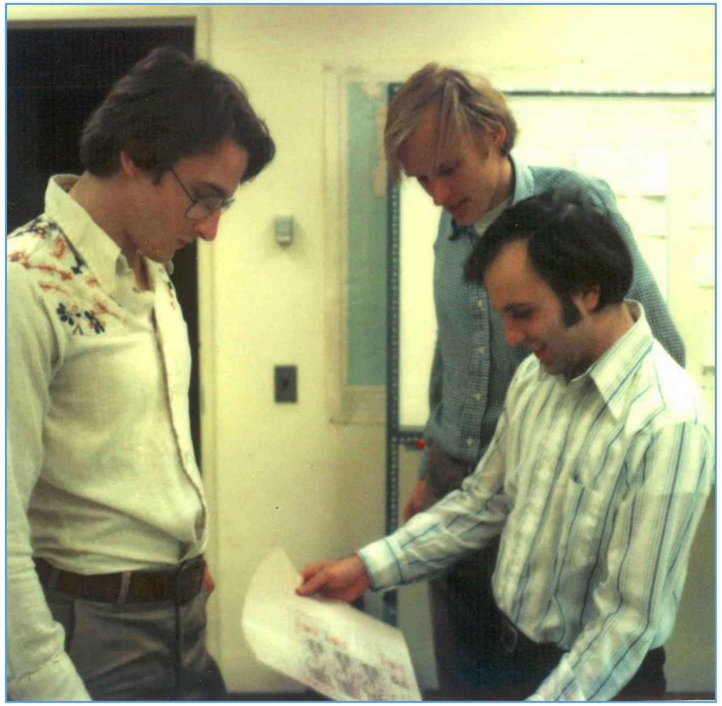
This course was an important milestone in the development, demonstration and evaluation of the Mead-Conway structured VLSI design methods. Lynn Conway conceptualized and planned the course during the late spring and summer of '78, and taught the course while serving as Visiting Associate Professor of EECS at MIT in the fall of '78 and early '79.

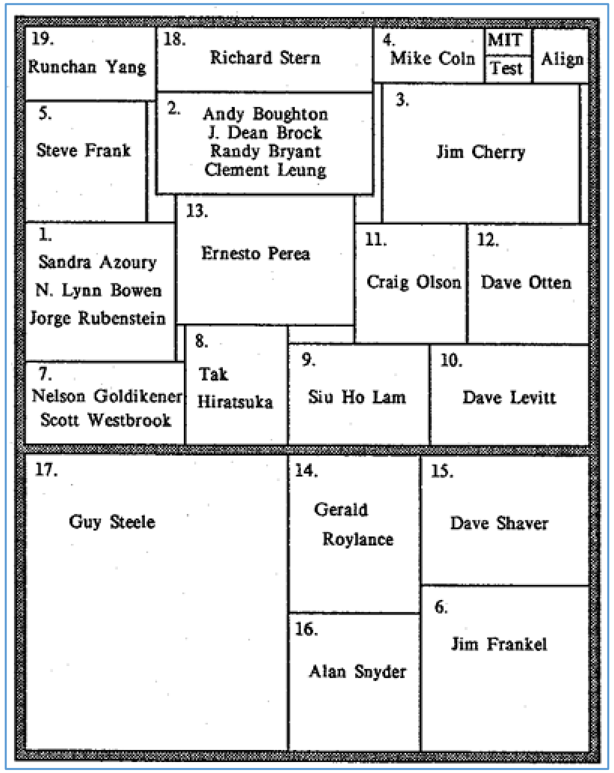
Students learned chip design in the 1st half course, and did project-chip designs in the 2nd half . . . which were fabricated at HP right after the course.

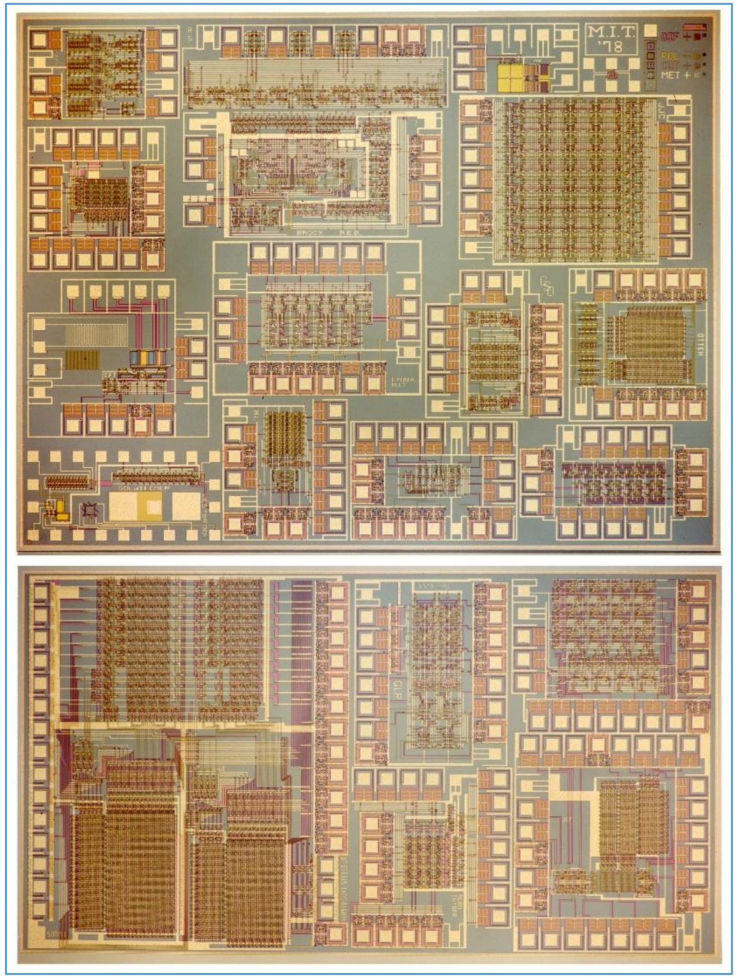




Among many amazing results was a complete Lisp microprocessor designed by Guy Steele . . .

[Map and photomicrograph](#) of the 19 student projects on the MIT’78 ‘MultiProject’ Chip





For more about the MIT’78 course, see Lynn’s “MIT Reminiscences”

The MIT'78 course stunned various top folks across Silicon Valley . . .
Until then chip design had been mysterious, only grasped by a few computer engineers working for chip manufacturers . . thus having inside access to the "printing plants" . . .

Many other top research universities wanted to offer "MIT-like" courses. But how?

After intensive pondering, I grasped the answer: Try to rerun the MIT'78 course at a dozen research universities . . . using my MIT lecture notes to keep everything in sync.

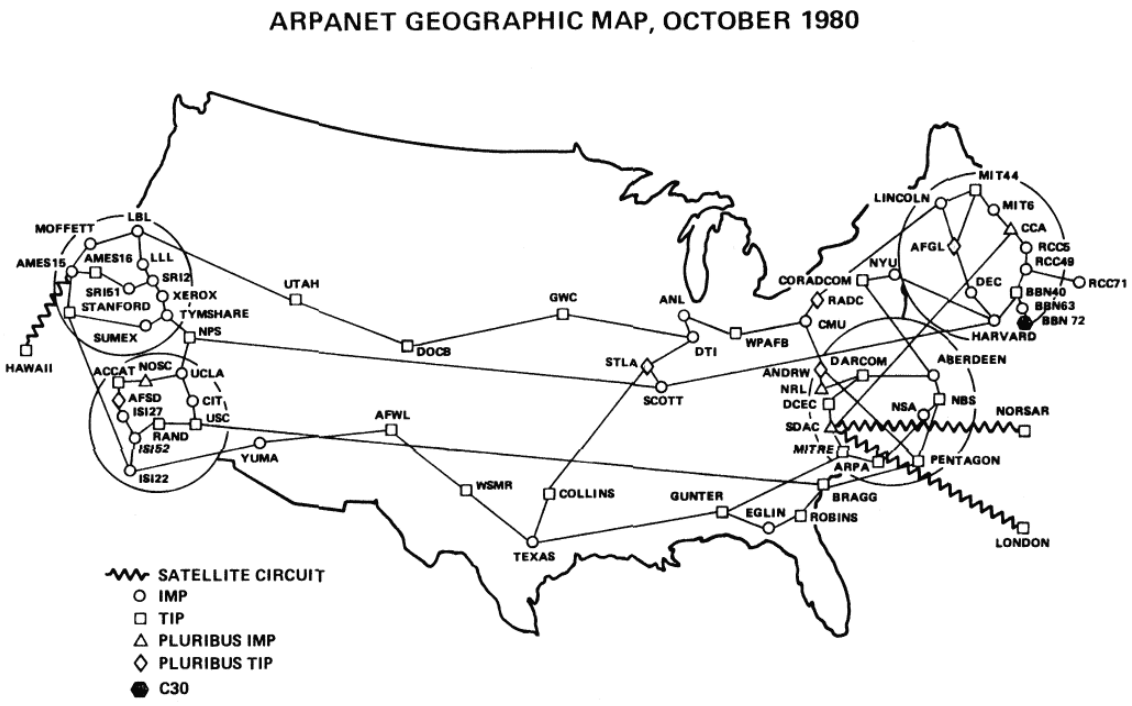
But how to "print" all the student project chips?

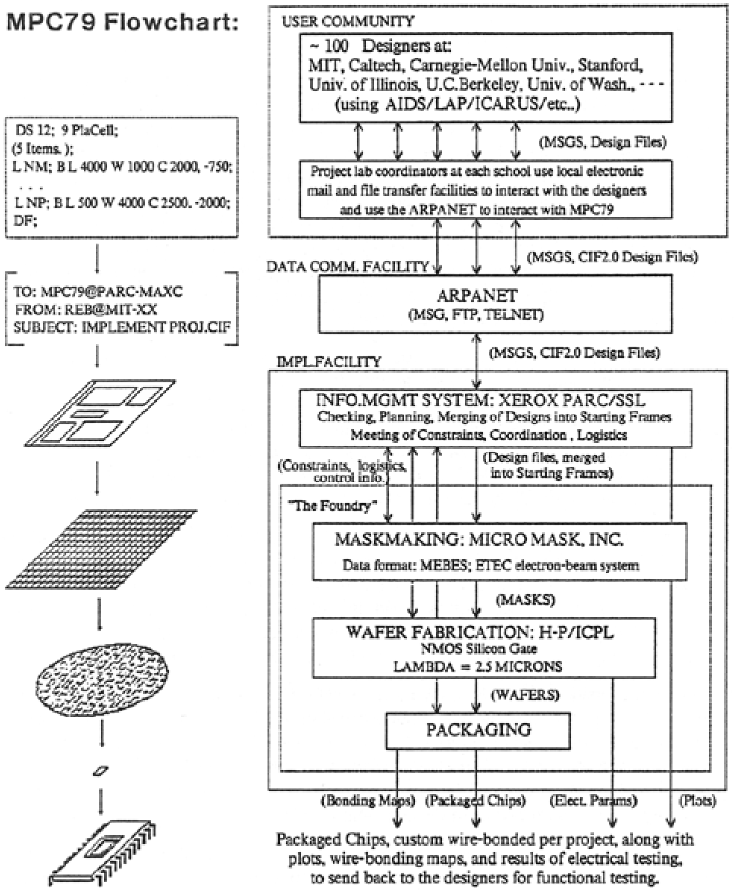
I suddenly envisioned the idea of (what's now called) an "e-commerce system" enabling student design files to be remotely submitted via the Arpanet to a "server" at PARC .

That server would run software to pack designs into multi-project chips (like composing the print-files for a magazine, using remotely-submitted articles) . . .

We'd then "print" the MPC's again at HP Labs (where my colleague Pat Castro had prototyped the first "silicon foundry"), and quickly return the chips to students.

In the fall of 1979, I covertly-orchestrated a huge “Arpanet happening” (MPC79)* . . . involving 129 budding VLSI-designers in Mead-Conway courses at 12 research-universities:





*The MPC Adventures: Experiences with the Generation of VLSI Design and Implementation Methodologies, L. Conway, Xerox PARC, 1981 (PDF)

MPC79 provided a large-scale demonstration and validation of the VLSI design methods, design courses, design tools and e-commerce infrastructure.

It also triggered synchronized 'cyclic gain' in and exponentiation of the budding VLSI design techno-social ecosystem . . . composed of new tribes of VLSI instructors, designers, design tool builders, digital infrastructure providers, fabricators and their collectively entangled artifacts.

By 1982-83, Mead-Conway VLSI design courses were being offered at 113 universities all around the world

It was an early experimental-exploration of emergent techno-social system-dynamics in a field now becoming known as "social physics."

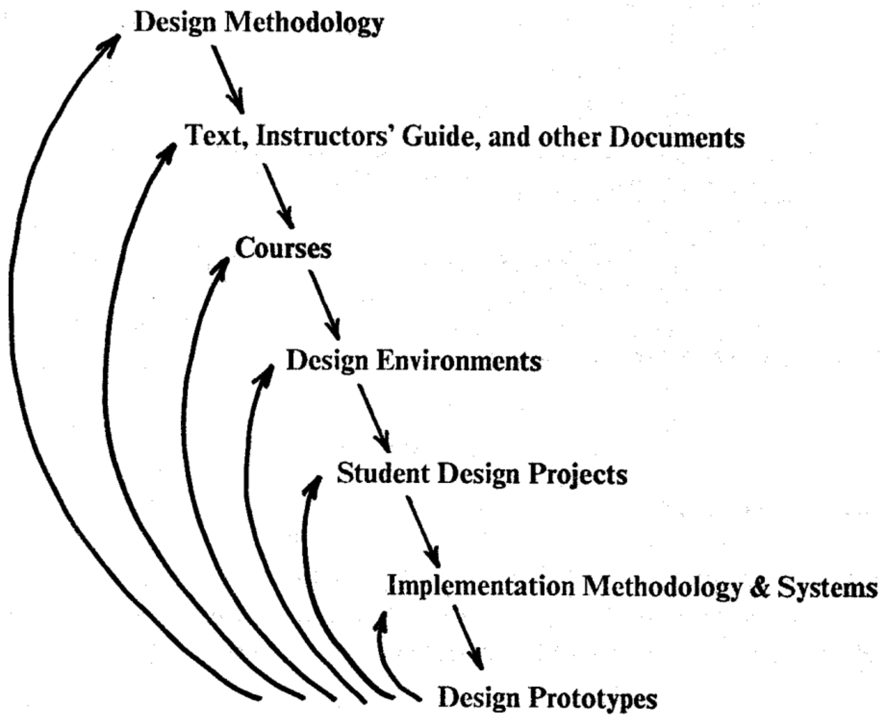
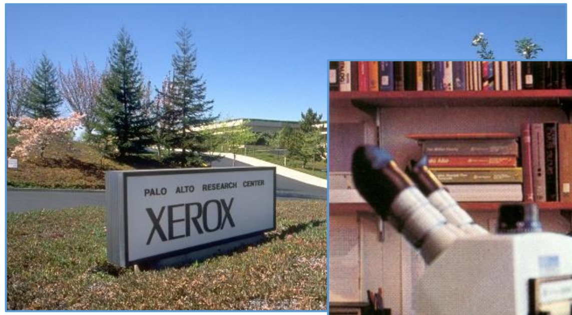


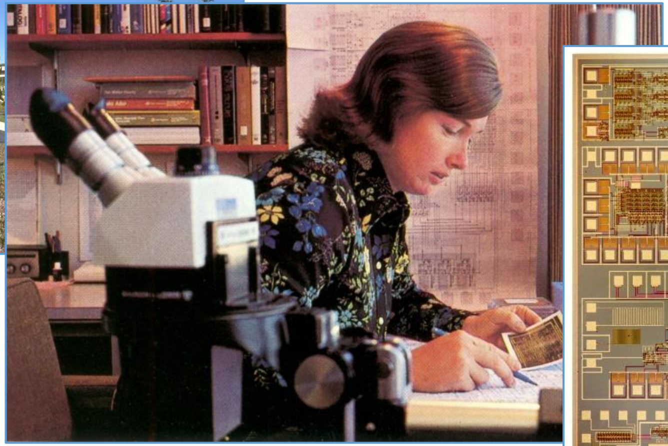
*Figure 8. The Joint Evolution of the Multi-Level Cluster of Techno-Social Systems

From The MPC Adventures* (Lynn Conway, 1981, p. 16)

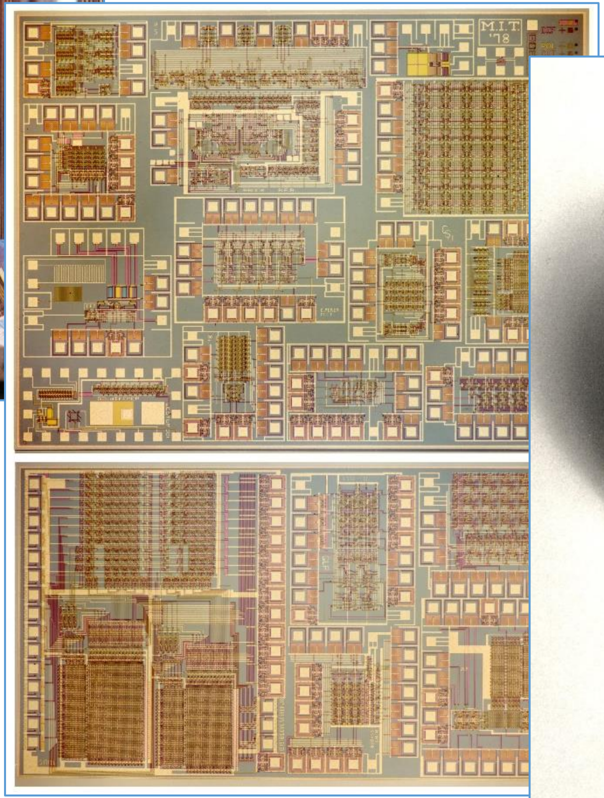
1976



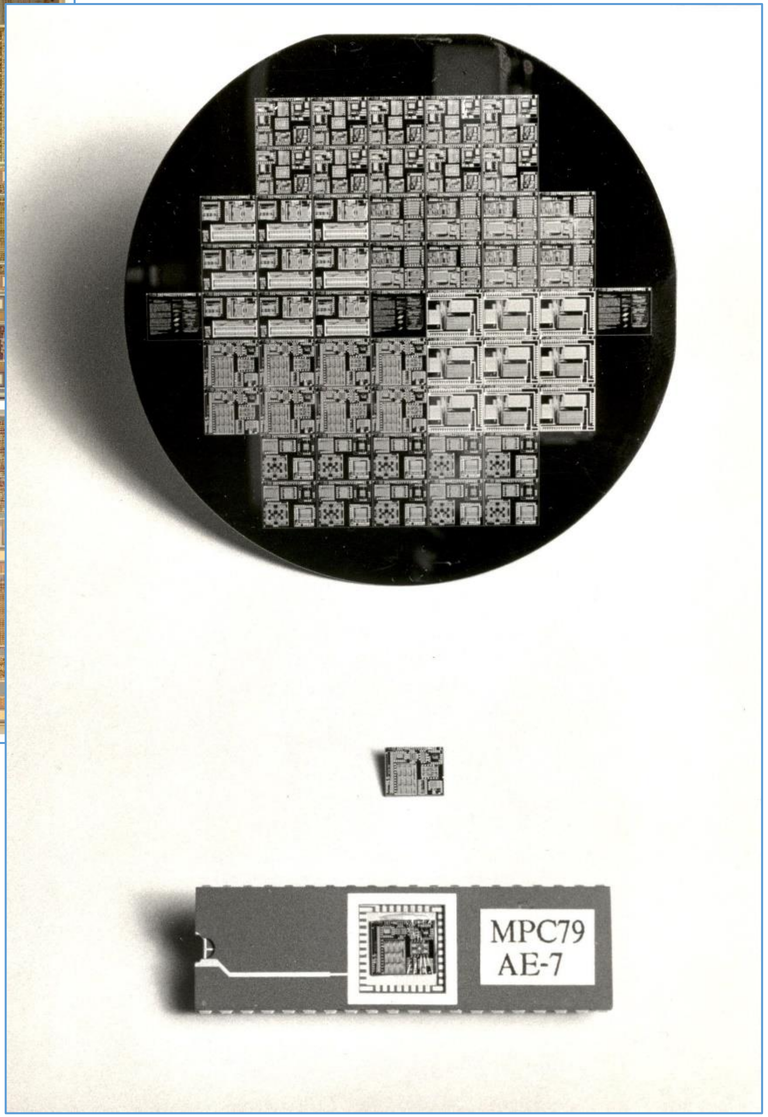
1977



1978



1979



Visualizing the exponentiating wave of VLSI innovation . . .

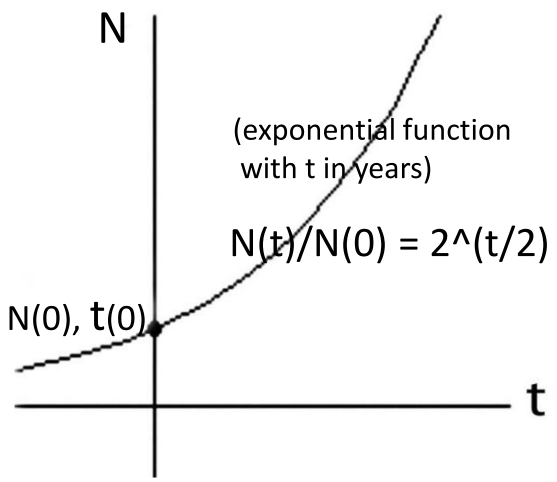
’76: How to cope with VLSI complexity?

’77: Inventing scalable VLSI design rules.

’78: Launching the VLSI methods at MIT!

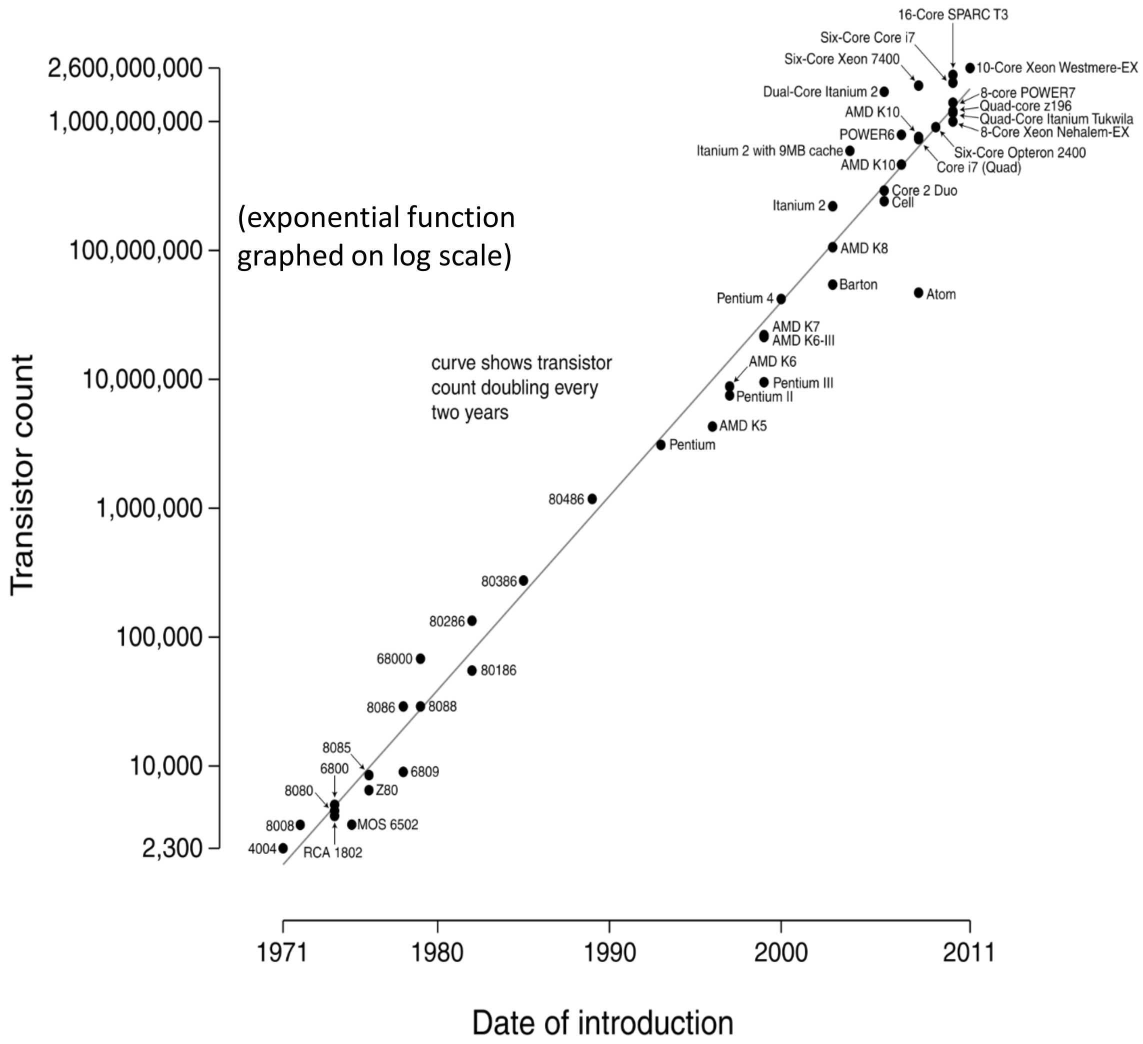
’79: Launching the VLSI courses via MPC79!!

Over the past 40 years or so, Moore's Law stayed on track all the way:

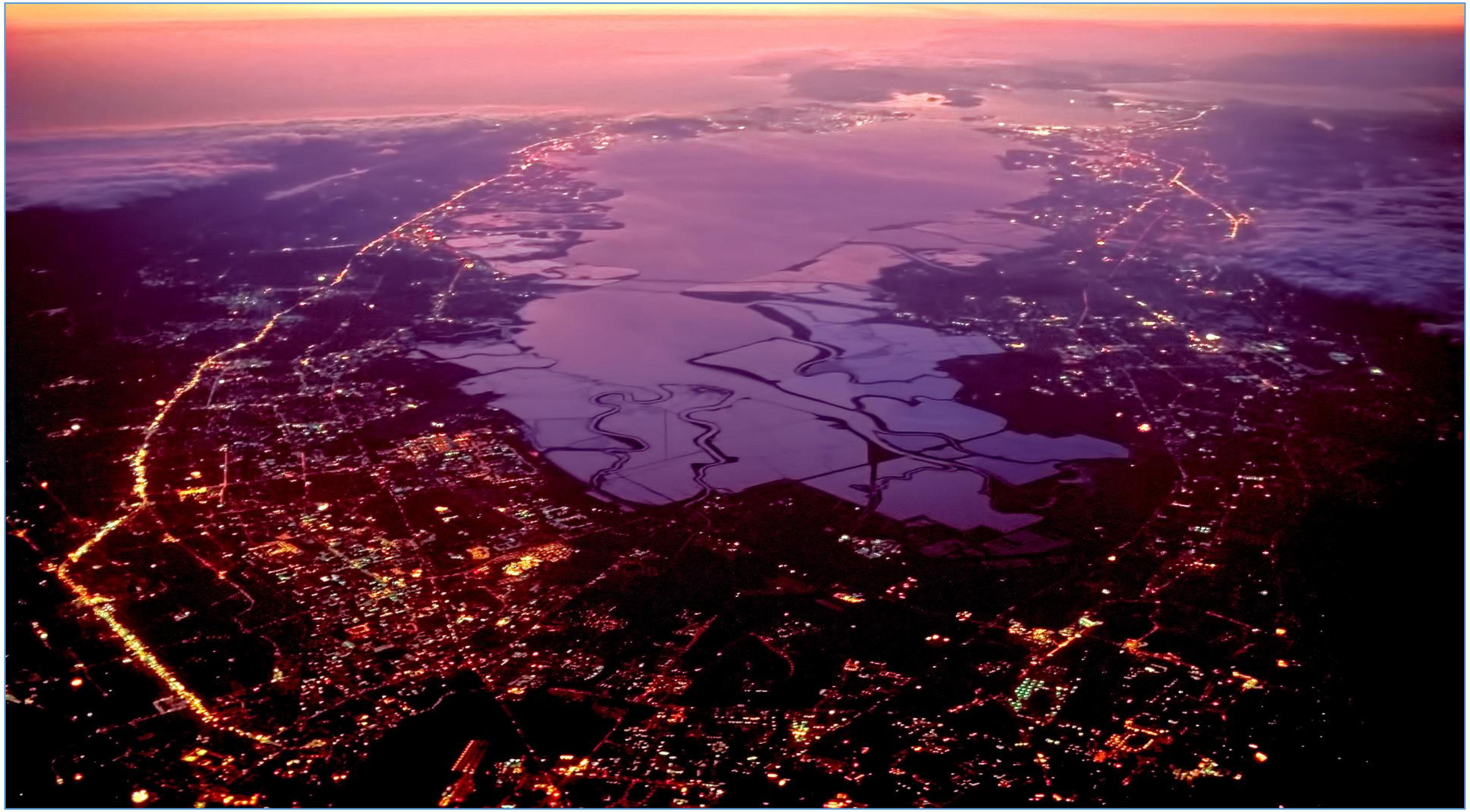


Starting with several thousand in 1971, the number of transistors on a chip passed one million by 1991, and passed several billion by 2011!

Microprocessor Transistor Counts 1971-2011 & Moore's Law



Exponentiation! Visualizing the *compounding of techno-social-system "interest"* . . .



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2(b). Let's now go back and follow high-tech community reactions
to the "Mead-Conway" innovations over the ensuing decades:

By ’81 key people sensed ‘something significant’ had happened, and Mead & Conway began receiving major recognition during the 1980s:

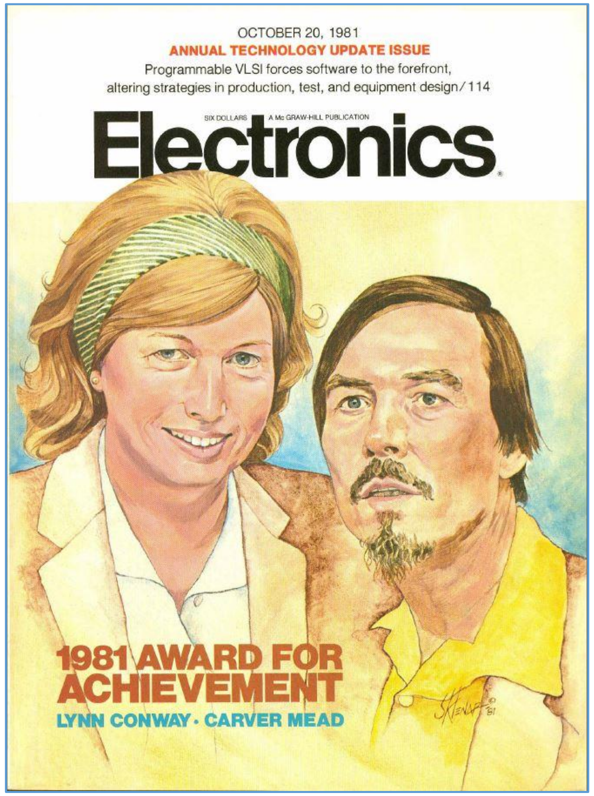
Electronics Award for Achievement ‘81

Pender Award, Moore School ‘84

Wetherill Medal, Franklin Institute ’85

NAE, Mead ‘84

NAE, Conway ‘89. . .



However, from ‘89 on through the ‘00s, Mead received increasingly major recognitions, while Conway’s role was erased*:

NAS ‘89
American Academy of Arts and Sciences ‘91
EDAC Phil Kaufman Award ‘96
IEEE John Von Neuman Medal ‘96
ACM Allen Newell Award ‘97
MIT Lemelson Award ‘99 ($500,000)
Fellow Award, Computer History Museum ‘02
National Medal of Technology ‘02
NAE Founders Award ‘03
Inventors Hall of Fame, at Computer History Museum Gala ‘09

Most of these awards were for innovations that were solely Conway’s

As a result, by 2009 the erasure was complete:

Chip inventors getting their due at Hall of Fame induction

By Mike Cassidy, San Jose Mercury News

Apr. 30, 2009 --The 50th birthday celebration of the integrated circuit kicks off in Silicon Valley this weekend, and frankly, I'm a little overwhelmed . . .

On Saturday night, the National Inventors Hall of Fame is inducting this year's class. The sold-out ceremony (at the Computer History Museum) is in Silicon Valley for the first time, because the Ohio-based hall is honoring 15 who are responsible for breakthroughs in semiconductor technology -- the technology that put the "silicon" in Silicon Valley . . . In a way, it's as if the valley's founding fathers are coming together to be honored in person and posthumously.

Inductees Gordon Moore, co-founder of Intel and namesake of Moore's Law, and Carver Mead, chip design pioneer and all-around brainiac, will be at the ceremony. So will lifetime achievement honoree Andy Grove, Intel's former CEO . . .

With Andy Grove, Gordon Moore and Carver Mead taking center stage:

INTEGRATED CIRCUIT

HONORING THE PEOPLE WHO HELPED PIONEER COMPUTER CHIP TECHNOLOGY

Andrew "Andy" Grove, top left, who cofounded Intel, will be given a lifetime achievement award.

Besides cofounding Fairchild Semiconductor and Intel, **Gordon Moore**, top right, will be honored for devising Moore's Law, which accurately predicted that the number of transistors built into each computer chip would double every two years, though he initially thought the doubling would occur annually.

Carver Mead, left, will be honored for devising the so-called VLSI method for designing chips.

MERCURY NEWS PHOTO ILLUSTRATION WITH IMAGES FROM MERCURY NEWS ARCHIVES AND ISTOCKPHOTO.COM

INNOVATORS TO BE INDUCTED INTO HALL AS PART OF 50TH CELEBRATION

By Steve Johnson
Mercury News

To celebrate the 50th anniversary of the integrated circuit, the National Inventors Hall of Fame will honor 16 people who helped pioneer computer-chip technology during a sold-out ceremony Saturday at the Computer History Museum in Mountain View.

Andy Grove, who cofounded Intel and formerly served as the Santa Clara chip maker's chief executive and chairman, will be given a lifetime achievement award.

Among the others being honored is Gordon Moore. Besides cofounding Fairchild Semiconductor and Intel, he devised Moore's Law, which accurately predicted that the number of transistors built into each computer chip would double every two years, though he initially thought the doubling would occur annually.

Also to be honored are:

■ Carver Mead. By devising the so-called VLSI method for designing chips, he helped to develop the standards and tools that permitted tens of thousands of transistors to be packaged onto semiconductors.

See **INVENTORS**, *Page 2*

Freethinkers shaped the valley

Honoring an era of innovation

MIKE CASSIDY
» Silicon Valley Dispatches

The 50th birthday celebration of the integrated circuit kicks off in Silicon Valley this weekend, and frankly, I'm a little overwhelmed.

It's like being the movie writer in Hollywood during Oscar week. Or being the golf writer in Augusta when the Masters comes to town. Because this weekend, the stars are coming out. Our stars, anyway.

Saturday night, the National Inventors Hall of Fame is inducting this year's class. The sold-out ceremony is in Silicon Valley for the first time, because the Ohio-based hall is honoring 16 who are responsible for breakthroughs in semiconductor technology — the technology that put the "silicon" in Silicon Valley. Add to that excitement the group of A-listers expected to be in the audience and, well, it gives me the vapors.

But seriously, whether or not they are all household names, these men changed our households and our history for the better. In a way, it's as if the valley's founding fathers are coming together to be honored in person and posthumously.

See **CASSIDY**, *Page 2*

SALUTE TO THE SEMICONDUCTOR

In addition to Saturday's National Inventors Hall of Fame induction ceremony, the Computer History Museum in Mountain View is holding several events next week as part of a yearlong program called Salute to the Semiconductor, in honor of the 50th anniversary of the integrated circuit. Museum officials expect the events to be booked to capacity. The events:

Wednesday: "From Tinkertoys to Solid Circuits: Microcircuitry in the Late 1950s," with speakers Michael Riordan, Charles Phipps, Jay Lathrop and L. Arthur D'Asaro. 6 p.m. reception, 7 p.m. event.

Thursday: Tours of the Computer History Museum (2:30, 3:30 and 4:30 p.m.) and the Intel Museum (3:30 p.m.).

Friday: Commemorative plaque unveiling at original Fairchild site (shuttle bus leaves museum at 3:30 p.m.). Also: "The Planar Integrated Circuit: Building the Future at Fairchild Semiconductor," with speakers Christophe Lécuyer, Leslie Berlin, Gordon Moore and Jay T. Last. 6 p.m. reception, 7 p.m. program.

Information/registration: www.computerhistory.org/events

San Jose Mercury News April 30, 2009

Andrew "Andy" Grove, top left, who cofounded Intel, will be given a lifetime achievement award.

Besides cofounding Fairchild Semiconductor and Intel, **Gordon Moore**, top right, will be honored for devising Moore's Law, which accurately predicted that the number of transistors built into each computer chip would double every two years, though he initially thought the doubling would occur annually.

Carver Mead, left, will be honored for devising the so-called VLSI method for designing chips.

MERCURY NEWS PHOTO ILLUSTRATION WITH IMAGES FROM MERCURY NEWS ARCHIVES AND ISTOCKPHOTO.COM

INNOVATORS TO BE INDUCTED INTO HALL AS PART OF 50TH CELEBRATION

By Steve Johnson
Mercury News

To celebrate the 50th anniversary of the integrated circuit, the National Inventors Hall of Fame will honor 16 people who helped pioneer computer-chip technology during a sold-out ceremony Saturday at the Computer History Museum in Mountain View.

Andy Grove, who cofounded Intel and formerly served as the Santa Clara chip maker's chief executive and chairman, will be given a lifetime achievement award.

Among the others being honored is Gordon Moore. Besides cofounding Fairchild Semiconductor and Intel, he devised Moore's Law, which accurately predicted that the number of transistors built into each computer chip would double every two years, though he initially thought the doubling would occur annually.

Also to be honored are:

■ Carver Mead. By devising the so-called VLSI method for designing chips, he helped to develop the standards and tools that permitted tens of thousands of transistors to be packaged onto semiconductors.

See **INVENTORS**, *Page 2*

Not only was Lynn Conway not invited, she didn't even know it was happening!
Hmm . . . Reminds us of the Apple Macintosh story, eh?

3. My investigations into and reporting on what happened,
hoping to regain some of my legacy along the way . . .

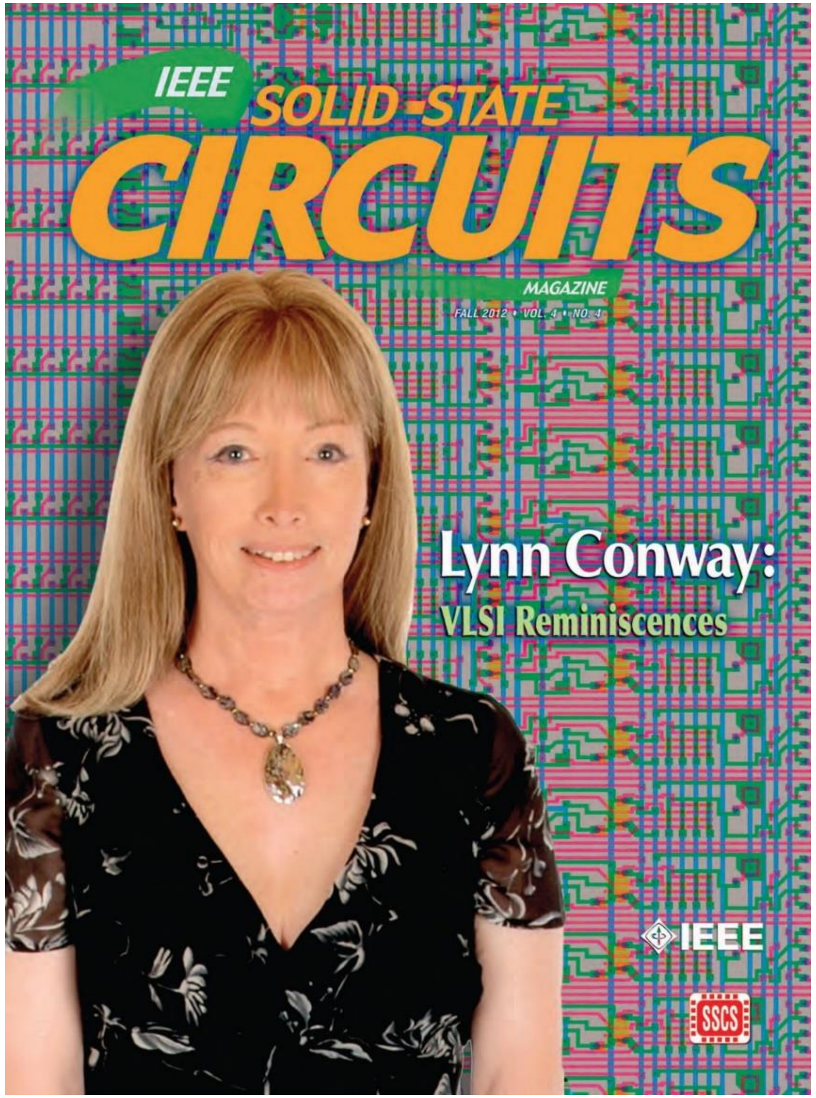
[Link]

The story of my recent investigations is quite a saga, yet to be fully told . . .

Along the way I uncovered all sorts of fascinating data and evidence.

That led me to write and publish my "Reminiscences of the VLSI Revolution" in the Fall 2012 IEEE *Solid State Circuits Magazine*.

The first time in decades I'd come forward and begun telling the story . . .



I also began to visualize **how my transgender journey affected my role in the revolution**.

I'd been **fired from my research position at IBM during my transition back in 1968**, and restarted my career all over again in "stealth mode", in a covert new identity.

Rising from contract programmer, to computer architect at Memorex, to working at Xerox PARC, **I lived like a foreign spy in my own country** . . . Always looking over my shoulder, terrified I'd be outed and lose my career again.

Not wanting to call attention to myself**, I used "tradecraft" I'd learned during my transition to covertly make things happen** . . . **while staying hidden behind the scenes.**

And now my reminiscences were finally **triggering my reappearance** . . .

Links re my investigation to understand what happened, and to reclaim my life-legacy:

Compilation of the VLSI Archive, 2009-2012

Publication of my IBM-ACS Reminiscences, 2011

Publication of my VLSI Reminiscences, 2012

Publication of my MIT Reminiscences, 2014

Evidence that "the paradigm is shifting":

Hall of Fellows, Computer History Museum, 2014

Honorary Doctorate, Illinois Institute of Technology, 2014

IEEE & Royal Society of Edinburgh, James Clerk Maxwell Medal, 2015

Honorary Doctorate, University of Victoria, 2016

Fellow of the AAAS, 2017.

Honorary Doctorate, University of Michigan, 2018.

Lifetime Achievement Award, IBM Corporation, 2020

3(b). But Why did Lynn's 'disappearance" happen in the first place?

A Counter-Intuitive Explanatory-Conjecture: The '*Conway Effect'!*

Link

Throughout this example we “appear to observe” the following effects:

(i) the “Matilda effect” (repression of women scientists’ contributions)
(ii) the "Matthew effect“ (eminent scientists get more credit)

These effects involve “self-fulfilling prophecies”, which Merton describes as:

“. . . *a false definition* of the situation evoking a new behavior which makes the original false conception *come true*. This specious validity of the self-fulfilling prophecy *perpetuates a reign of error*. For the prophet will cite the actual course of events as proof that he was right from the very beginning.”

But is that all that’s happening?

Or are other, far deeper, systemic forces in play?

Link

On closer investigation, I realized that something far more subliminal and fundamental was happening at a social level . . . something that involves no errors, no conspiracies, no repressions **and no 'bad guys'**:

CONJECTURE: Almost all people are blind to innovations, especially ones made by 'others' whom they do not expect to make innovations.

Since for most people, 'others' = 'almost all people', few people ever witness or visualize innovations, even ones made right in front of their eyes, even including some made by themselves!

Instead, when internally-orientating towards 'novelties' they stumble upon, most people look for cues by others . . . and not just whether to accept or reject the novelty . . . but even whether to notice it in the first place!

From this perspective, the **Mathew Effect and Matilda Effect are derivatives** of the newly conjectured **"Conway Effect"**, which covers 'all outsiders'.

Visualizing the Conway Effect in action:

Most students in MIT'78 thought they were learning "how chips were designed in Silicon Valley" (the course was, in effect, a giant MIT hack!). They "did it" without realizing they were learning radical new methods.

The astonished reaction amongst Silicon Valley's cognoscenti led to intense interest in reverse engineering "How MIT did this", and many research universities immediately wanted to offer similar "MIT VLSI courses".

The next year, the MPC79 chip designers took 'foundry access' for granted and just 'used it'. No one realized MPC79 was an even larger paradigm-shifting-hackathon that was launching the modern microchip "fabless design"+"silicon foundries"+"e-commerce" infrastructure.

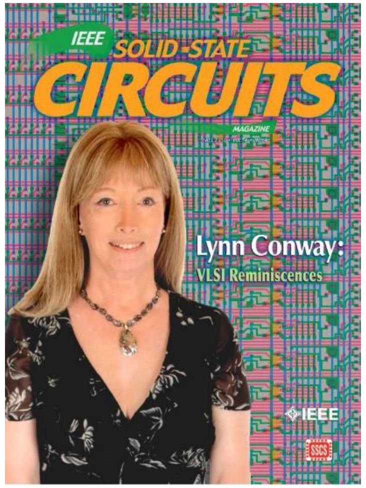
By 'hiding in plain sight', MPC79 simply 'disappeared' from view as an innovation!

What might MPC79 participants have been thinking?

Since MPC79 used the ARPANET, many thought DARPA had "launched it."

When DARPA sponsored transfer of the MPC79 technology to a support-contractor, many future users thought that new "MOSIS" service had been "invented by DARPA"! Government-supported MOSIS-like services even began springing up in other countries!

Thus the VLSI revolution swept through the high-tech community without anyone realizing it had been deliberately generated, much less how that was done, or who did it.



Although the VLSI Book by 'Mead' was iconically-connected with these large-scale techno-social events, Mead himself was never able to explain what happened . . .

Meanwhile, Conway remained hidden in the shadows until 2012, when she finally <u>felt able to emerge and explain how it happened</u> . . .

The Conway Effect: Almost all people are blind to innovations, especially those made by folks they don't expect to make innovations.

- Innovations diffuse via social-processes involving subliminal subgroup noticings, mimickings, rejections, adoptions, adaptations, tradings and displacements

Meanwhile, credits for innovations as social-markers are *separately* subliminally assigned, gained, granted, bartered, **seized**, etc . . .

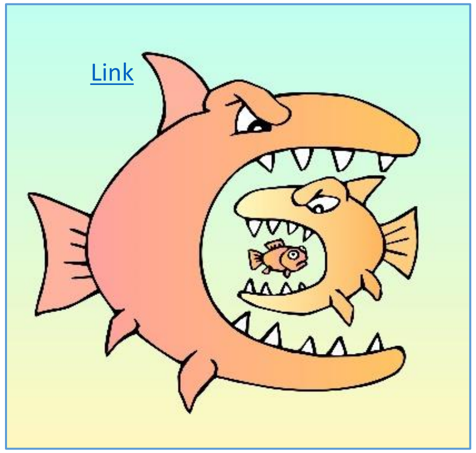
- Crediting-processes are modulated by visibility, status, prestige, class, power, location, credentials, prejudice, popularity, influence, money and accident . . .

The **high visibility of crediting** (vs the invisibility of innovations) sustains both the crediting-processes and the ongoing-blindness to innovations.

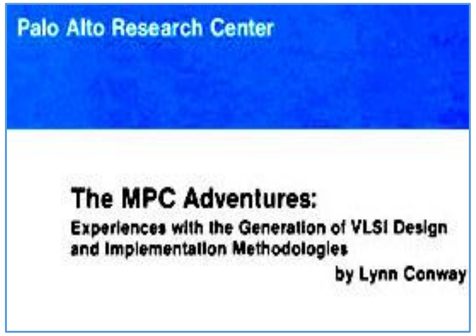
Corollary: It's possible to trigger large paradigm-shifts right out in the open, as long as people have no clue what you're doing!

I wonder, could this even have happened any other way . . . ?

Distracted by Greed!



Covert Visioneering!


Palo Alto Research Center

The MPC Adventures:
Experiences with the Generation of VLSI Design and Implementation Methodologies
by Lynn Conway

Closing Reflections:

If women are not expected to innovate, the stories of their innovations, even major ones, disappear. Credit then goes to men associated with the innovations, who do not have to aggrandize credit. Credit accrues to those men as they are remembered, while the women disappear.

To be able to "win at innovation," women must be expected to be able to win. This expectation **must live inside women themselves.** And **to live inside them, it must fully-live in society**.

As a **previously-marginalized "unexpected-innovator"** this struggle was existentially-difficult at times, especially during the decades of my disappearance . . .

Fortunately, **it has led to insights into how people can be wronged, even when no one is deliberately doing wrong**. Hopefully **these insights can help empower us** . . . to better-visualize what's going on, better seize our moments, and better-trigger positive social change.

THE END

Moral Of The Story:

"When Weirdness breaks out, don't get upset . . . Do Science On It!"

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