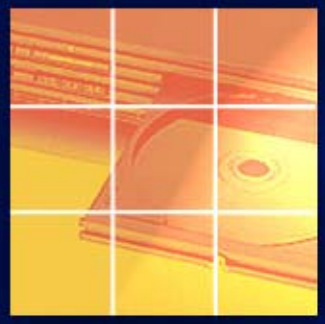


Hope for High Tech? Innovation and the Path to Growth

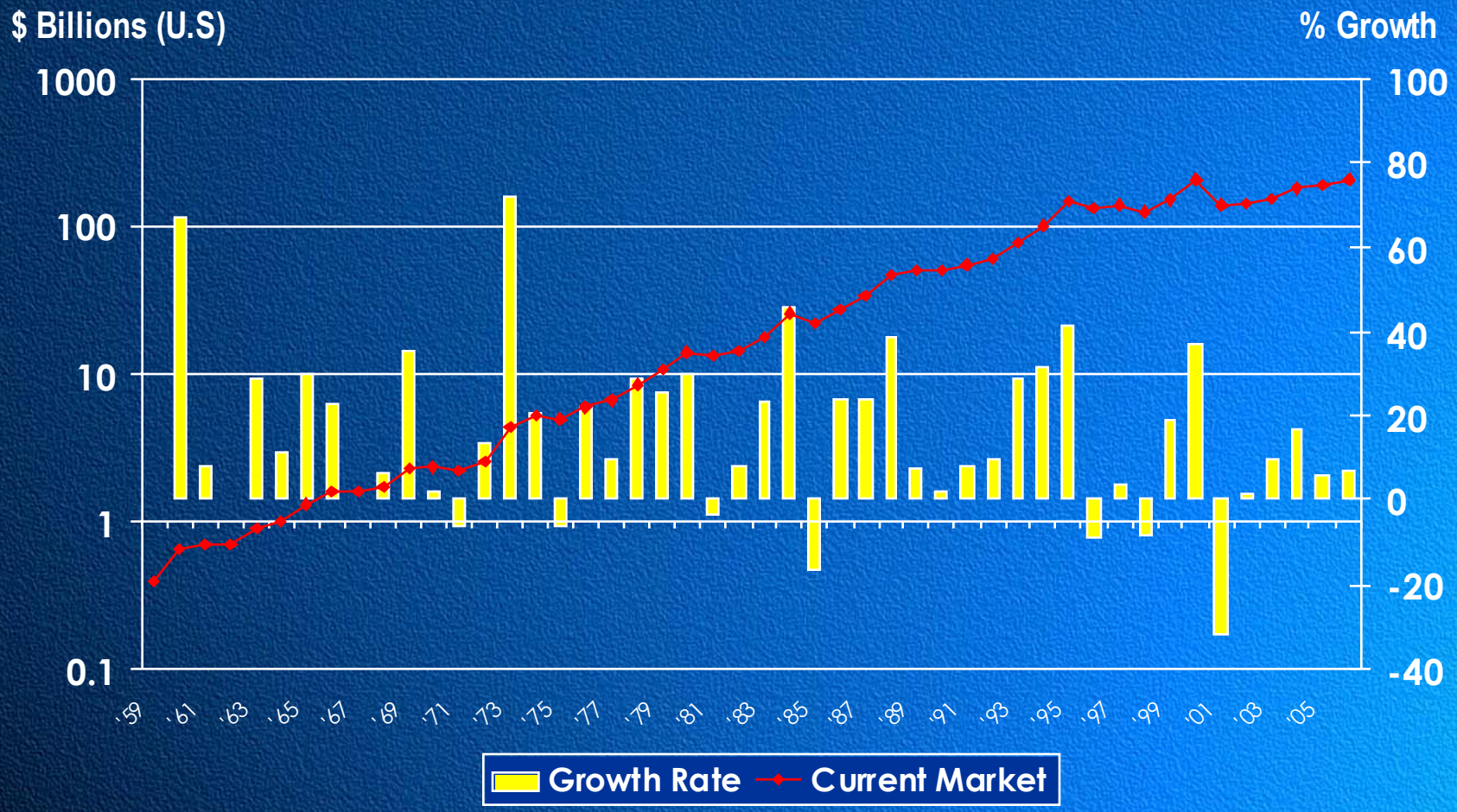
Chris Hamlin
Chief Technology Officer
LSI Logic

LSI LOGIC

The Current Uncertainty

- Many Sources of Volatility
- Many Contradictory Voices
- Semiconductor Down Cycle: Unprecedented Depth and Duration
- Many Disparate Forces are Operating in Concert
  - Macroeconomic
  - Geopolitical
  - Technological
  - Sociological
- It all needs to be taken into account
- ‘Business as usual’ doesn’t exist

Semiconductor Market Cycle



Source: SIA, November 2002

The End of High-Tech?

Candy-Coated Electronics

By David Gelernter

The U.S. economy has been working from a script that said "pause here until Iraq has been liberated." The pause is nearly over, so it's a good time to face up to the postwar state of the world. The technology sector is crucial to the economy, and personal computers to the tech sector—and consumers and businesses no longer replace their PCs on cue. The U.S. computer industry will either deal with this fact or come screeching to a traumatic halt soon.

Five years ago we were flooded with information; now we're drowning. Meanwhile, the distance between evolving hardware and the same old software has become a crisis. The industry suffers from a software gap that could change its nature and choke off the cash flow that underwrites its future.

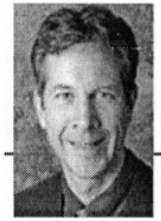
Who needs a desktop, a file system, a mailer, or a document manager?

or their e-mail full of everything, they are telling the industry something: Who needs a desktop and a file system? A mailer and a document manager?

We desperately need a structure that brings to bear visual sense.
onscreen picture mus
way you browse the W
supermarket or new
things at once, and h
Sophisticated visual b
formation manageme
ways know exactly w
you know where it is,

tion systems are cand

USA TODAY



Technology
Kevin Maney

Hey, let's all just decide that the tech downturn is kaput

That's it. Enough. This whole tech industry misery thing has gone on too long, ar
over.

Larry Ellison's Sober Vision

Tech Industry Will Shrink, 1,000 Companies Will Fail, Predicts Oracle's Feisty Chief

By Mylene Mangalindan

WAKE UP, Silicon Valley. Your misspent youth is behind you.

That's the unlikely message from Larry Ellison, chief executive of **Oracle** Corp. and a longtime captain of the valley.

Mr. Ellison disputes the popular, romanticized vision of the computer industry as always growing and reinventing itself. He says the high-tech world—now in the throes of a devastating downturn—might not be immune to aging.

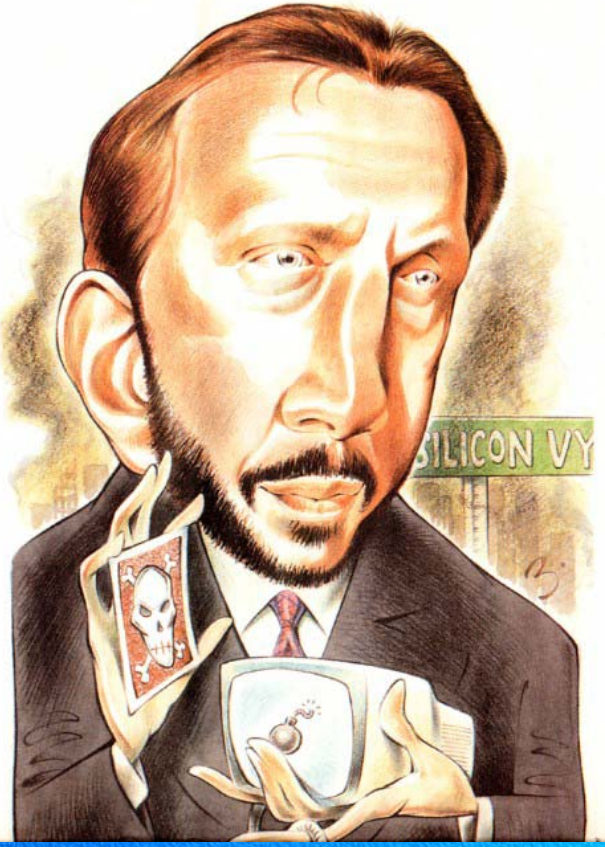
"What's going on ... is the end of Silicon Valley as we know it," the co-founder of the world's second-biggest software company, after **Microsoft** Corp., told a group of Wall Street Journal editors and reporters. "The next big thing ain't computers." Instead, he says, it's biotechnology.

Mr. Ellison, sounding like a modern-day Cassandra, paints a dark vision of the computer industry's future: increasingly standardized products with little distinguishing technology and thin profit margins. Sweeping consolidation, prompting the death of 1,000 tech companies. Fewer start-ups. And a handful of category-dominating winners, which will control innovation.

"There's this bizarre notion in the computer industry that we'll never be a mature industry," Mr. Ellison says. In his view, the industry "is as large as it's going to be."

The Oracle chief says his analysis is based on economic principles that he jokingly suggests should win him the Nobel Prize: "I call it 'specialization of labor' as well as 'economies of scale.' "

Among his predictions: cheaper computers that use the free Linux software and other technical efficiencies will drive down prices. More software development will move overseas, seeking lower-cost labor. Maturation of the industry will lead to bigger companies, which will offer a wider range of products and take more market share from everyone else.



Business/Financial Desk | April 9, 2003, Wednesday

TECHNOLOGY; Is There Life After Silicon Valley's Fast Lane?

By JOHN MARKOFF (NYT) 1596 words
Late Edition - Final , Section C , Page 1 , Column 2

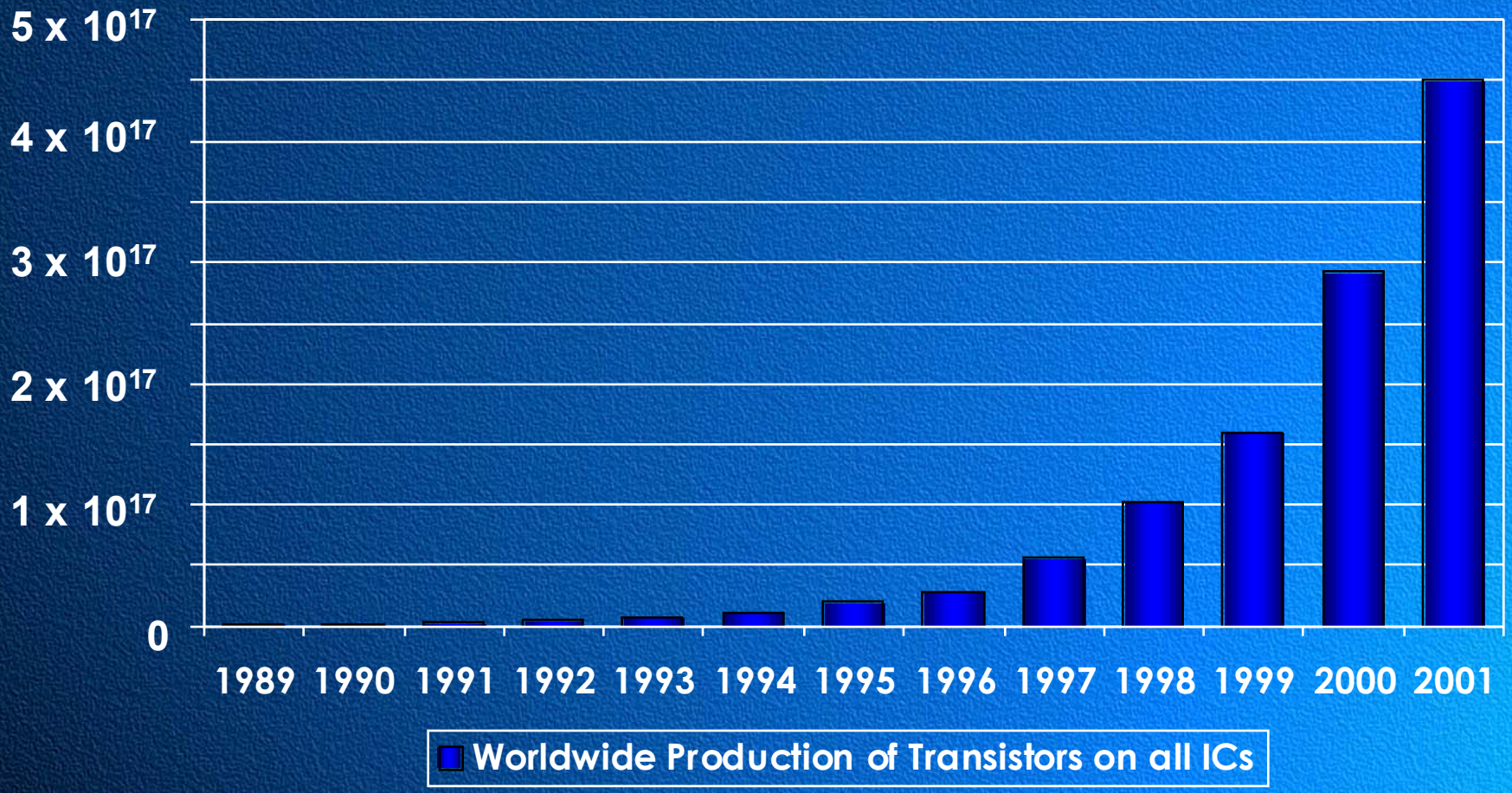
The New York Times

ABSTRACT - Some computer industry experts warn that Moore's Law, 1965 observation by Intel co-founder Gordon E Moore that number of transistors on silicon chip would double about every 18 months, dictating pace of product obsolescene and innovation, may soon reach its theoretical limits, with dire consequences for technology industry's economic engine; influential cadre of heretics is arguing that seeing end to slavish demands of Moore's Law could be best thing to happen to culture of Silicon Valley and maybe even to future of technological innovation that is afected by that culture; eBay founder Michael S

Hope or Despair?

- Sources of Change and Volatility:
  - Dot Com Bust:
    - Russian Default
    - Long Term Capital
  - End of PC Boom
  - Customer Dissatisfaction
  - Cyclical Behavior
  - Recession
  - Rise of Chinese High Technology Industry
  - Moore's Law
  - Nanotechnology
- Complexity: Opportunity and Challenge

450,000,000,000,000,000 Transistors Produced in 2001

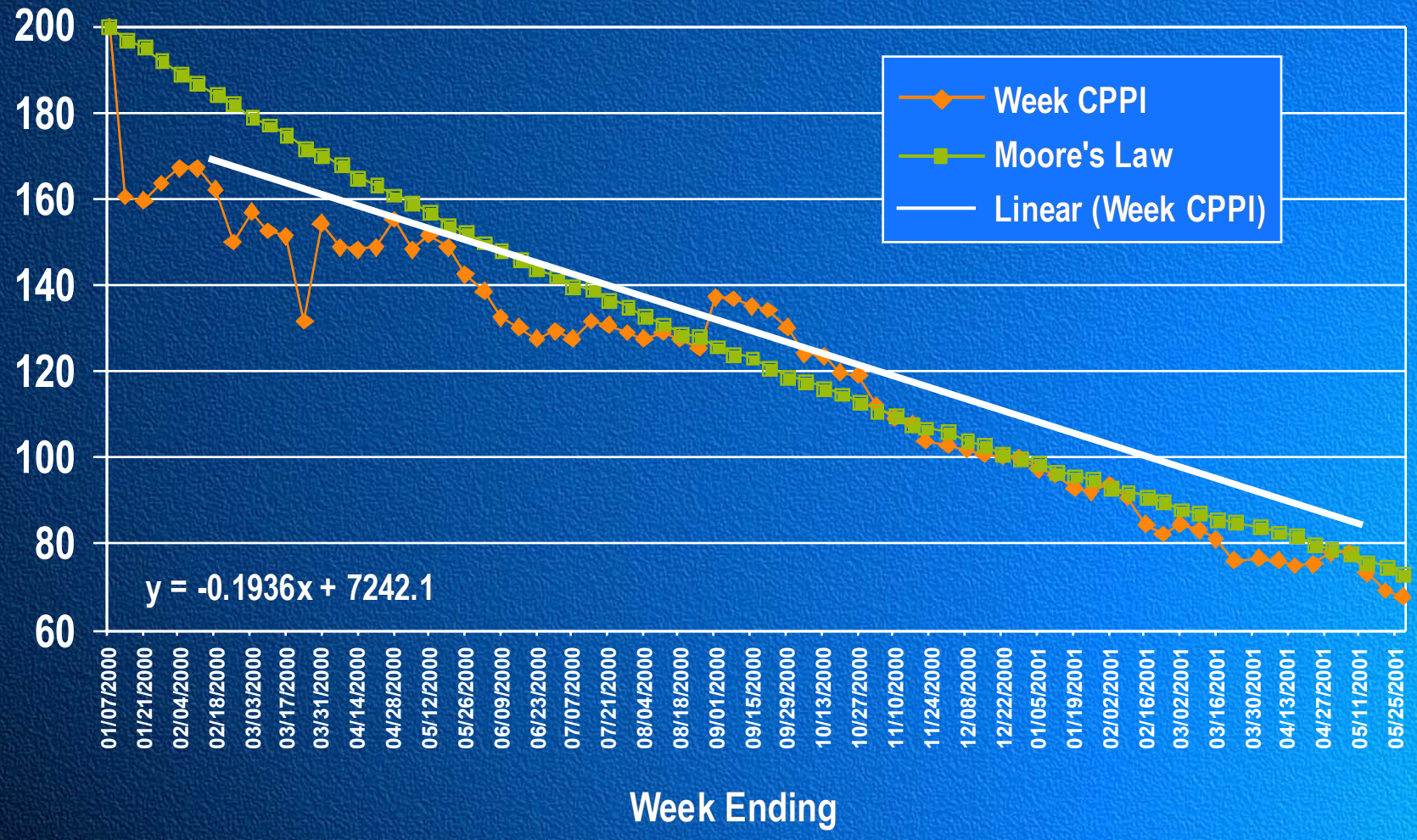


Source: SIA

How Did We Get Here?

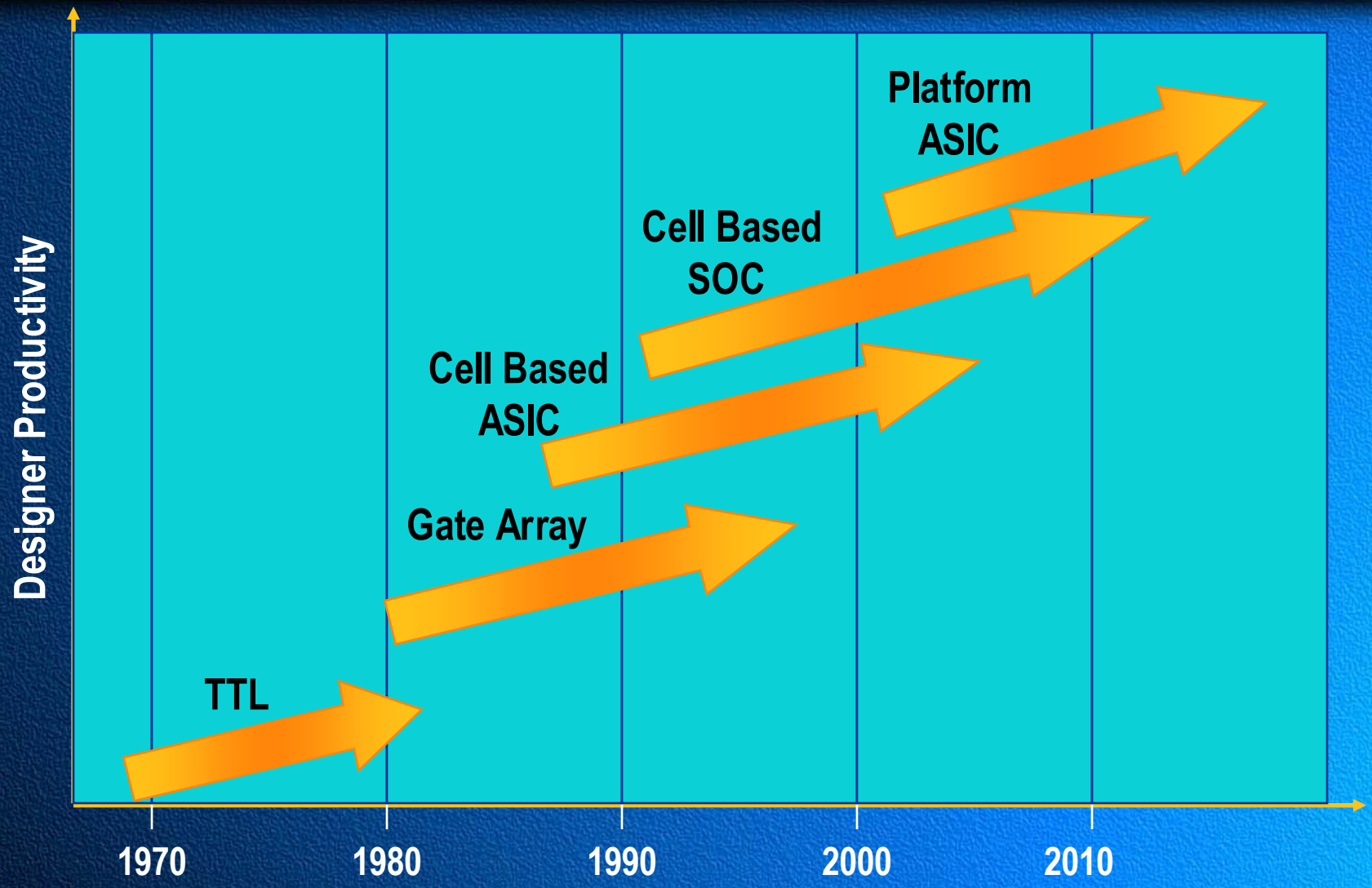
- Perfect Storm?
- Dot-Gone + Recession + Cycle + Defaults + War + New Paradigm
- The Pessimists' View:
  - All the PCs have been sold already
    - and if not, they're commodities without profit
  - No one wants cell phones with unworkable gadgets
  - The Internet was a fraud (and the equipment wasn't needed)

Chip Price / Performance Index

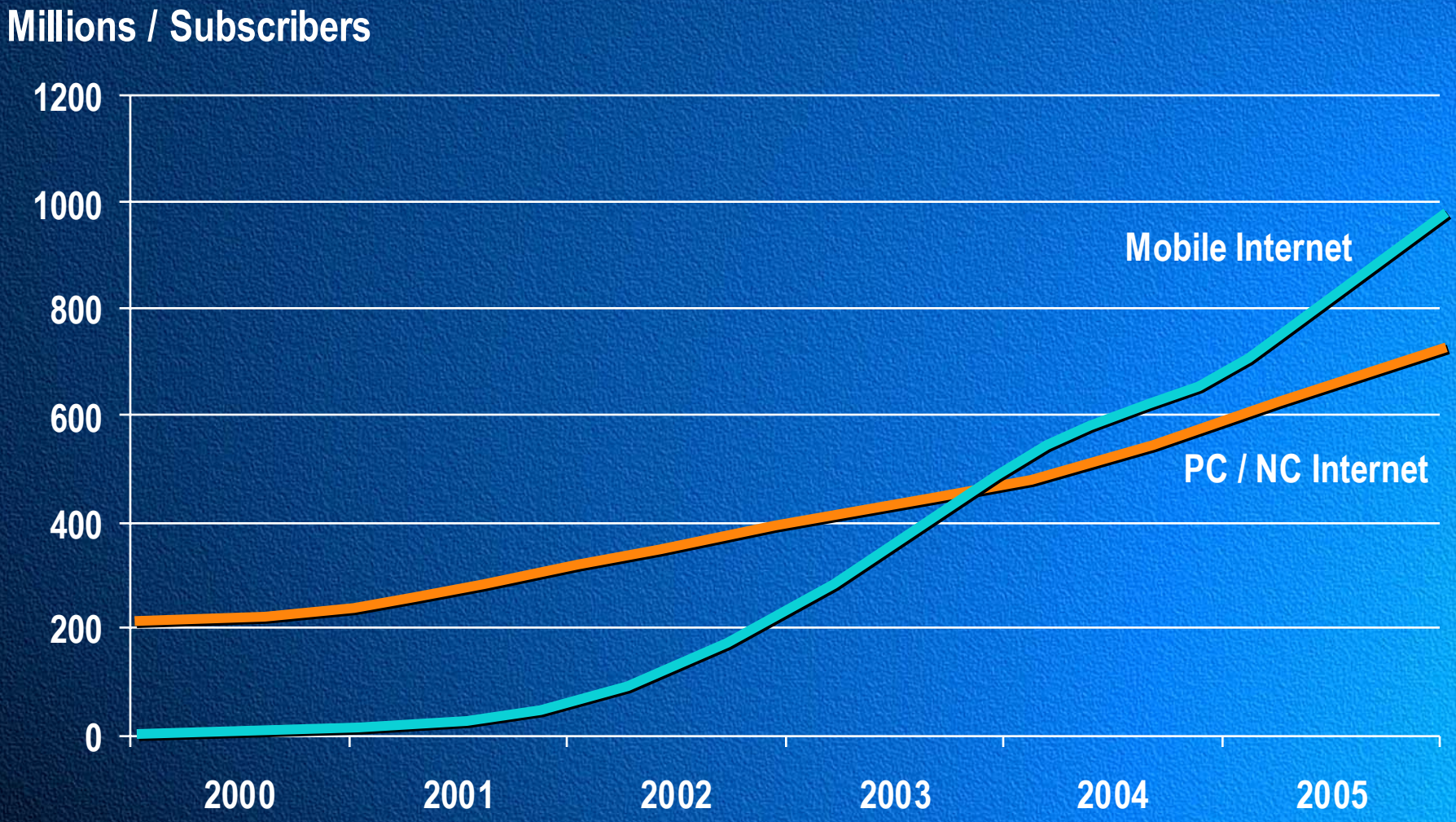


Source: VLSI Research

Eras of Productivity Improvement



Worldwide Internet Users



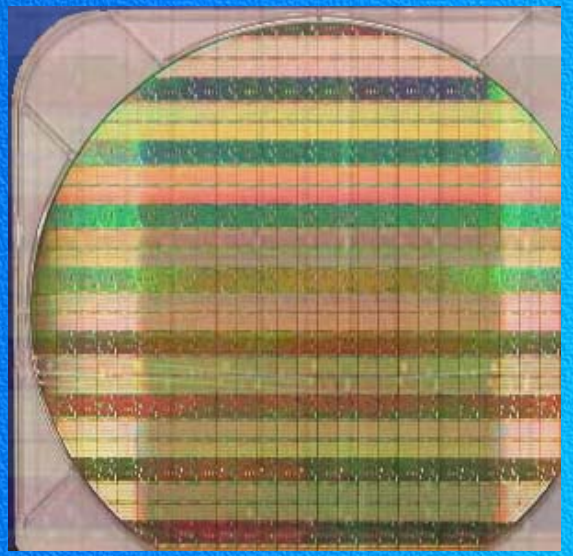
Source: Ericsson

Duality of Globalization's Role

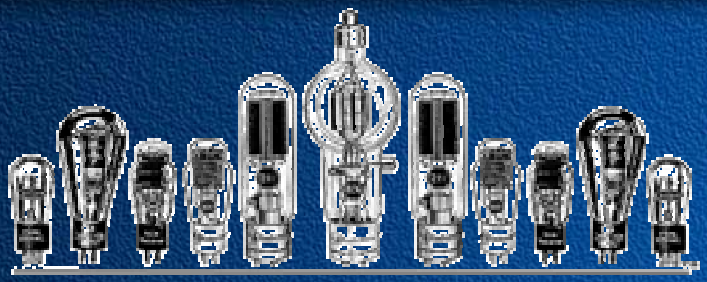
- Expansion of Markets
- Creation of New Markets
- Commodification
- Narrowing Creativity

The Role of the PC

- The PC Plays a Contradictory Role:
- Economies of Scale…
- …with Enforced Conformity
- Very Low Costs…
- …with Loss of Innovation:
  - Processors
  - O/S
  - Storage
  - Memory
- But Great Advances in Manufacturing

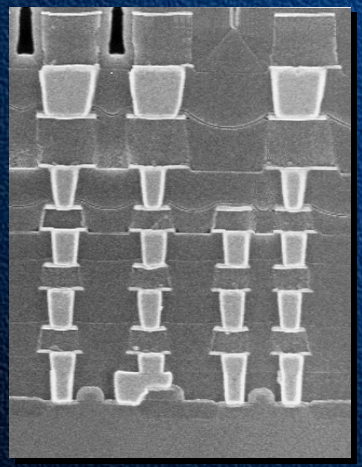


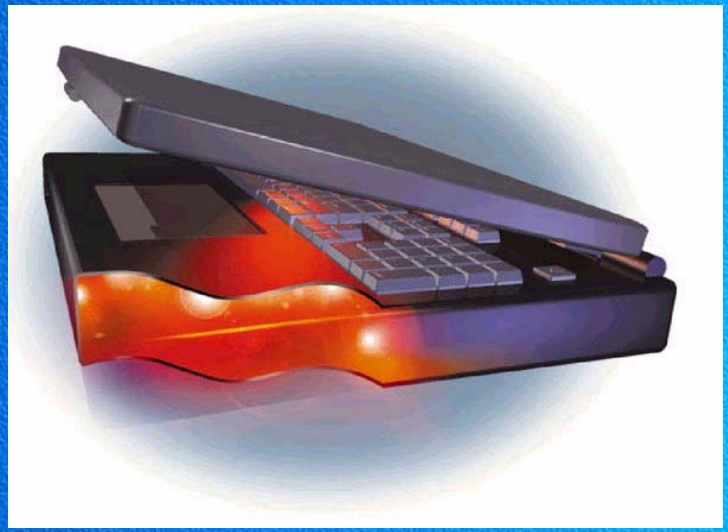
End of an Era?



63.5 μm

- Vacuum tubes to PCs
- PCs to Platforms
- Platforms to …
- The Lloyd Laptop?

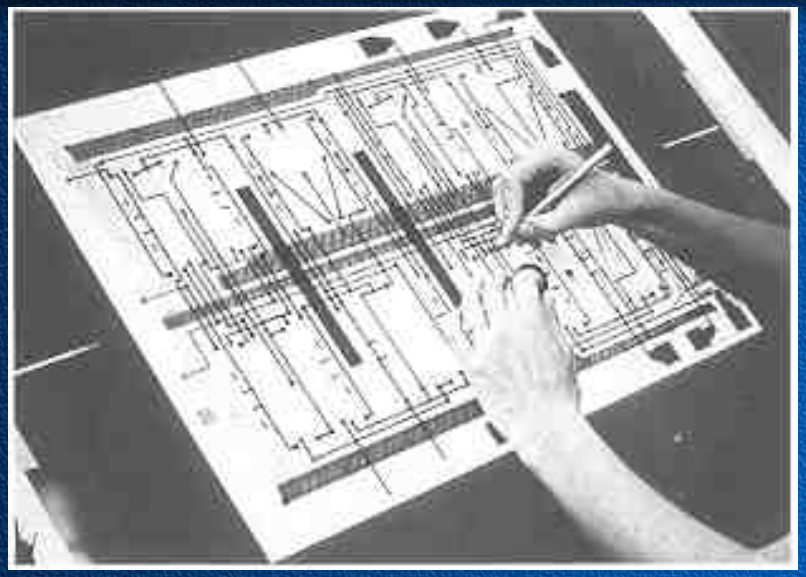




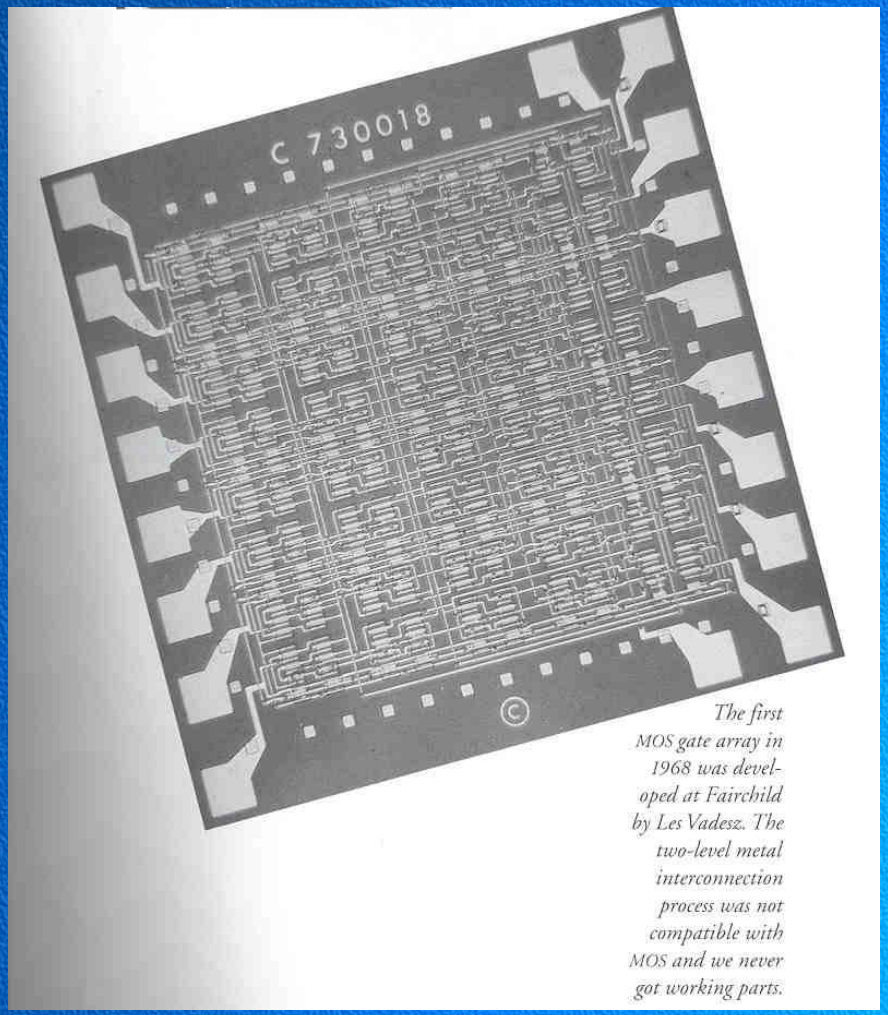
The Complexity Squeeze

- Exists at Many Levels as a Two-edged Sword:
- Social
- Hardware: Within & Between Chips and Products
- Software: Applications and Systems S/W is Weak
- System Structure: Networks Scale Poorly
- The Social Sources of Competing System Products work against Harmonious Interoperation and Simplicity of Use
- Real Time Quality is Alien to the Computer/PC Model
- Stands in the way of The Next Big Thing

Times Have Changed…



1967

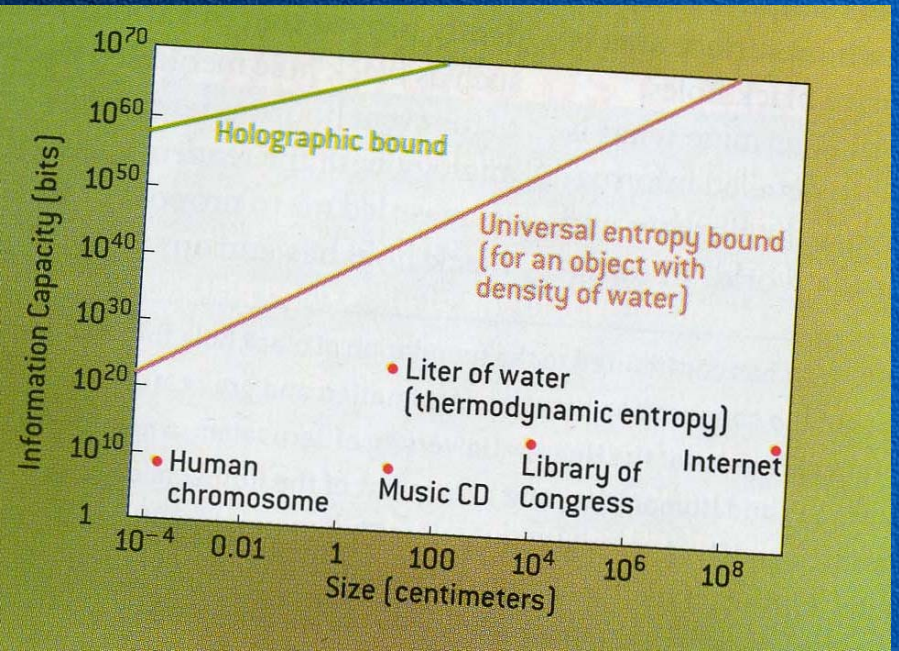


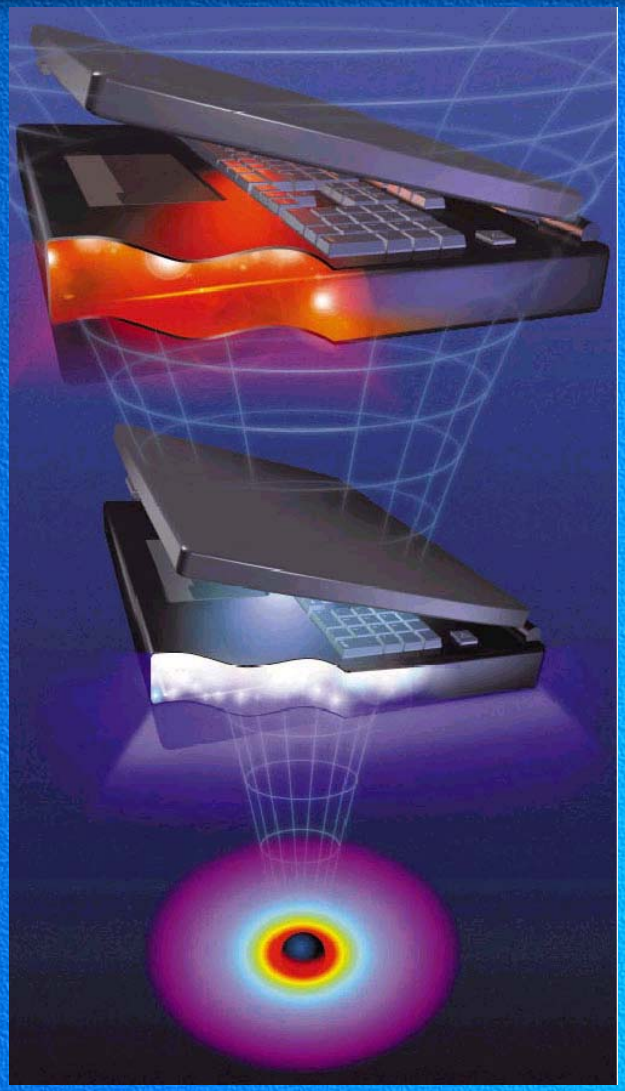
The first MOS gate array in 1968 was developed at Fairchild by Les Vadesz. The two-level metal interconnection process was not compatible with MOS and we never got working parts.

1968

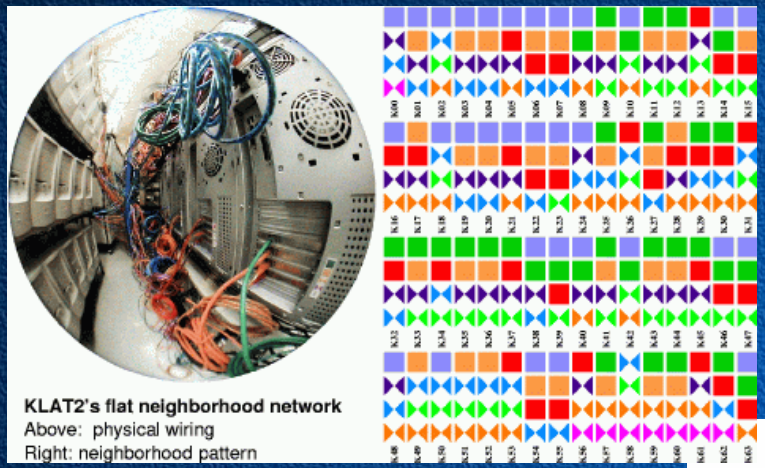
Beckenstein, Lloyd, & Bremermann

- The ultimate limits:
- 2*10**47 bits / sec / gm?
- 5.4258*10**50 ops / sec?
- 10**66 bits / cm?





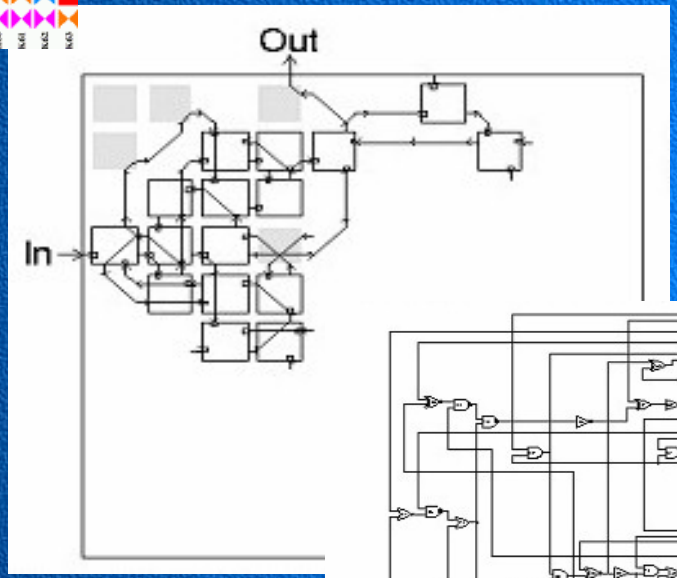
How to organize complexity -- Efficient irregularity?…

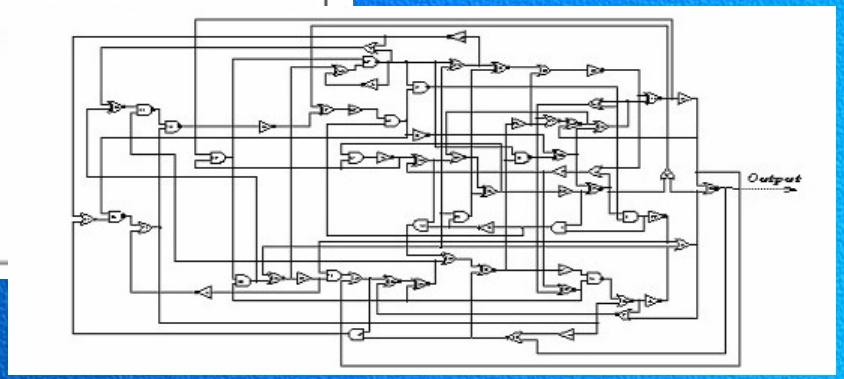


KLAT2's flat neighborhood network
Above: physical wiring
Right: neighborhood pattern

(H. Dietz)

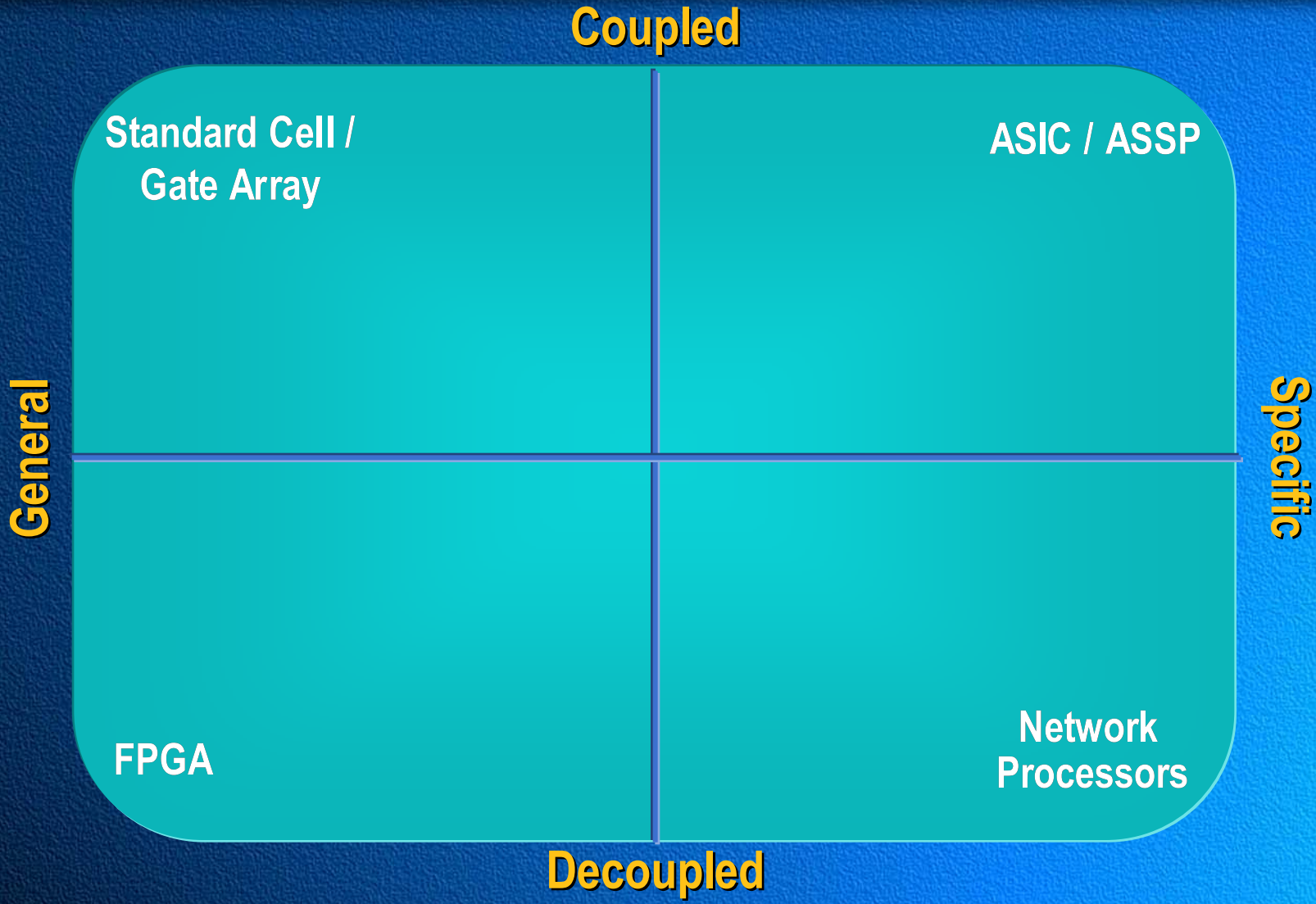
…but these are poor design maps for human-driven design processes





(A. Thompson)

The Device Space & Fab Coupling

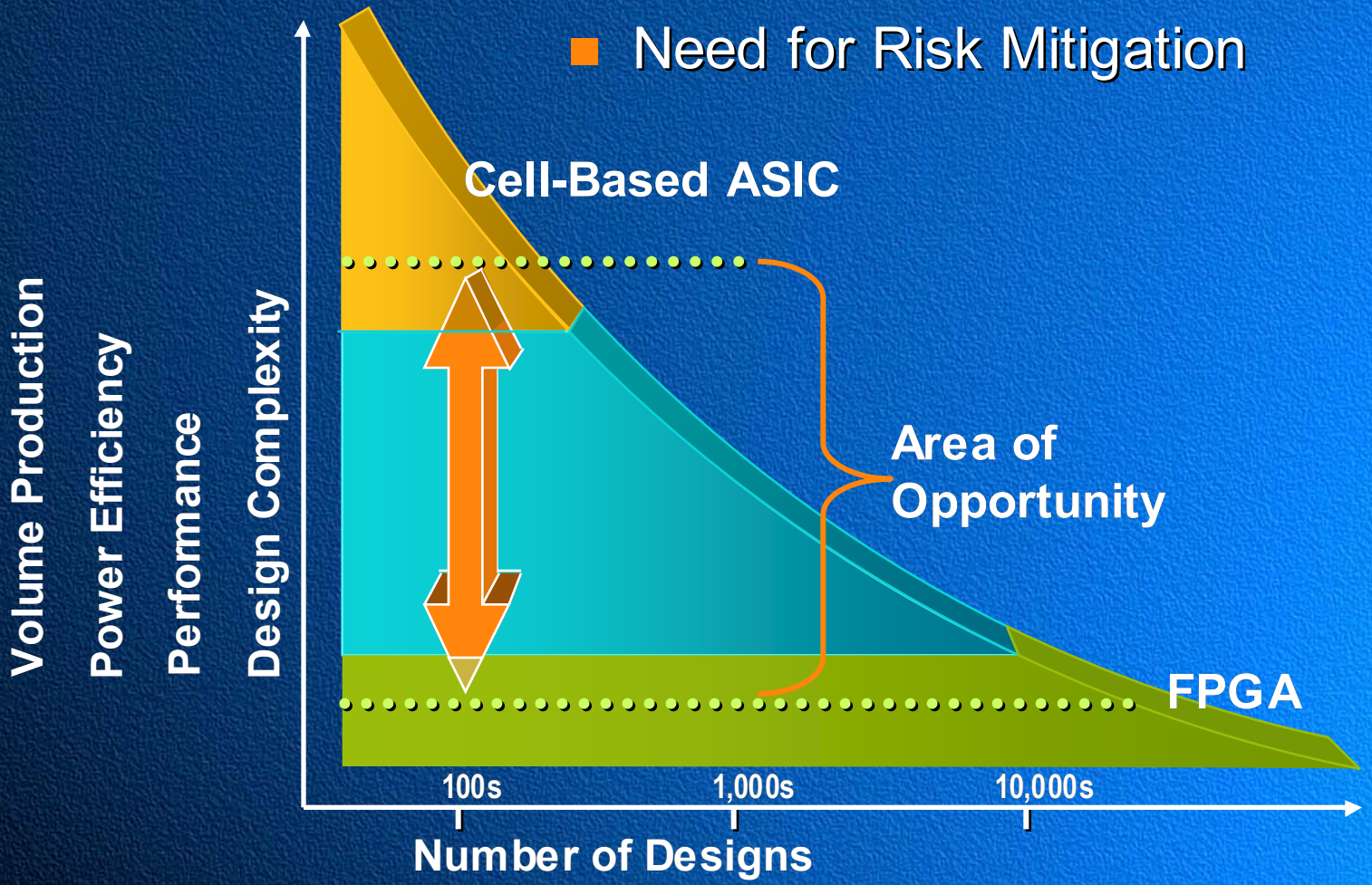


What is a Platform ASIC?

- Platform ASICs Entail Some or All of:
  - Encapsulated IP Blocks
  - Late metal customization
  - I/Os and Mixed Signal Blocks
  - Processors and DSP
  - Programmable Logic Blocks
  - Memory Blocks
  - Interconnect
  - Reconfigurable Cores
- The Design Environment is Part and Parcel of the Architecture

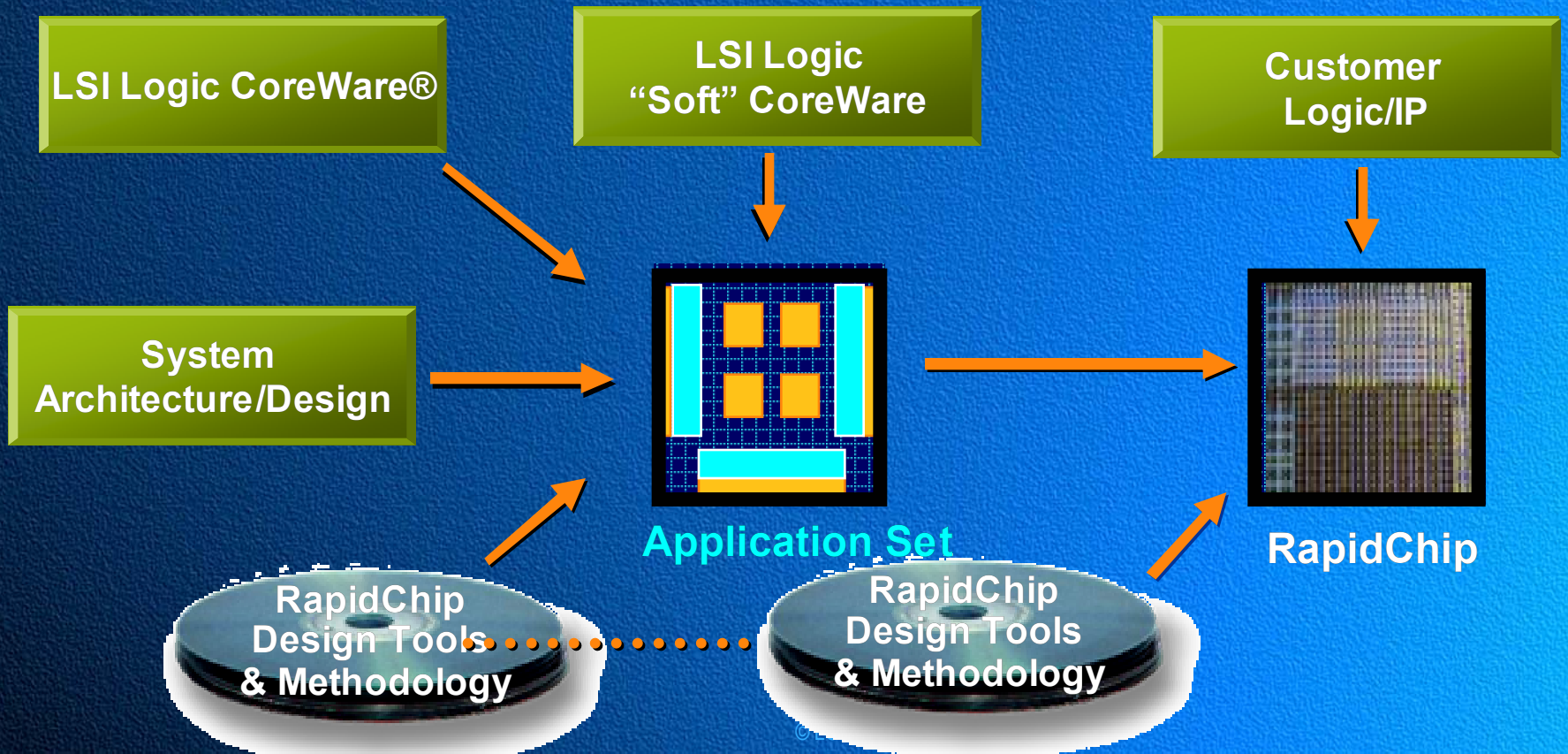
Types of Platform

- Platforms between FPGA and ASIC
- Need for Risk Mitigation



What is RapidChip?

- Processor(s)
- DSP
- Memory
- Programmable Logic
- Interconnect
- Customizable Array



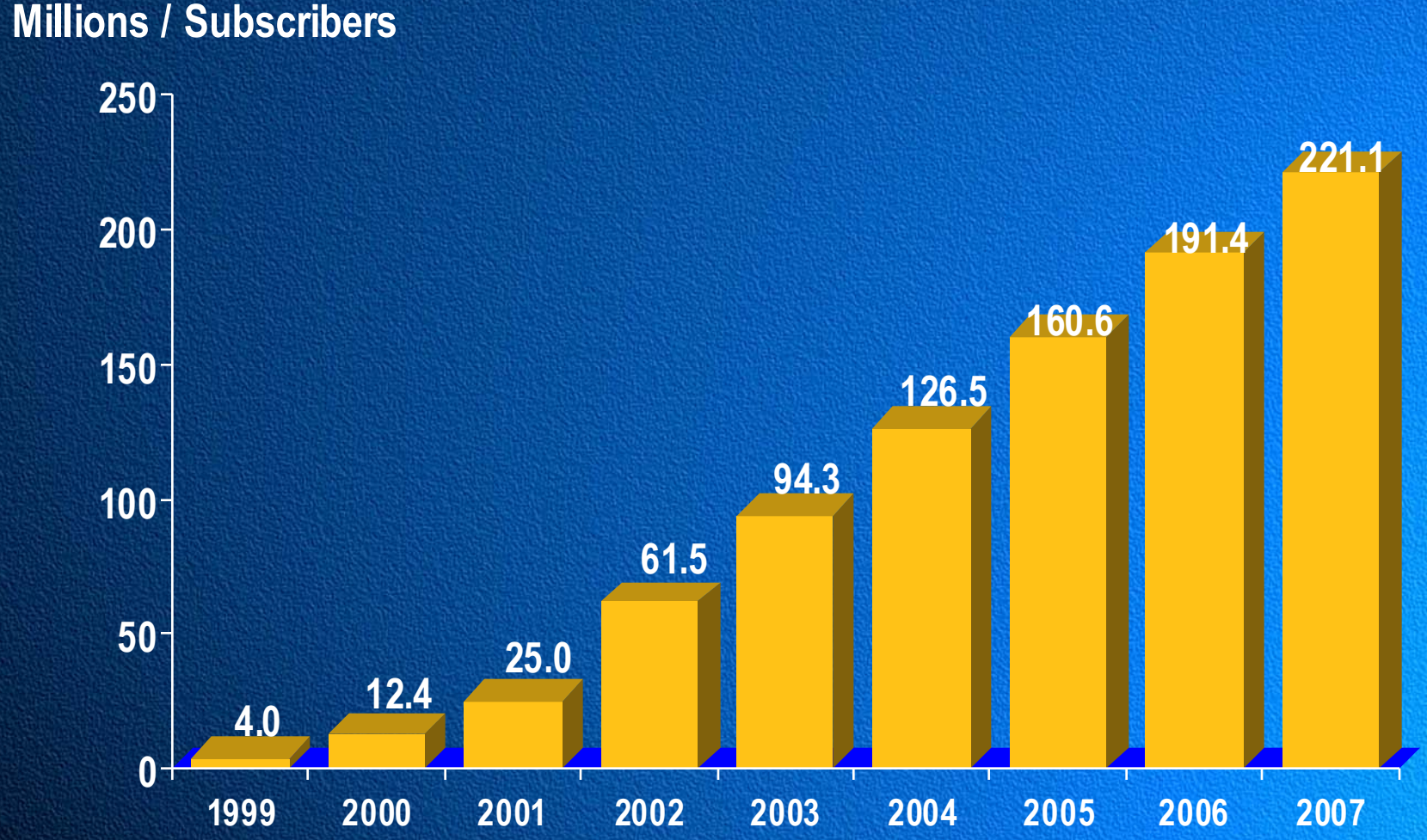
Product Value Stack

- More software
- Higher integration
- Lower power
- Higher reliability
- Easier to use
- Higher bandwidth
- More storage
- Better image & signal quality
- Smaller packages
- Lighter
- Lower cost

Cautionary Notes

- Systems' complexity makes them less usable
- Blue Screen of Death
- Cell Phone Dropouts
- Viruses and Worms
- Spam
- Identity Theft & Security Tower of Babel
- Mediocre Audio/Video on PCs
  - Even as HDTV comes on Strong
- DRM Must be solved

WW Broadband Subscribers

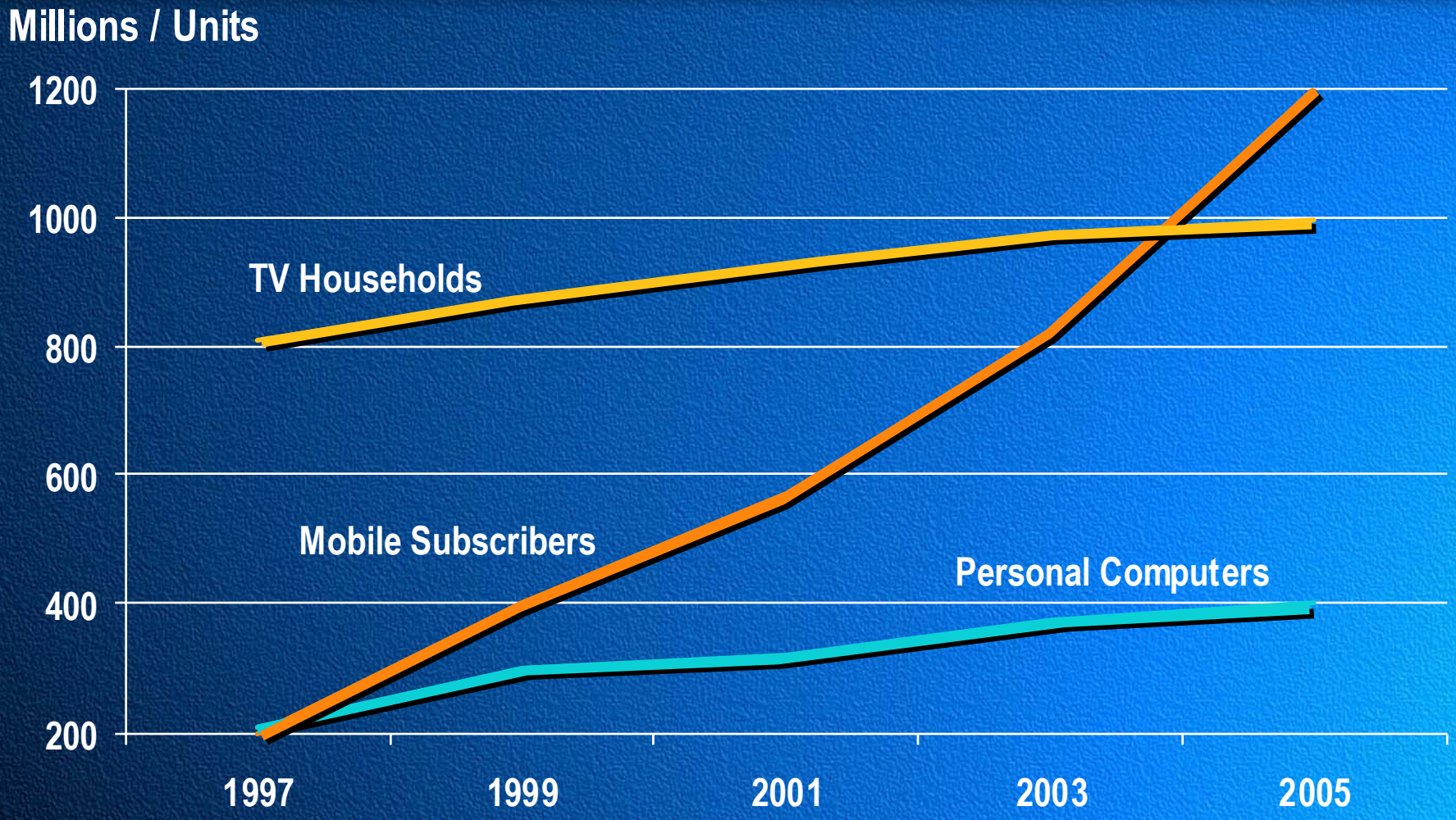


Source: In-Stat/MDR, 2003

New Functions

- For Instance,
  - AI for Wireless
  - Digital Entertainment
  - B-to-B Networks
  - Aerospace
- GUI Sophistication
- Signal Management for Consumers
- The Shift to System Integration:
  - Functional Density vs.
  - Packaging Density
  - vs. gates or transistors
- Methodology Must Keep Up

WW Mobile Subscribers Growth Exceeds TV and PCs



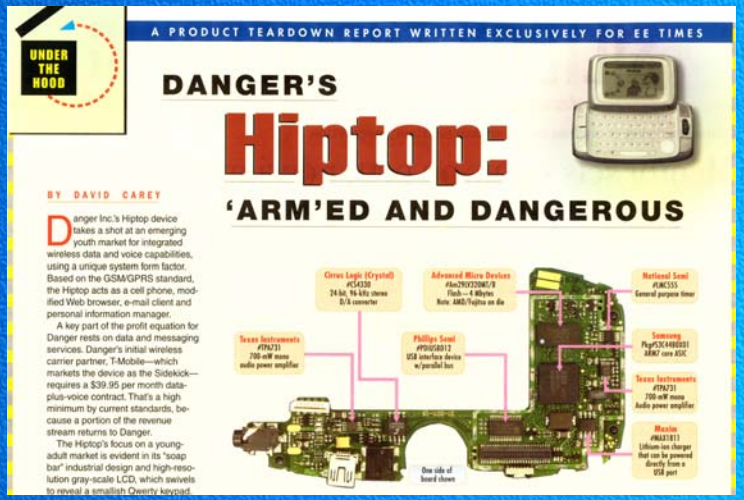
Source: Sonera / GoldmanSachs, February 2000

Hope Springs Eternal

- High Tech Industry's Response:
  - R&D Investments
  - Academic Vitality and Vigor
  - New Departures in Architectures:
    - Platforms and Methodology
    - Systems and Communications
    - Yield and Error
- The Art of the Small:
  - Quantity drives Quality: New Structures
  - The Advent of the Quantum System
  - Biobricks and Nanotubes
- Singularity Ahead?
- Ambient Intelligence
- Digital Entertainment Avalanche
- Service Industries depend on high tech completely

Platforms Beyond Computers

- Content Will Rule
- Communication is the Focus
- Platforms will Support Security, Real Time Quality, and Reliability
- ‘Computation’ Yields to ‘Convolution’
- The Signal is the Datum
- Rotating Memory…
- …Gives way to Solid State
- …and Beyond
- Personal Databases will Abound



A PRODUCT TEARDOWN REPORT WRITTEN EXCLUSIVELY FOR EE TIMES

UNDER THE HOOD

DANGER'S

Hiptop:

'ARM'ED AND DANGEROUS

BY DAVID CAREY

Danger Inc.'s Hiptop device takes a shot at an emerging youth market for integrated wireless data and voice capabilities, using a unique system form factor. Based on the GSM/GPRS standard, the Hiptop acts as a cell phone, modified Web browser, e-mail client and personal information manager.

A key part of the profit equation for Danger rests on data and messaging services. Danger's initial wireless carrier partner, T-Mobile—which markets the device as the Sidekick—requires a $39.95 per month data-plus-voice contract. That's a high minimum by current standards, because a portion of the revenue stream returns to Danger.

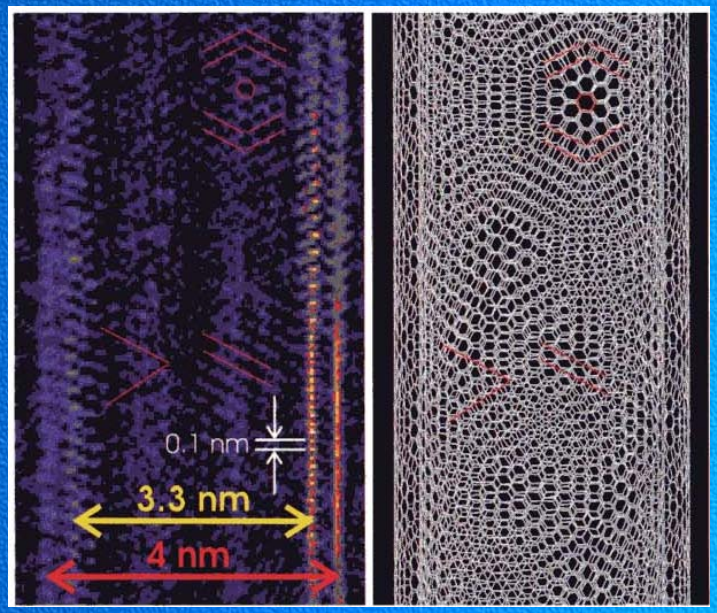
The Hiptop's focus on a young-adult market is evident in its "soap bar" industrial design and high-resolution gray-scale LCD, which swivels to reveal a smallish Qwerty keypad.

The Realm of the Small

- Small Means Complex
- Computer Dust?
- Complexity isn't just technical:
  - RFIDs
    - Cf. Gillette
- The Singularity and the Proteome/Silicon Collision
- Structural Problems must be resolved before these technologies can flourish

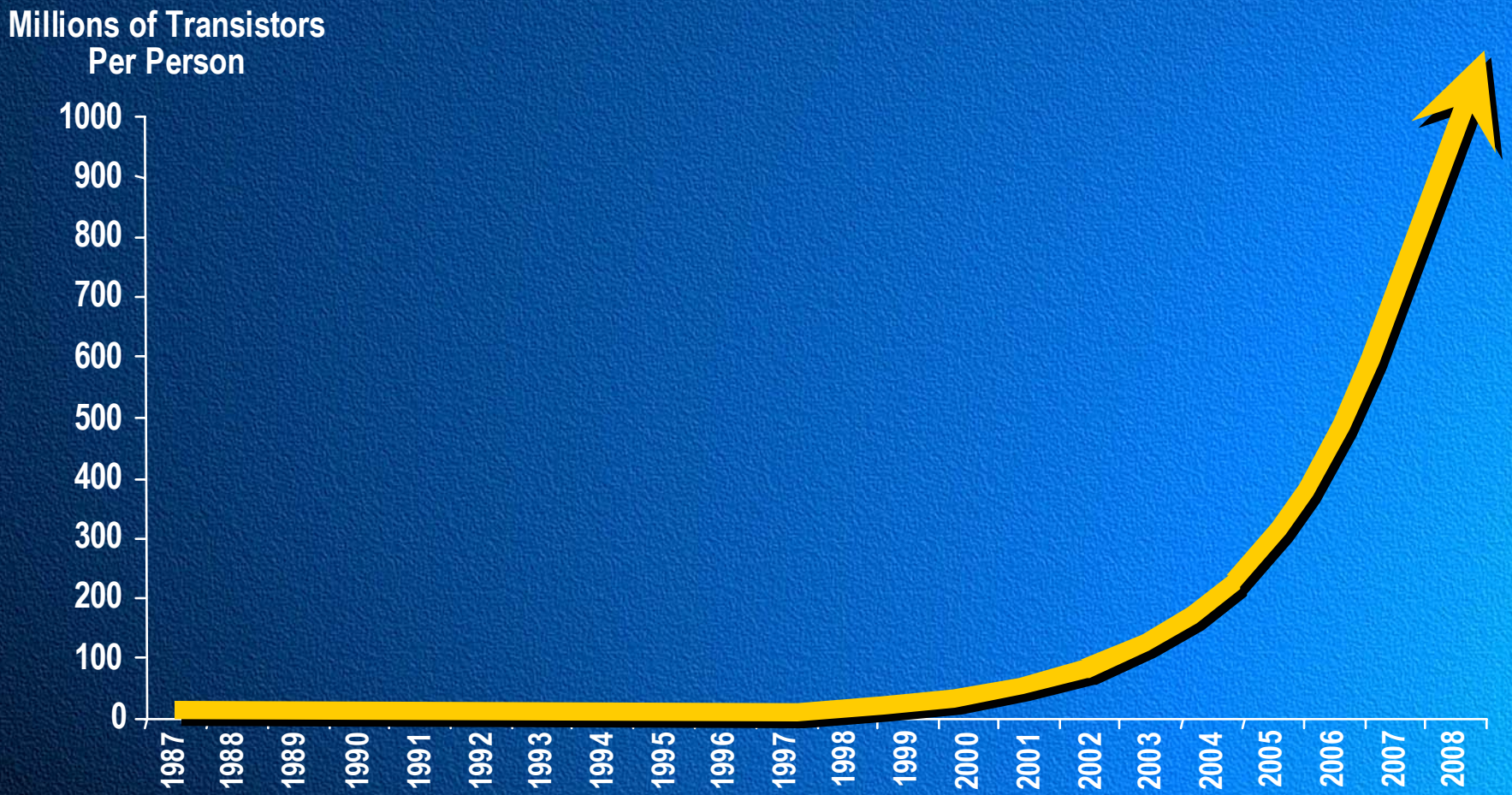
Post-CMOS Structures

- Nanotechnology is Progressing so Fast It's Impossible to Forecast Reliably –
  - Synthetic RNA Structures
  - Quantum Computing
  - Carbon Nanotubes, etc.
  - …new breakthroughs daily!
- Main challenge is scaling manufacturing for high yield



World to Consume 1 Billion Transistors Per Capita by 2008

Per Capita Consumption Increases 55% Per Year



Source: SIA, World Bank

In Conclusion… High Tech Lives!

- Complexity will drive us to --
  - Integrate from molecule to user interface
  - Unify hardware and software design
  - Use higher level abstractions
  - Focus on structure
- While markets demand
  - Quicker time to market
  - Greater ease of use
  - Faster / better / cheaper
  - More reliability, security, quality of service
- Platforms help solve this…
- But a new integrated system paradigm is also required.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