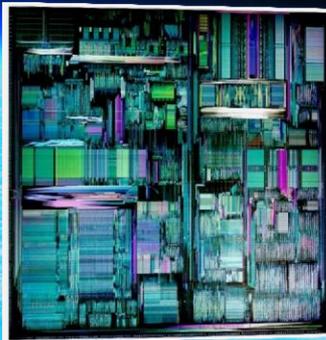


Tech & Space: CoDependent Enablers

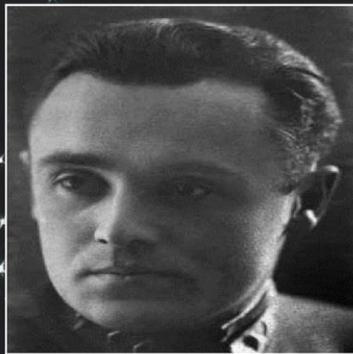


Rich Goldman

Vice President, Corporate Marketing & Strategic Alliances
Synopsys, Inc. July 11, 2012

Birth of the Industries

1940s & 1950s



An IBM 360 mainframe in the early 60s was ~9x faster than the Sputnik ground launch and tracking computers

Sputnik

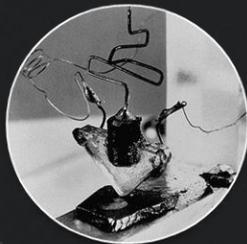
1957

Space

Technology

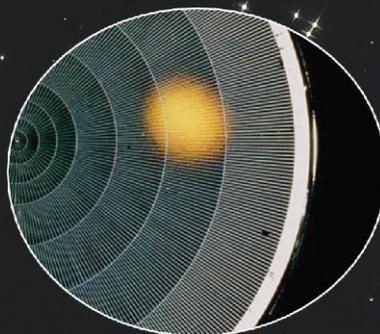
1947

Transistor



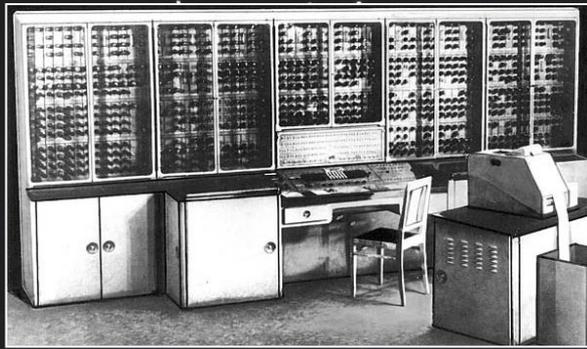
1954

Single Cell Silicon



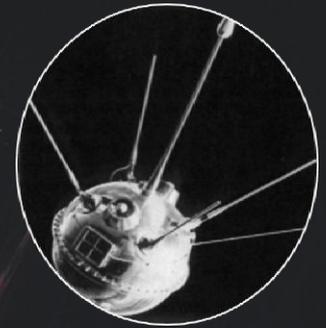
Birth of the Industries

1940s & 1950s



Sputnik

1957



Luna 2

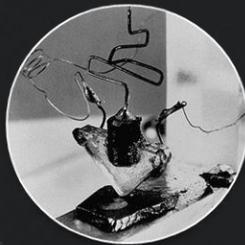
1959

Space

Technology

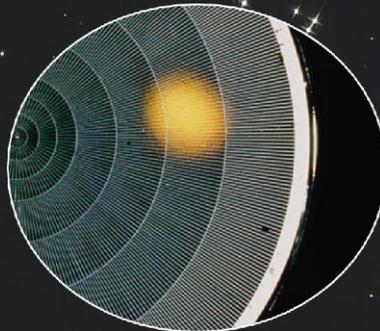
1947

Transistor



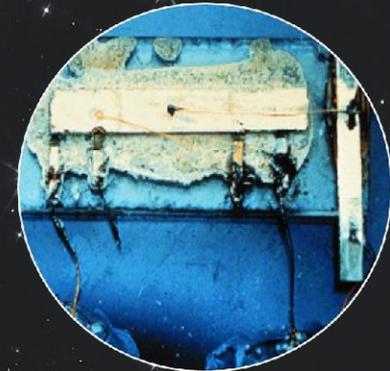
1954

Single Cell Silicon



1958

Integrated Circuit



Competition Rules

1960s



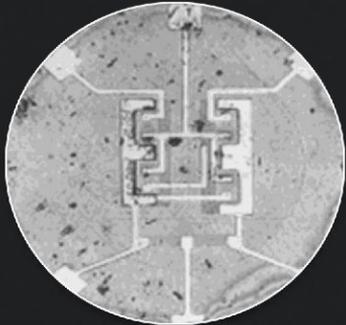
Gagarin Orbits Earth



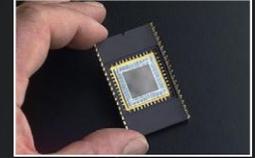
First Spacewalk

The space and defense market accounted for over 60 percent of all computer sales in the '50s, but commercial sales overtook MilAero in 1962.

First Silicon IC Chip



Moore's Law



1969 ● Invention of the CCD

1969 ● Man Lands on Moon



Giant Steps Forward

1970s



Cold War summit
Apollo-Soyuz docking

1975



1976

Supercomputer



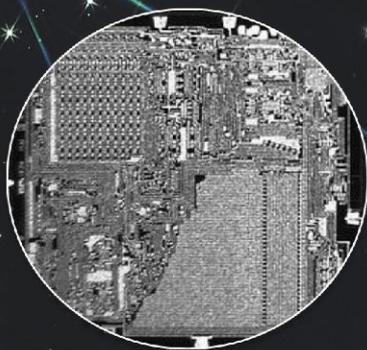
Pioneer 10 Travels to
Asteroid Belt

1972

Mariner 9 Orbits Mars
Salyut Space Station

1971

1971



1975

Personal Computers

1971

Intel 4004
1st Microprocessor
2,300 Transistors



Giant Steps Forward

1970s



A 1982 Intel 80286 chip was 26x more powerful than the on board computers on Voyager 1 & 2.



Voyager 1 & 2 ● 1977



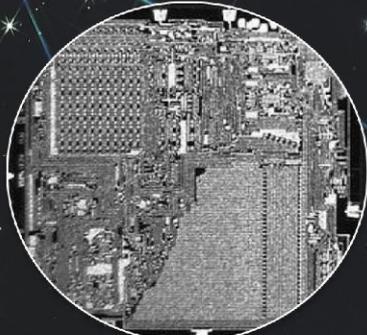
Pioneer 10 Travels to Asteroid Belt ● 1972

Mariner 9 Orbits Mars ● 1971

Salyut Space Station ● 1971



1976 ● Supercomputer



1975 ● Personal Computers

1971 ● Intel 4004
1st Microprocessor
2,300 Transistors

Setbacks & Solutions

1980s



Mir Space Station



1986

Challenger Explodes



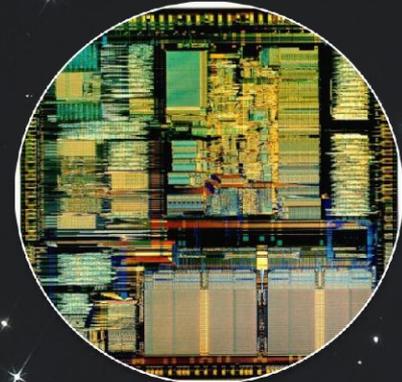
1986



Columbia – 1st Manned Shuttle



1981



Intel 80386 Microprocessor
275,000+ Transistors



1985

Intel 80286
Microprocessor
134,000+
Transistors

1982



Transistors



1981

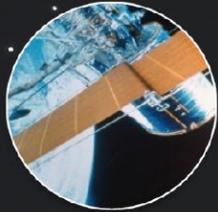


IBM Personal
Computer

An iPhone4S is 8000x more powerful than the on board computers on the Columbia

Worldwide Achievements

1990s



Hubble

Longest
Spaceflight

1995

The digital imaging revolution was critical to the success of the Hubble project.

1975

First Digital Camera

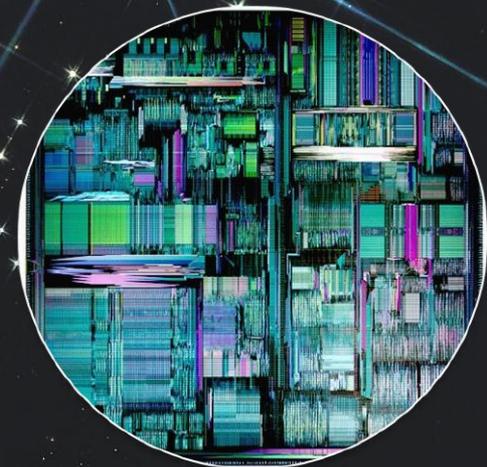


Commercial
Digital Camera



1995

Intel Pentium Pro
Microprocessor
5M+ Transistors



Light Years Ahead

2000 – 2011



5 MB Hard Disk Drive, 1956



1956 IBM launched the 305 RAMAC, the first 'SUPER' computer with a hard disk drive (HDD).



256 GB Flash Thumb Drive, 2011



256 GB: That's 262,144 MB or 52,428 times the storage of the 1965 device! BOOM!

2000

USB
Flash Drives

Light Years Ahead

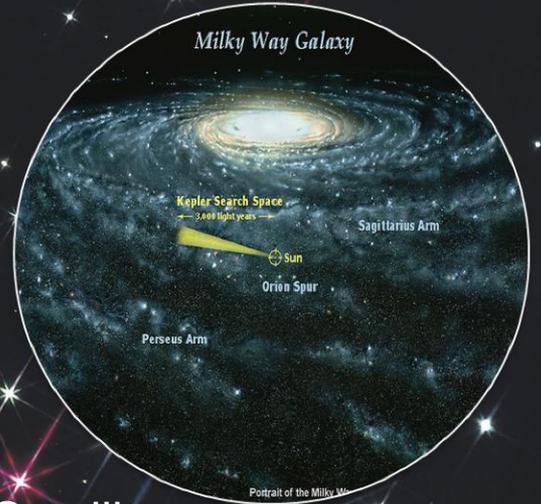
2000 – 2012



China Launches taikonaut
Yang Liwei into Orbit



First Private Spacecraft
Enters Space



2003

2004

2009

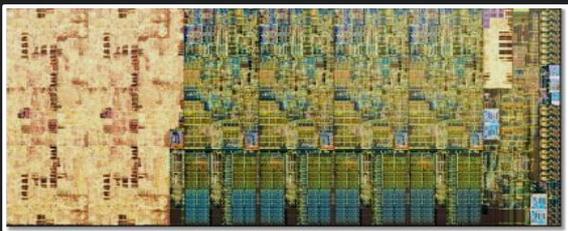
Kepler Satellite

2000

USB
Flash Drives

Intel
Ivy Bridge, 22nm
1.4 Billion transistors

2011



2012

China's Shenzhou-9 Spacecraft
Returns Safely to Earth



2012

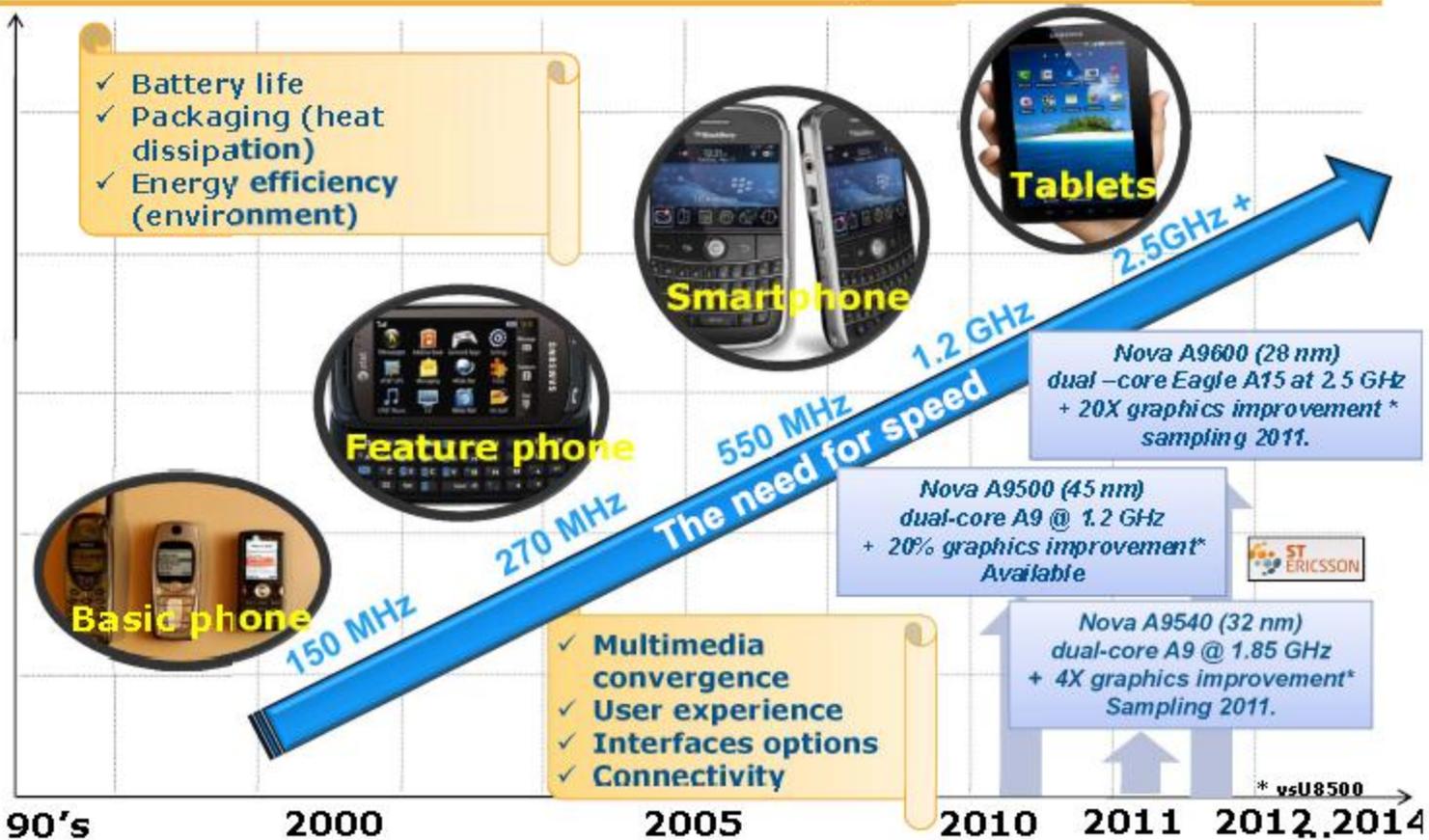
The First Private
Spacecraft to Reach
An Orbiting
Space Station



Today's Achievements

The phone becomes a computer

"Phones": High Performance @ Low Power



STMicroelectronics

DAC - June 2011

Today's Achievements

2012 in Technology: Compute Power

1985: Cray Super Computer



Comparable Size: VW Bug

Cooled By: Immersion in a liquid called Fluorinert

Cost: \$17M

End User: NASA, U.S. Dept. of Defense, major corporations



Today: iPad



Comparable Size: Notepad

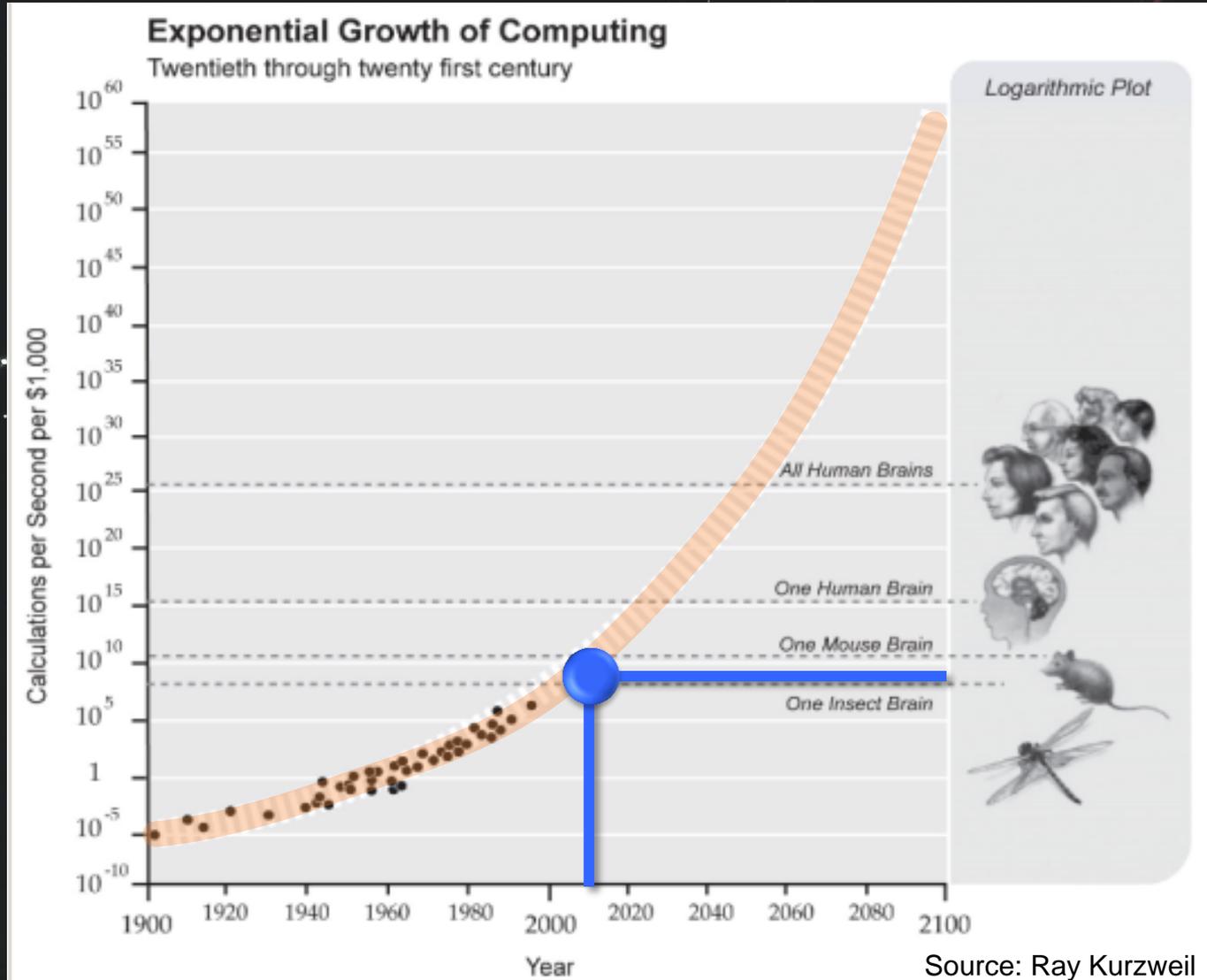
Cooled By: Runs off a battery and is air-cooled

Cost: \$499

End Users: Millions of Consumers

Today's Achievements

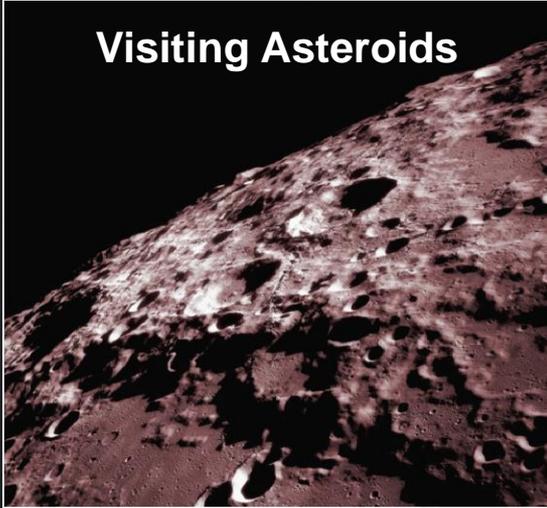
2012 in Technology: Compute Power



Today's Achievements

2012 in Space

Visiting Asteroids



Completion of International Space Station



700 People from 40 Countries Have Left the Planet



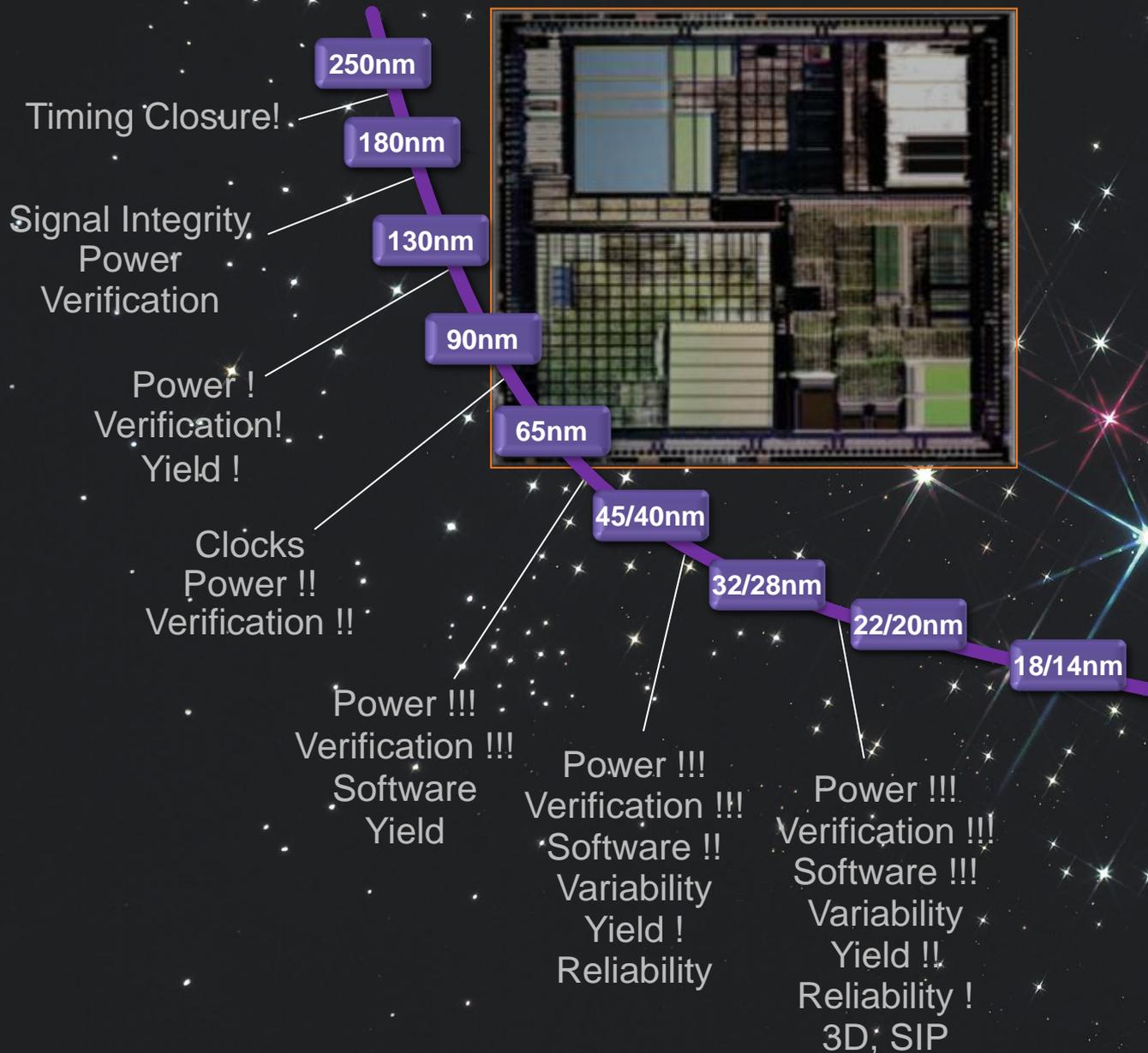
Shenzhou-9 docks with Tiangong-1

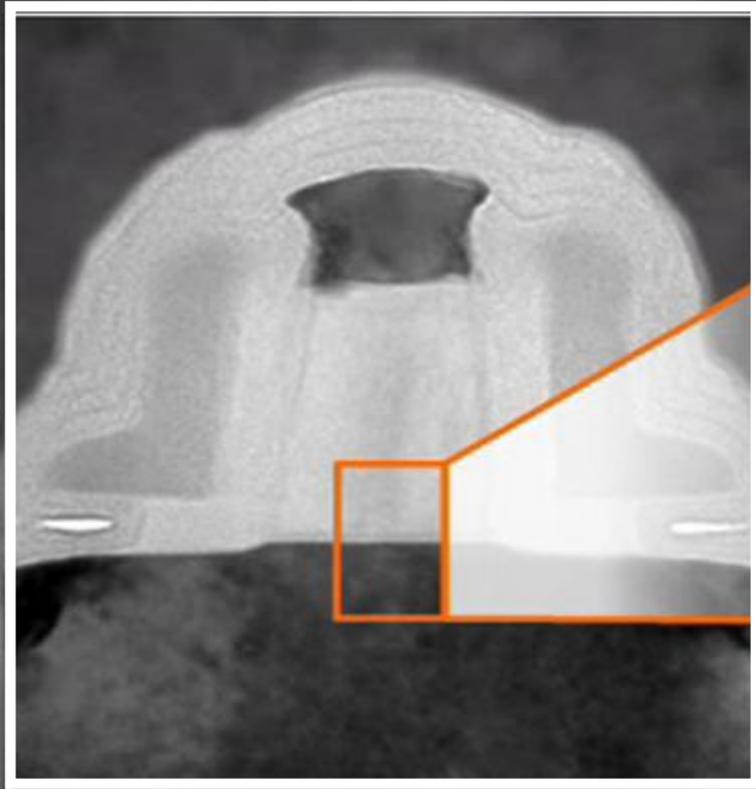


Russia's Command Center



Moore's Law Doesn't Come For Free

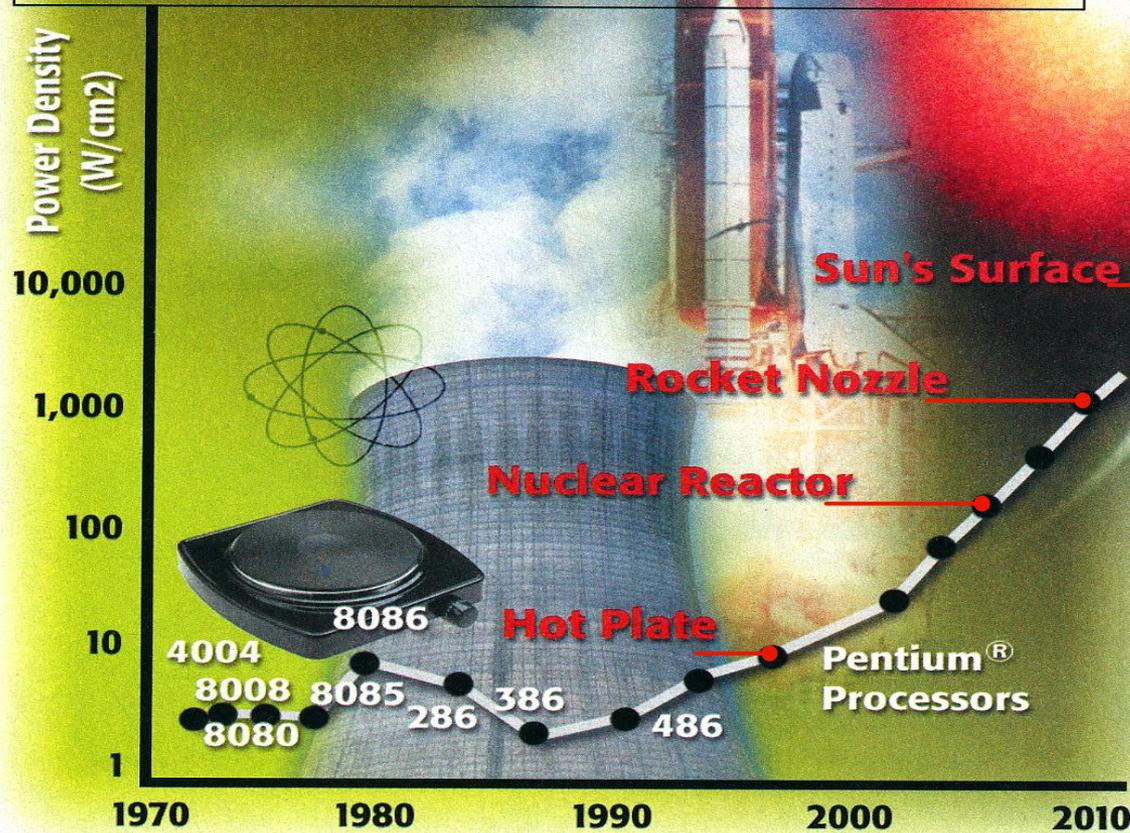




5 Atoms

Intel realized:
Something must change!

Power Density Extrapolation



SOURCE: INTEL

Today's Achievements

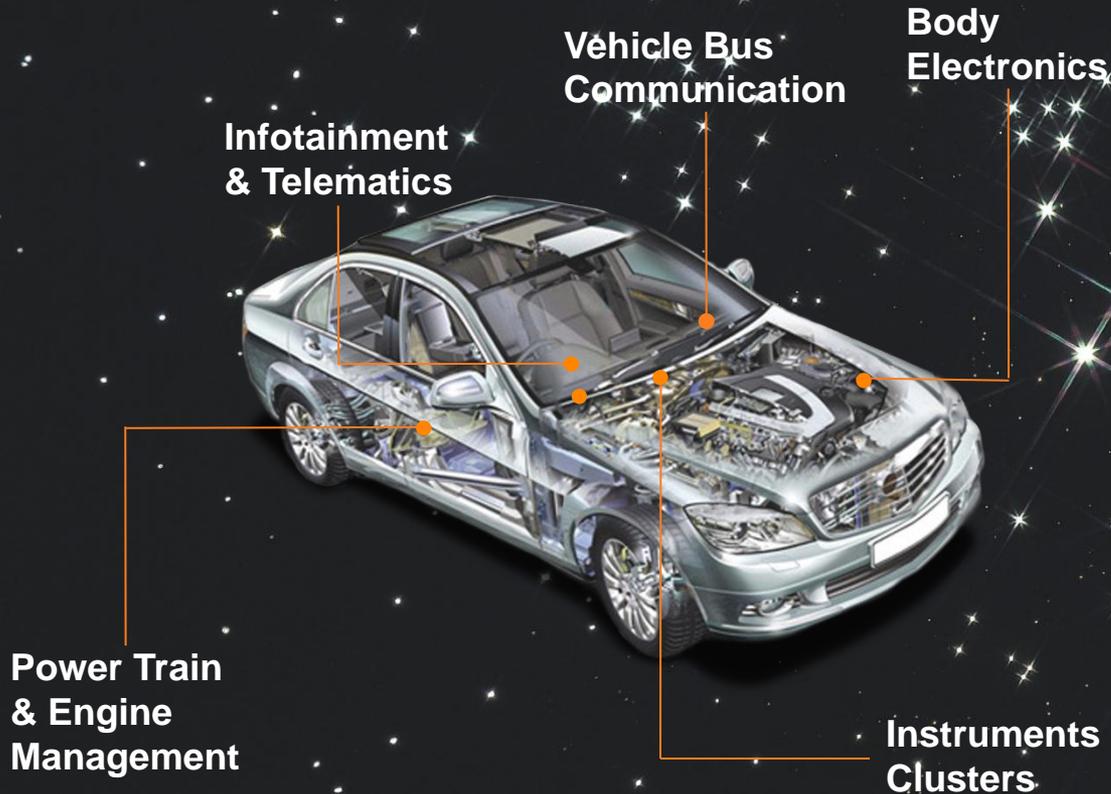
2012 in Technology: Smart Homes



- Increased convenience with centralized control of home systems
- Increased security with remote home management
- Increased energy and cost savings with automated lighting and temperature controls

Today's Achievements

2012 in Technology: Smart Cars



- Increased cost and energy savings with gasoline-electric hybrid structure
- Increased performance with sensor monitoring systems
- Increased convenience with GPS tracking and infotainment systems

Today's Achievements

2012 in Technology: Smart Cars

People have landed on the moon with less technology at their fingertips:

Step inside the Audi A8 and find yourself surrounded by one highly engineered breakthrough after another. Take the car's revolutionary MMI® central control system. With its handwriting recognition technology, the car literally reads what you write (yes, even if you're a doctor) as you tell it what to do. Or take its Audi night vision assistant.** Through thermal imaging, it knows what's ahead and will alert you if something is in your path. But maybe most impressive is its detailed 3D map navigation system with actual live, real-time traffic info. To learn about all the technologies at your fingertips, visit audiusa.com/A8. **The Audi A8 is here.**

Luxury has progressed.

- Increased cost and energy savings with gasoline-electric hybrid structure
- Increased performance with sensor monitoring systems
- Increased convenience with GPS tracking and infotainment systems



Today's Achievements

2012 in Technology: Smart Communications

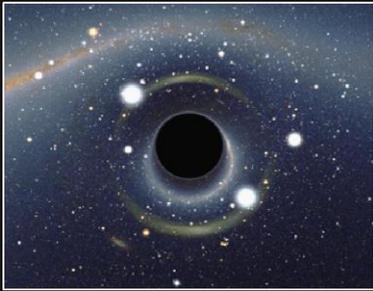


- Increased access to information with content streaming from internet and local storage devices
- Increased access to communication with email and instant messaging services
- Increased access to entertainment with video, music, and gaming applications

Future Potential

Going Where No One Has Gone Before: Space Industry

Dark Energy



- **SDSS III BOSS** project will explore the role of dark energy in the forming of galaxies

Outer Milky Way



- **SDSS III SEGUE-2** project will uncover rare, primitive stars from the earliest generations of star formation

Extrasolar Planets



- **SDSS III MARVELS** project will monitor bright stars with the precision needed to detect extrasolar planets

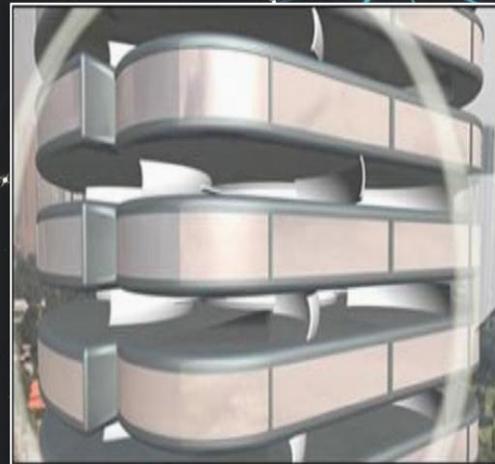
Extraterrestrial Contact



- Search for planets that could support life
- Searching within our solar system: Mars, Europa, meteoroids
- Sending and receiving messages beyond our system

Future Potential

Going Where No One Has Gone Before: Technology Industries

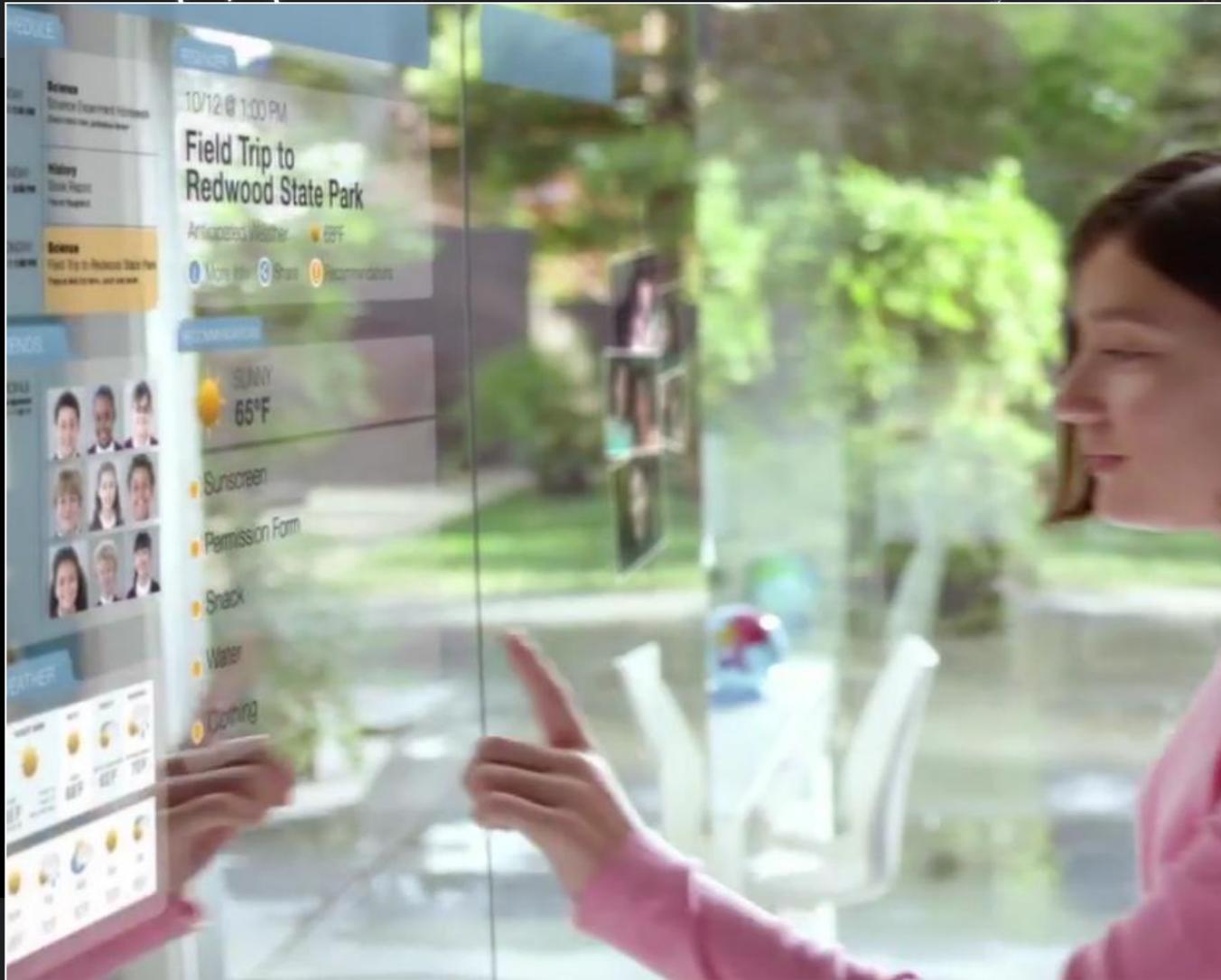


Augmented Reality



Sources: Google Co-Founder Sergey Brin Wears Google Glasses, *Pcmag.com*.
Google Unveils "Project Glasses" (AR Handsfree Computer Glasses), *You Tube Video*.

Even Glass is High Tech



Source: *A Day Made of Glass Made Possible*, YouTube Video.

Designing in The Future



Our Future

Going Where No One Has Gone Before:
Together we are better

We continue to move beyond our small planet into the wide universe beyond, thanks to the technology and space program and that sent us there.



Thank You!

Спасибо

Terima Kasih

