




# ***EE 2004 Microcomputer Systems***

## Computer: Where did it come from?

 It was all electricity at the beginning: Faraday came along and invented the first machine that made use of this new sort of energy.

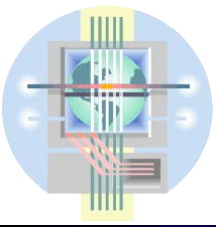
 Long time after, a new generation of specialists discovered that electrons could be a very convenient toy when closed in a glass pipe. Electronic was born.

 Transistors was invented, leading to the development of integrated circuits.

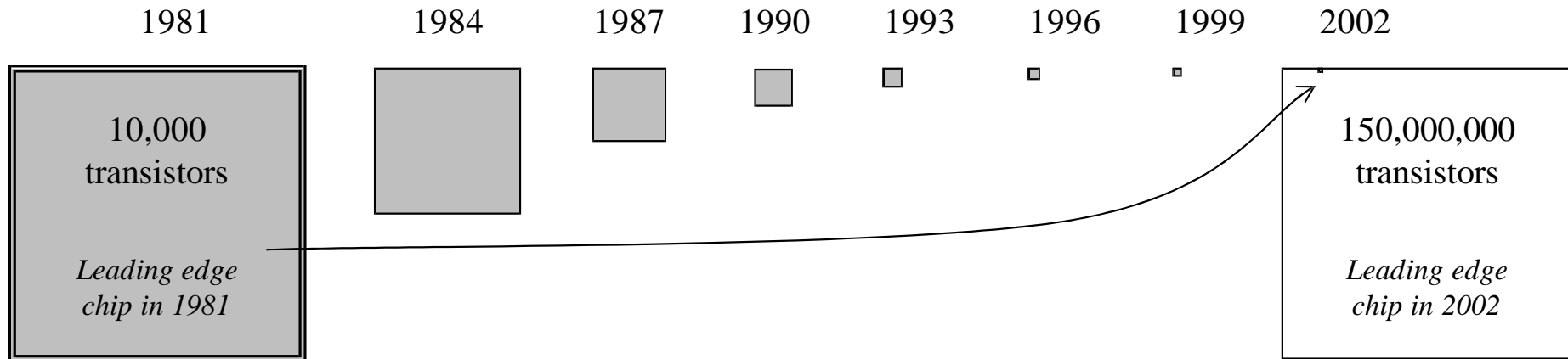
 Microprocessors appeared soon, leading to a shape price drop for computers and other electronic products.


 Ordinary people got hold of computers and

*computer era has begun...*

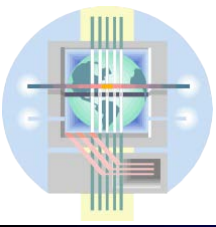


# Development of Microprocessor



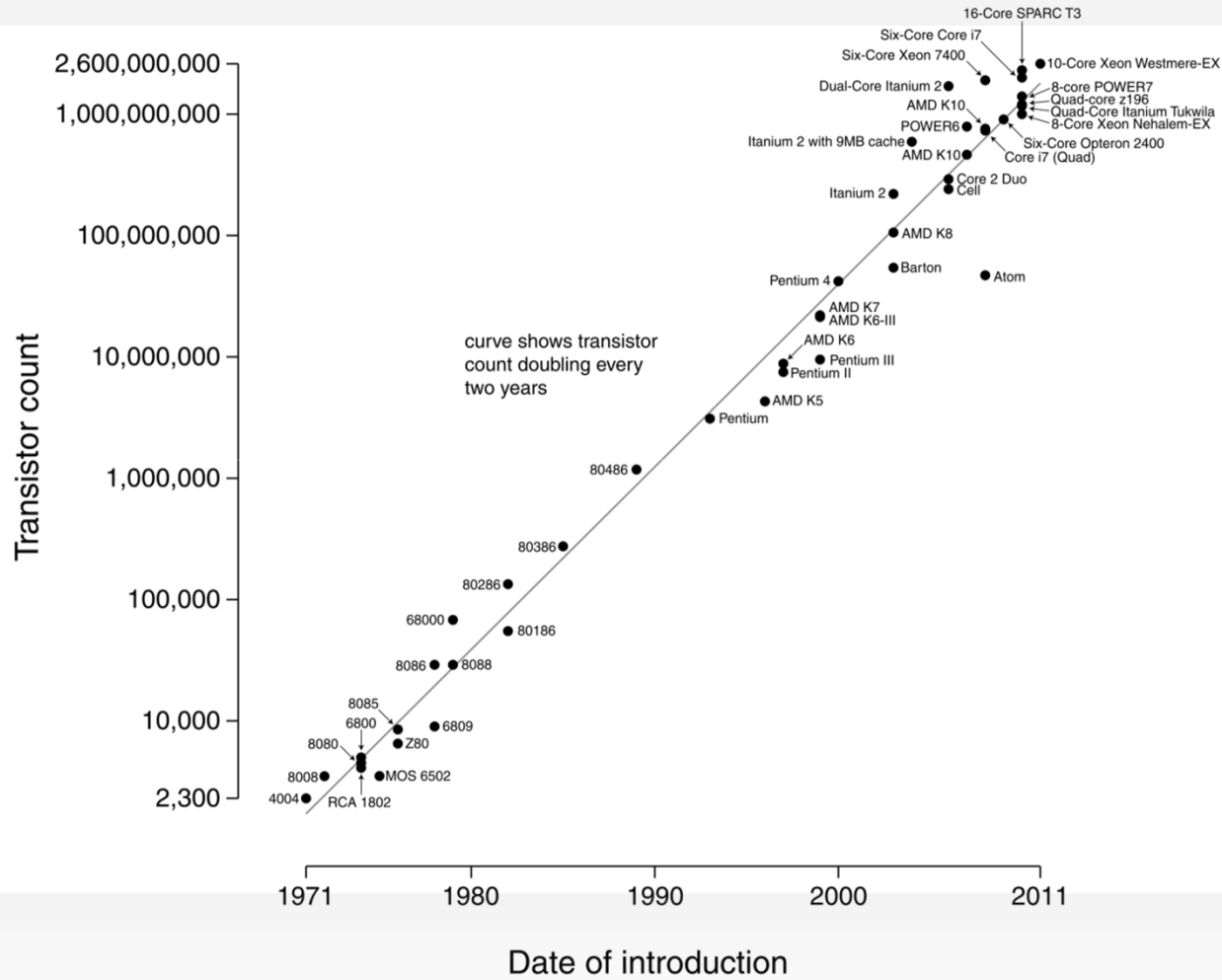
 **Moore's Law:** The number of transistors on ICs doubles approximately every one/two years. The projection was made by Intel co-founder Gordon E Moore in 1965.

 **2008 Intel® Xeon™ Processor Family:** 47nm, 1.9 billion transistors.

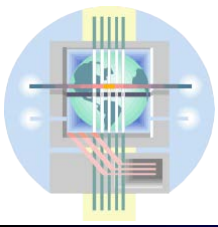


# Moore's Law

Microprocessor Transistor Counts 1971-2011 & Moore's Law



[From [http://en.wikipedia.org/wiki/Moore%27s\\_law](http://en.wikipedia.org/wiki/Moore%27s_law)]

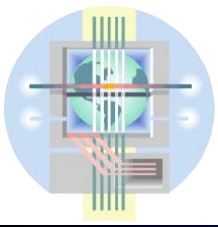


# *Microcontroller*

 With the tools available, it is not difficult to come up with these questions:

- Why should not we make a *universal* component?
- A programmable, cheap integrated circuit that could be used in any field of electronics, device or wherever needed?

 So it happened, the first integrated circuit was designed and called the MICROCONTROLLER.



# Prevalence of Microcontroller

- Microcontrollers are embedded inside a surprising number of products
- Much more prevalent than PC: Billions of units produced yearly, versus only (!) millions of desktop units
- Specific functionality that is typically preprogrammed and *burned into ROM*.
- In 2004, a typical American family had at most 1 PC but 300 embedded processors.
- An average car has 50 embedded processors.

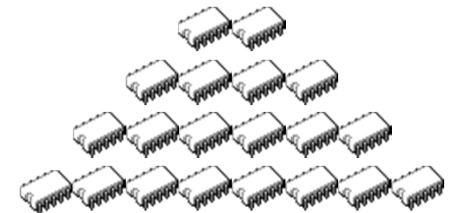
Computers are in here...



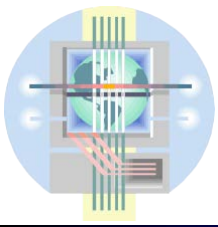
and here...



and even here...



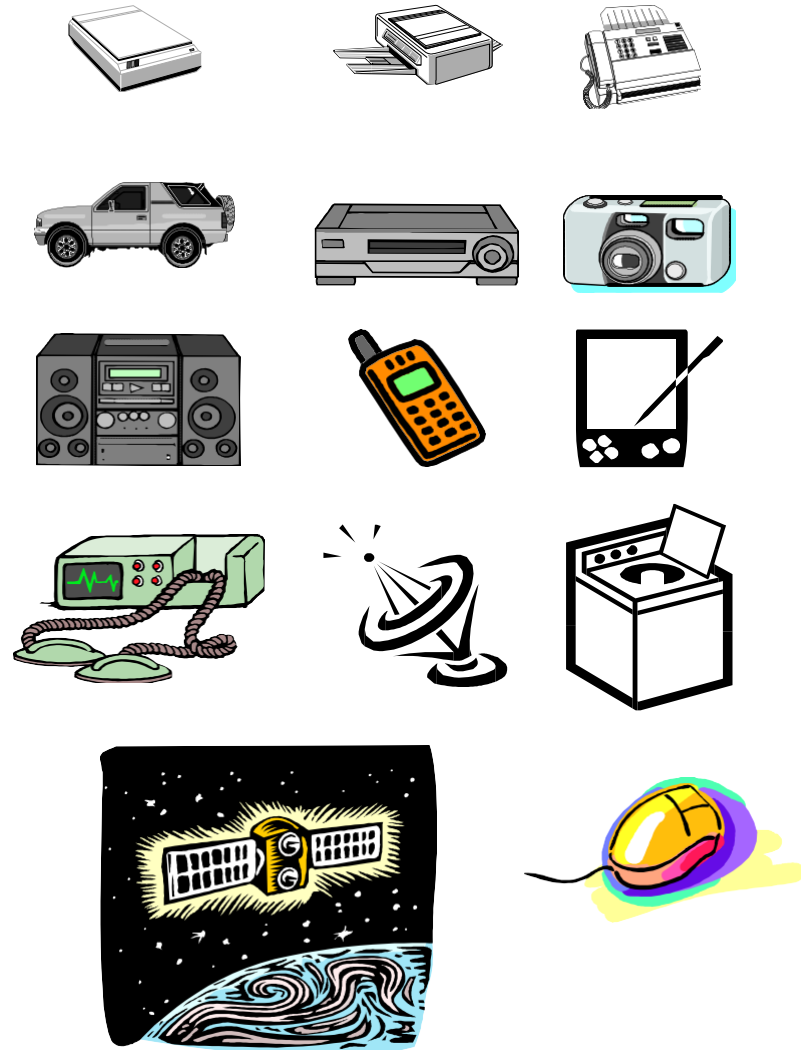
Lots more of these, though they cost a lot less each.



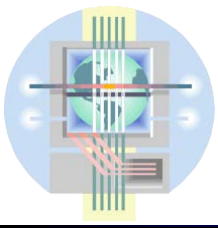
# A “short list” of electronic devices with embedded microcontrollers

Anti-lock brakes  
Auto-focus cameras  
Automatic teller machines  
Automatic toll systems  
Automatic transmission  
Avionic systems  
Battery chargers  
Camcorders  
Cell phones  
Cell-phone base stations  
Cordless phones  
Cruise control  
Curbside check-in systems  
Digital cameras  
Disk drives  
Electronic card readers  
Electronic instruments  
Electronic toys/games  
Factory control  
Fax machines  
Fingerprint identifiers  
Home security systems  
Life-support systems  
Medical testing systems

Modems  
MPEG decoders  
Network cards  
Network switches/routers  
On-board navigation  
Pagers  
Photocopiers  
Point-of-sale systems  
Portable video games  
Printers  
Satellite phones  
Scanners  
Smart ovens/dishwashers  
Speech recognizers  
Stereo systems  
Teleconferencing systems  
Televisions  
Temperature controllers  
Theft tracking systems  
TV set-top boxes  
VCR's, DVD players  
Video game consoles  
Video phones  
Washers and dryers  
.....





And the list goes on and on



# Course Aims

 Describe the structure and major components of a microcomputer and microcontroller system

 Describe how the microcomputer system interfaces with external devices (e.g., LED, LCD screen, external memories)

 **Discuss how you can start working with microcontrollers yourself!**

 For more details, see: <http://www.cityu.edu.hk/ug/current/course/EE2004.htm>