# CMOS Scaling Trends
## Snapshots from 40 and 10 years ago.

From: "Design Challenges in Multi-GHz Microprocessors," by Bill Herrick, Alpha/Compaq, MIT VLSI Symposium, 2/15/00

**Moore's Law:** the trend that the demand for IC functions and the capacity of the semiconductor industry to meet that demand, will double every 1.5 to 2 years.

## Historical Trends:  Then and Now

| Circa 1970 | Circa 2000 |
|---|---|
| 12 $\mu$m PMOS | 0.18$\mu$m CMOS |
| 1000 transistors | 10-100 million transistors |
| 5-10 mm2 die size | 300-400 mm2 die size |
| 10V supply | 2.5 V supply |
| 50-100 kHz frequency | 500-1000 Mhz frequency |
| 100-200 mW | 50-100 W |
| 16 pin DIPs | 500-1000 pin BGAs |

## Intel Trends
### The 4004 (1971)
2300 transistors in a 10 $\mu$m process
108 kHz operation, executing 0.06 MIPs

### The Pentium III (1999)
28 million transistors in a 0.18 $\mu$m process
733 Mhz operation, executes 2000 MIPs

6.012 Microelectronic Devices and Circuits
Fall 2009