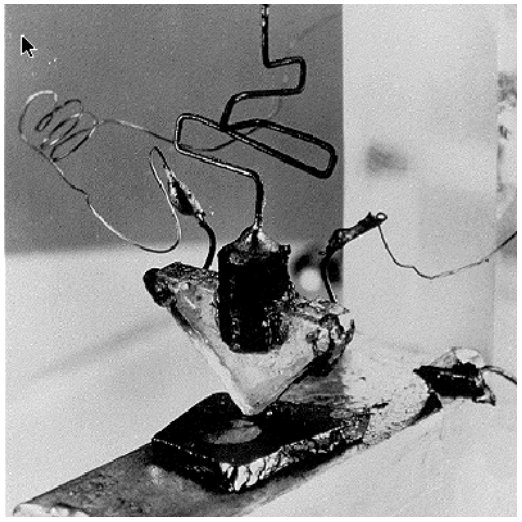
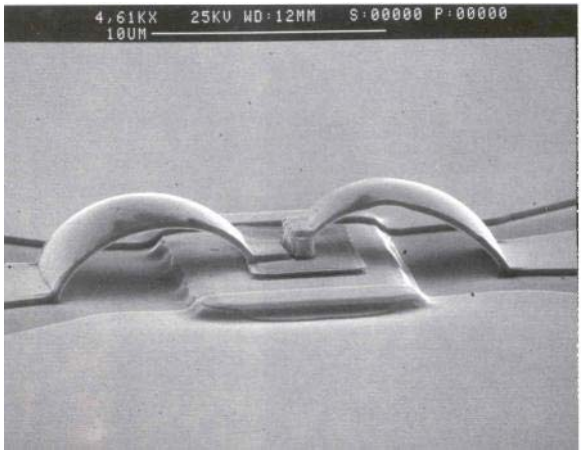
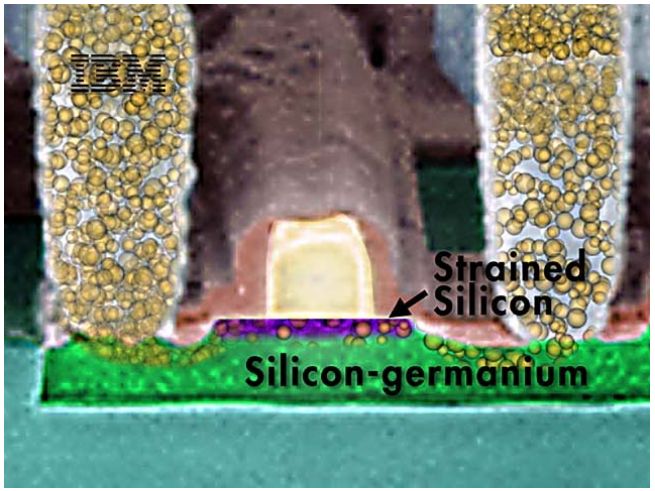
Bulk Semiconductor – Device Applications



The First Transistor (1947)



Today's HBT



Today's MOSFET

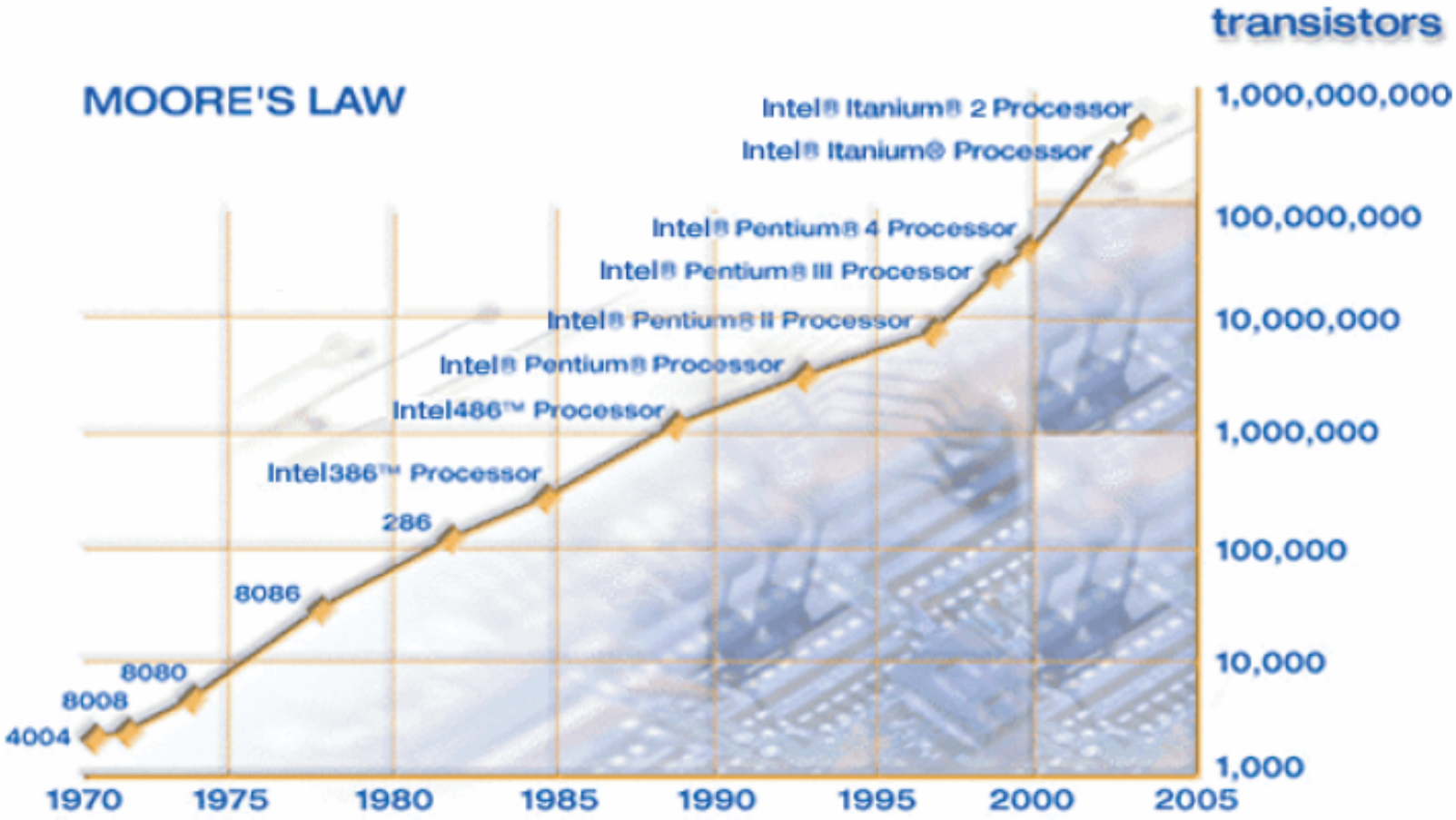


Figure 0.1: Illustration of Moore's Law.

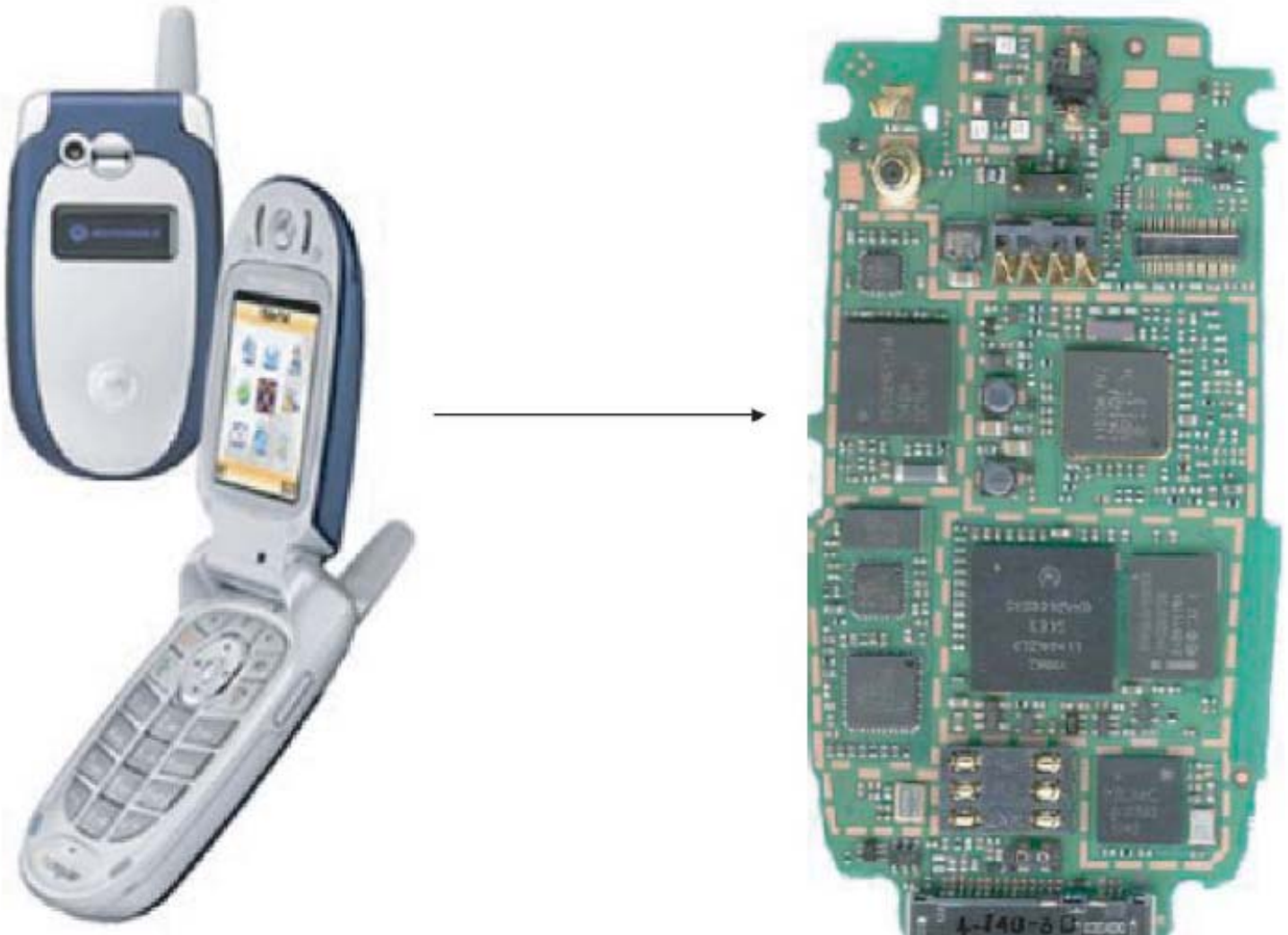


Figure 0.2: The Motoral V551 cellular phone. Picture courtesy of A. Upton, R. Vetury, and J. Shealy, RFMD.

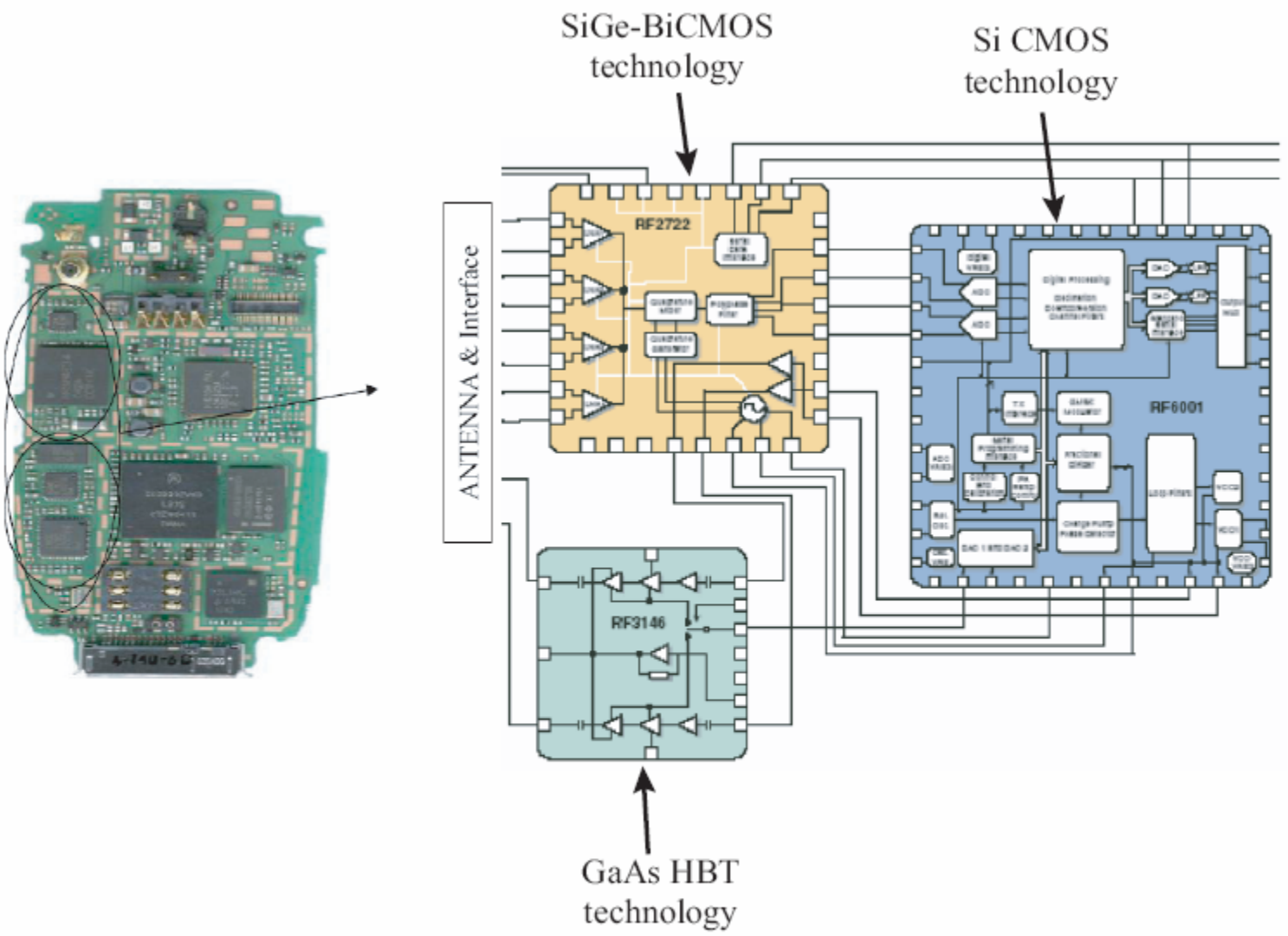


Figure 0.3: The POLARIS total radio solution from RFMD. Picture courtesy of A. Upton, R. Vetury, and J. Shealy, RFMD.

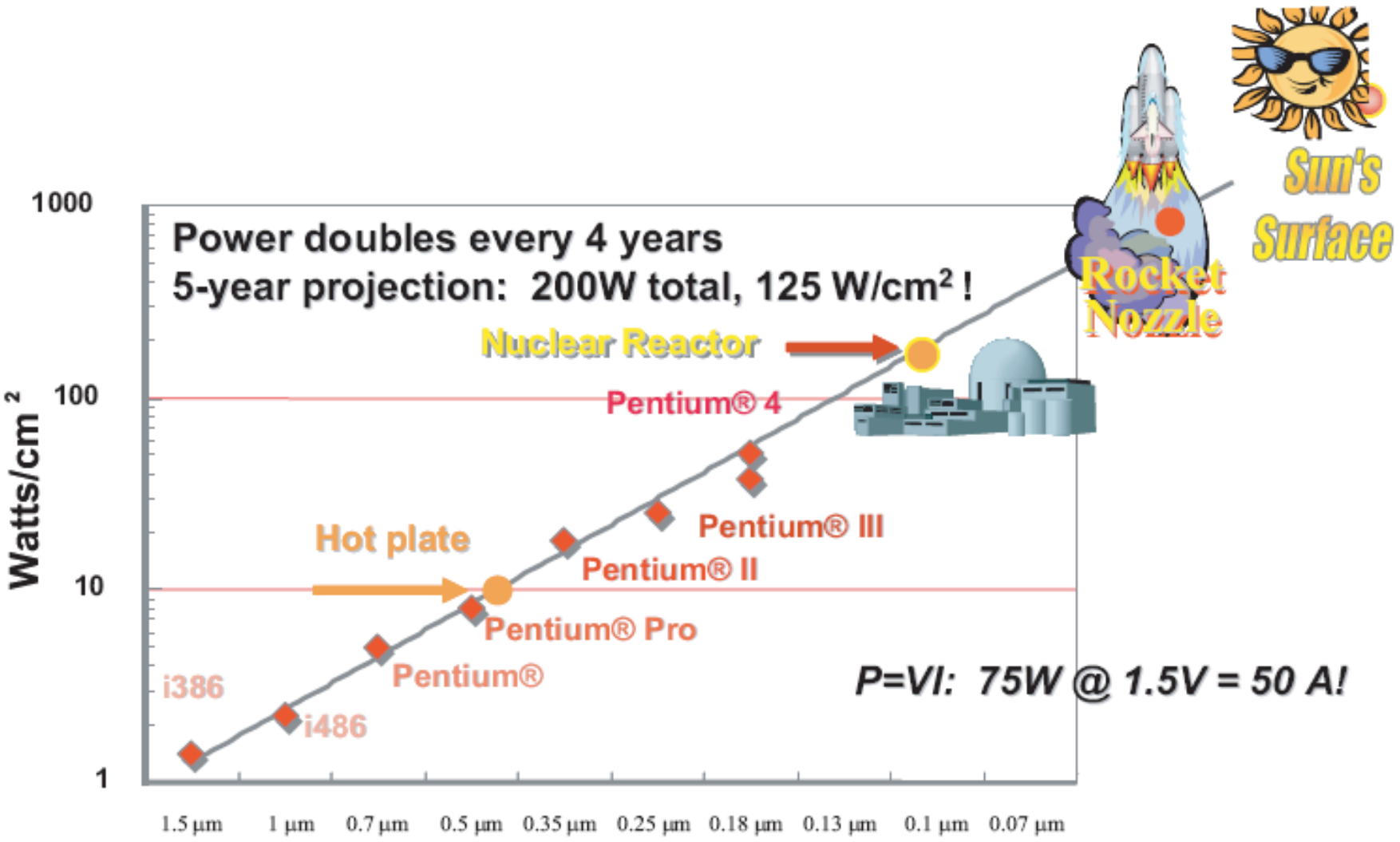
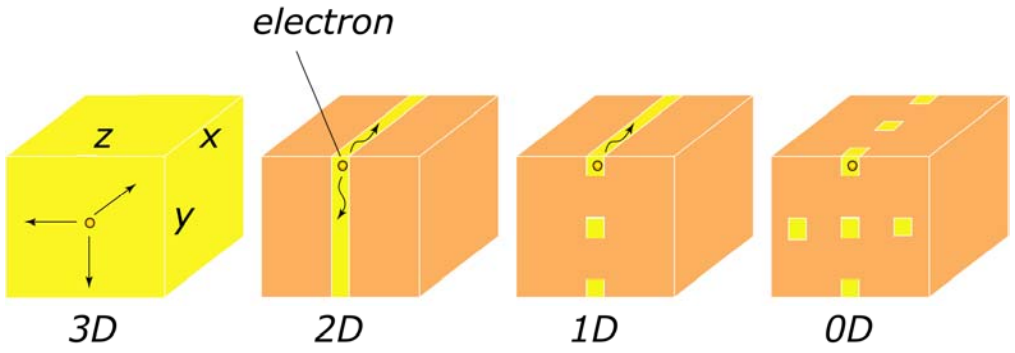


Figure 0.4: Chip power density is increasing exponentially with time.

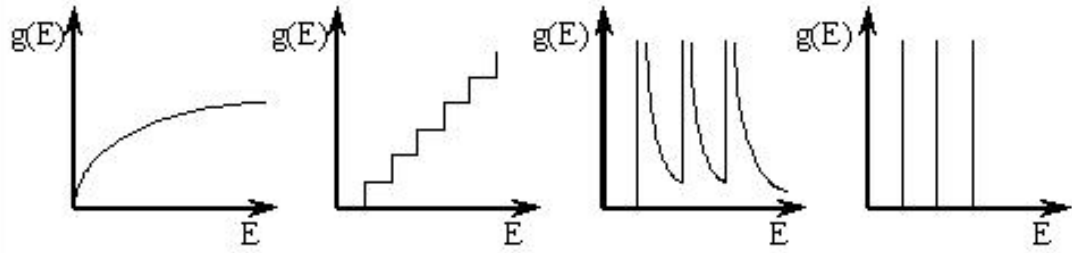
Quantum Confined Structures

Structures that you can 'build' by MBE growth

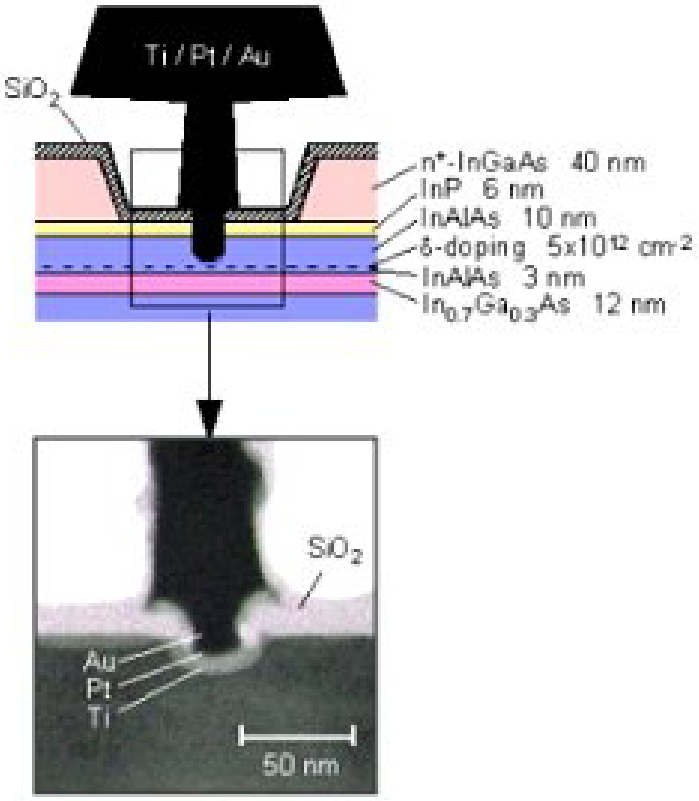


Microstructures to Nanostructures

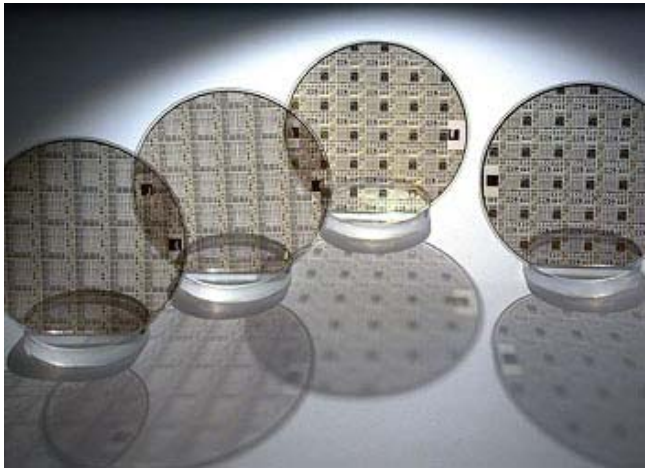
Nanostructures now used for
- Very fast transistors
- Very bright light sources and Lasers



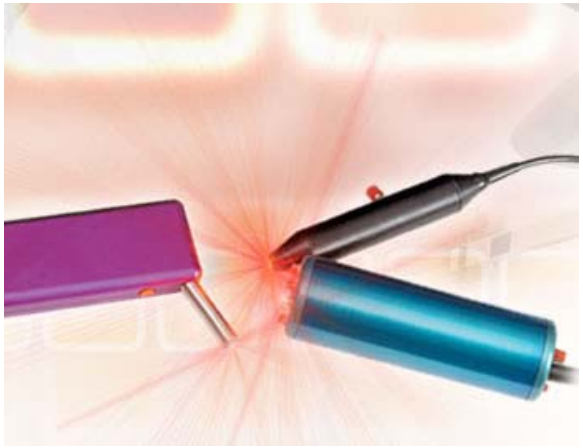
Quantum – Well Devices



High-electron Mobility Transistors (HEMTs)

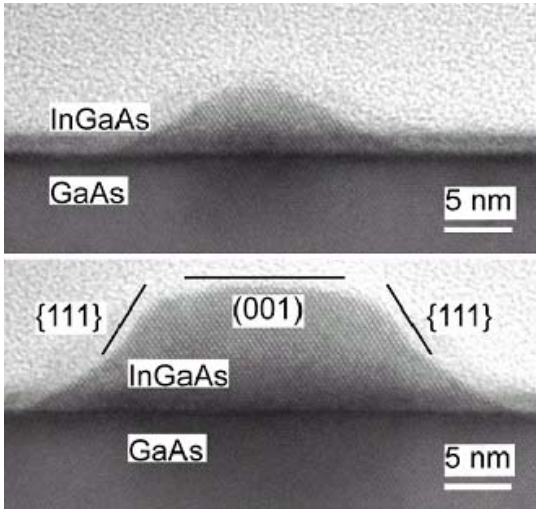


GaN HEMTs

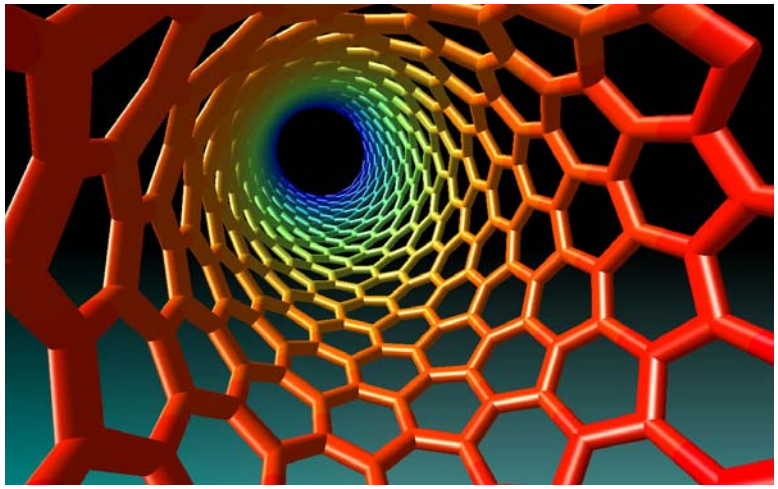


GaAs Laser Diodes

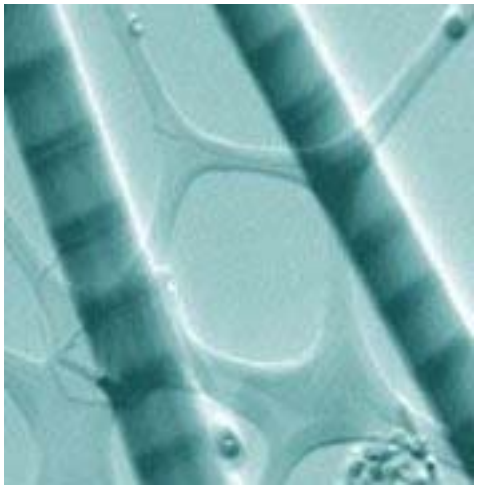
Quantum Confined Structures



Epitaxial 0-D (Quantum Dots)



Nanotubes – 1D (Quantum Wires)

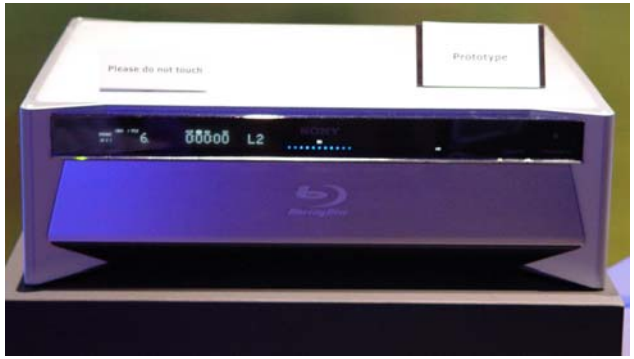


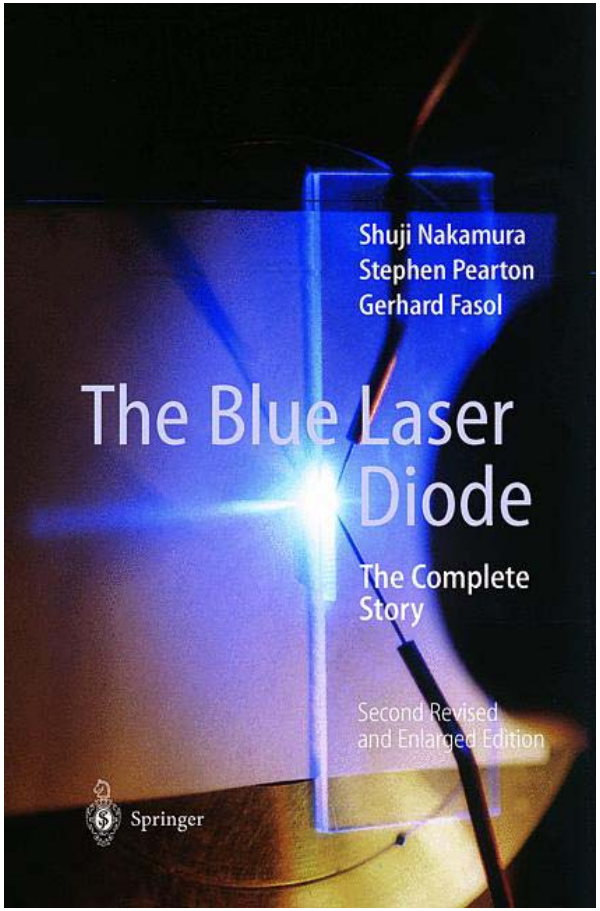
Nanowire Superlattices

Nanowire “Combs”

Quantum Well Devices – GaN Solid State Lighting

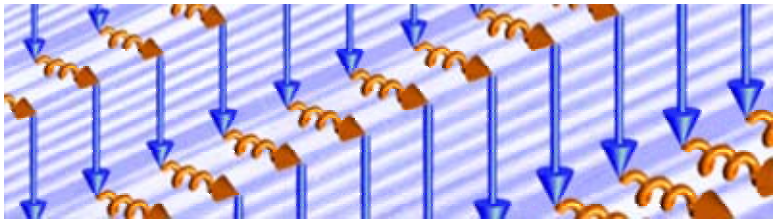
Blu-Ray DVD (GaN QW Laser)

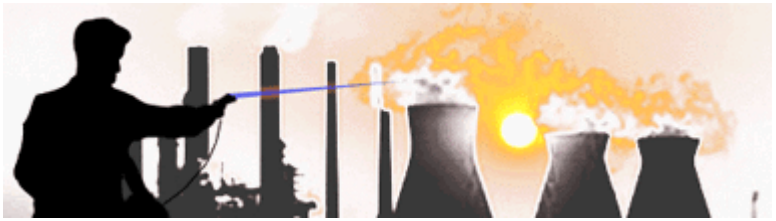


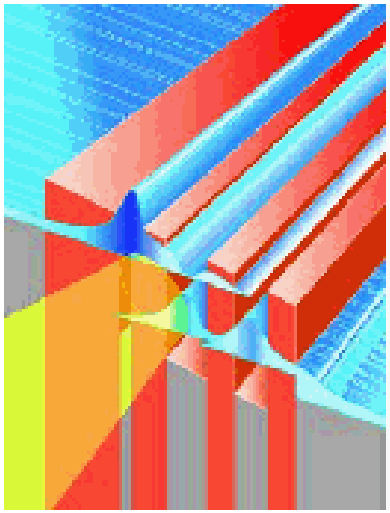


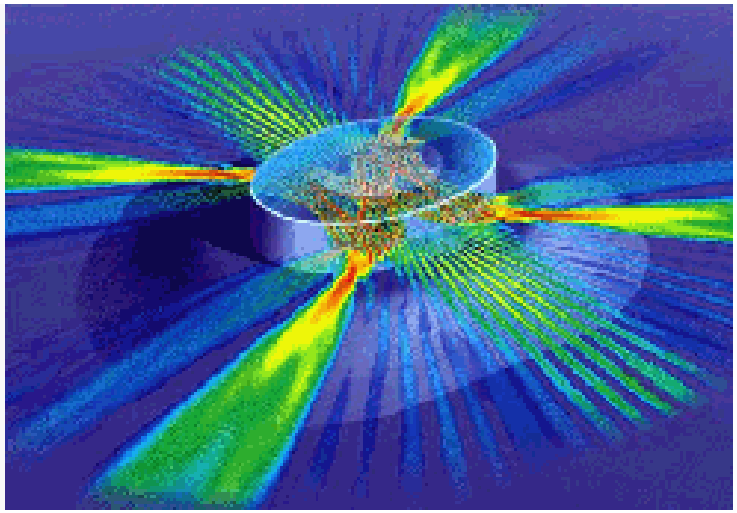
White LEDs -
The New Bulbs!

Superlattices – Device Applications



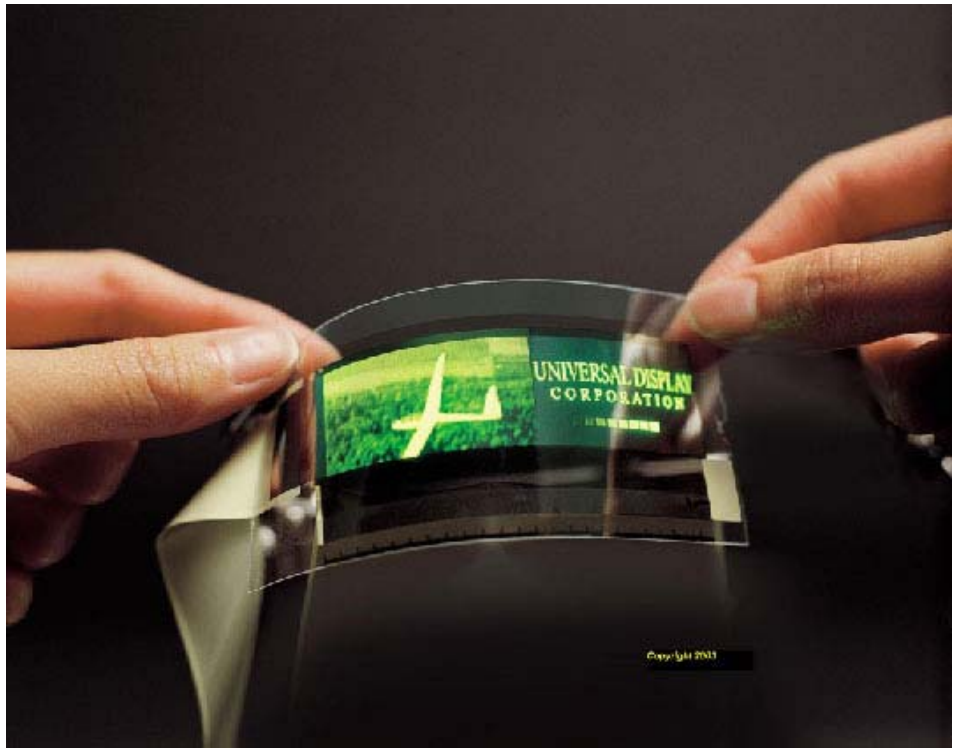






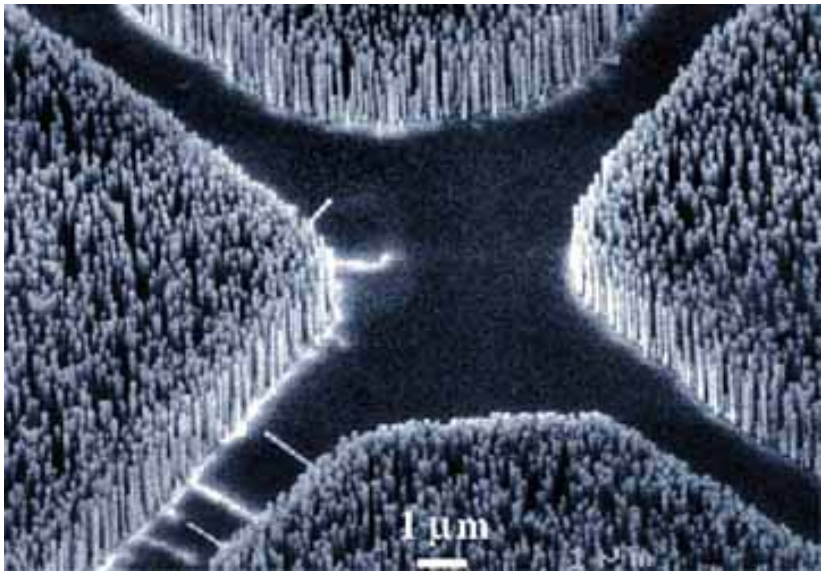
Quantum Cascade Lasers

Quantum Well Devices : Organic Semiconductors

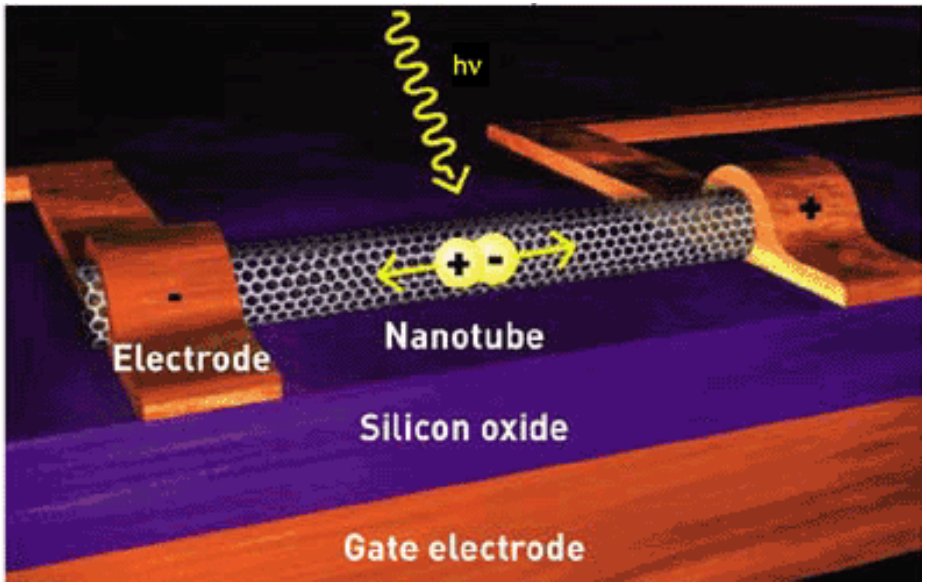


Flexible Displays
(Based on optical transitions in organic QW- structures)

Quantum Wire Device Applications



Nanowire Laser Arrays



Nanotube FETs