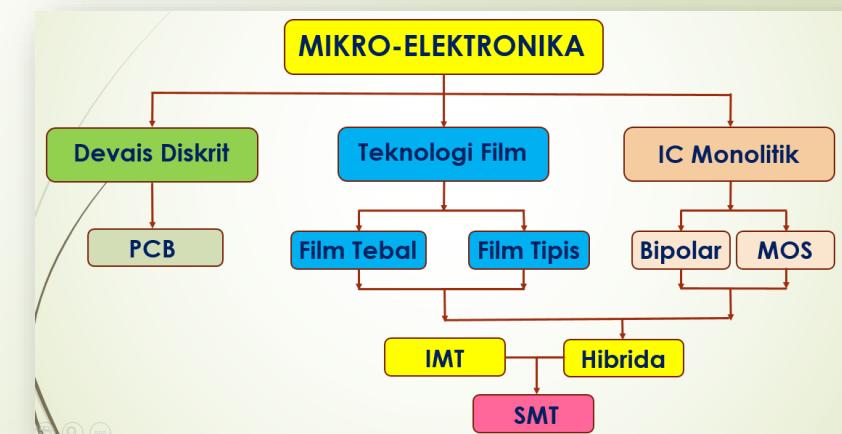


KLASIFIKASI TEKNOLOGI MIKROELEKTRONIKA

Eka Maulana, ST, MT, MEng.

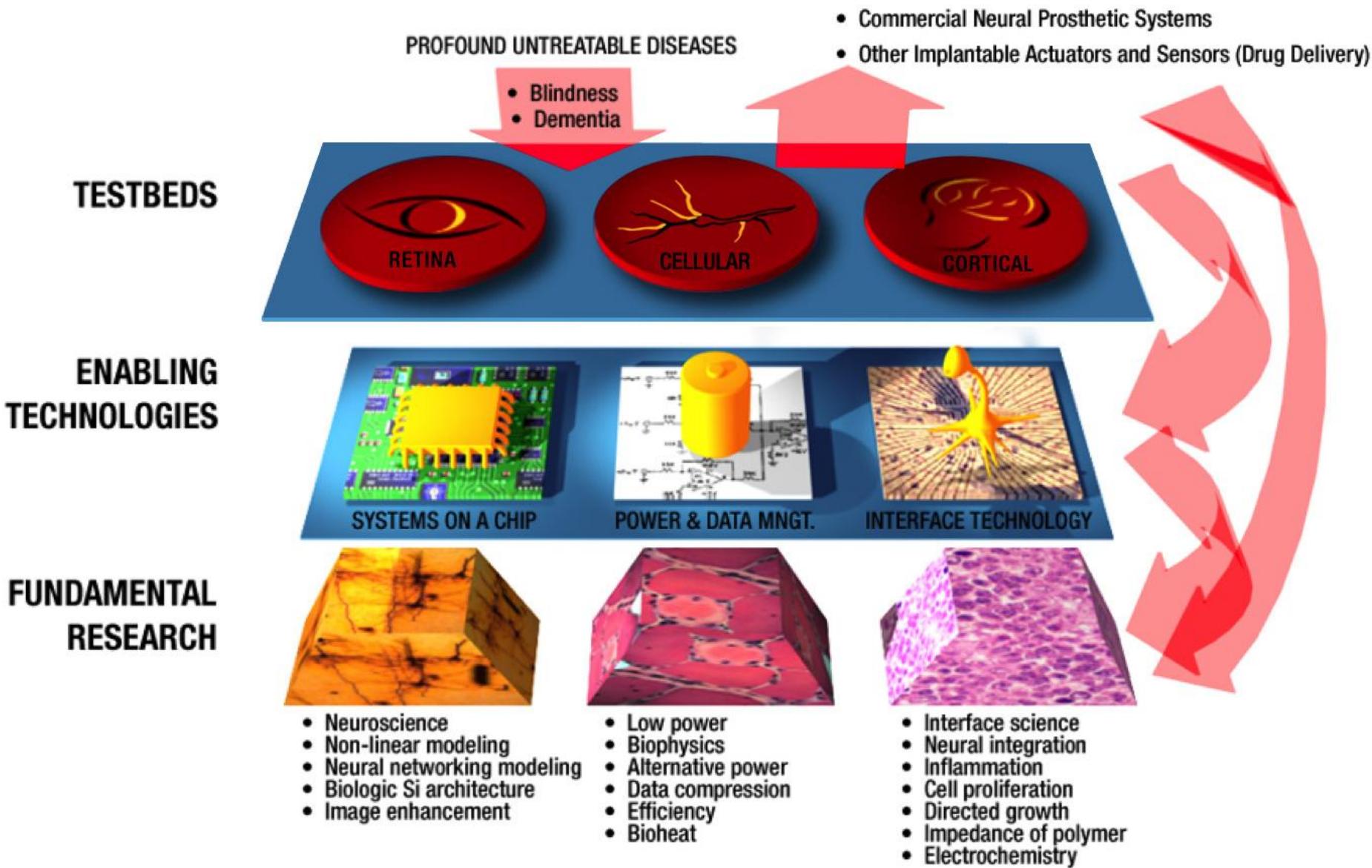
Teknik Elektro
Universitas Brawijaya



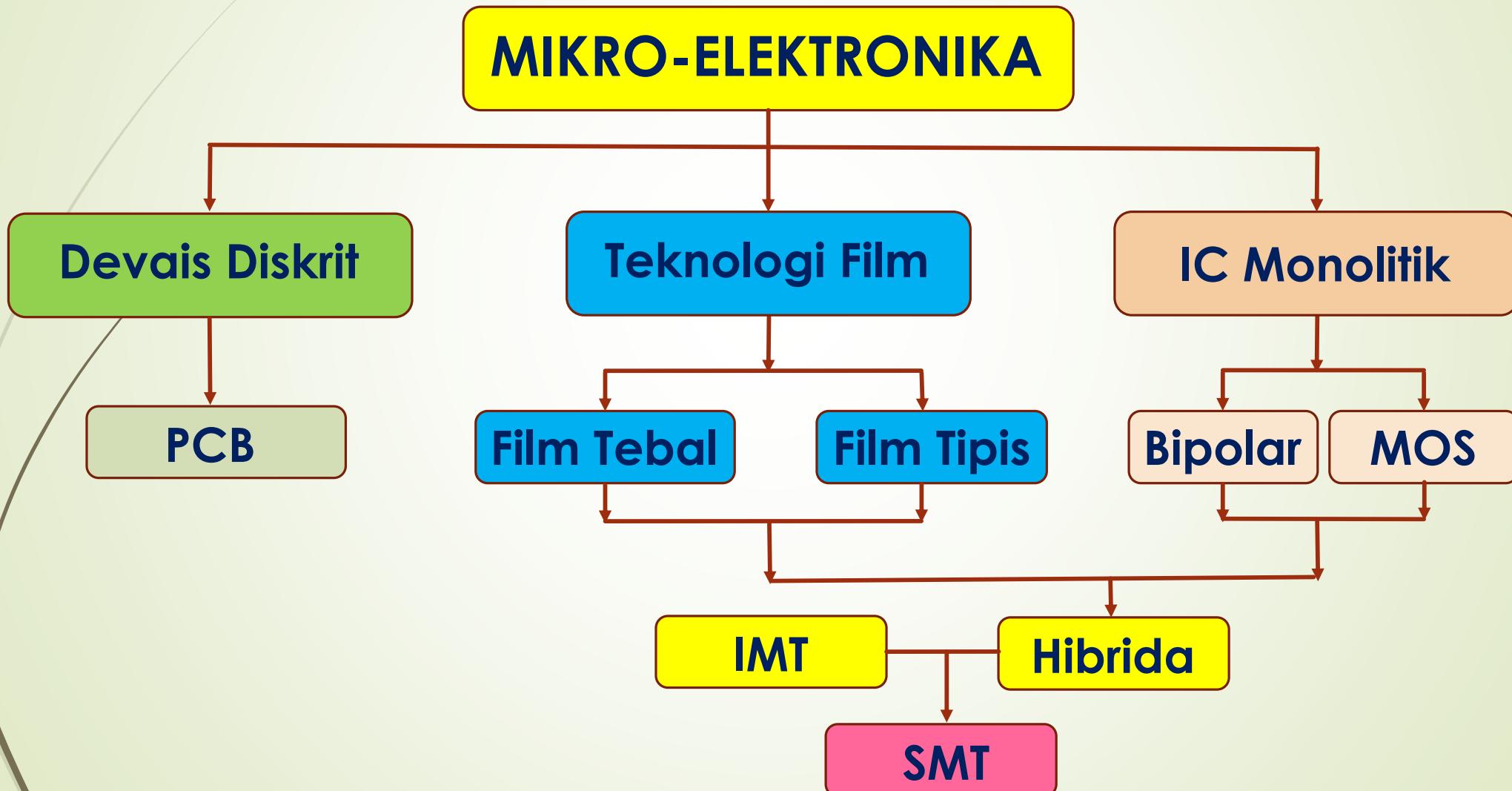
Pengantar Perkembangan Teknologi



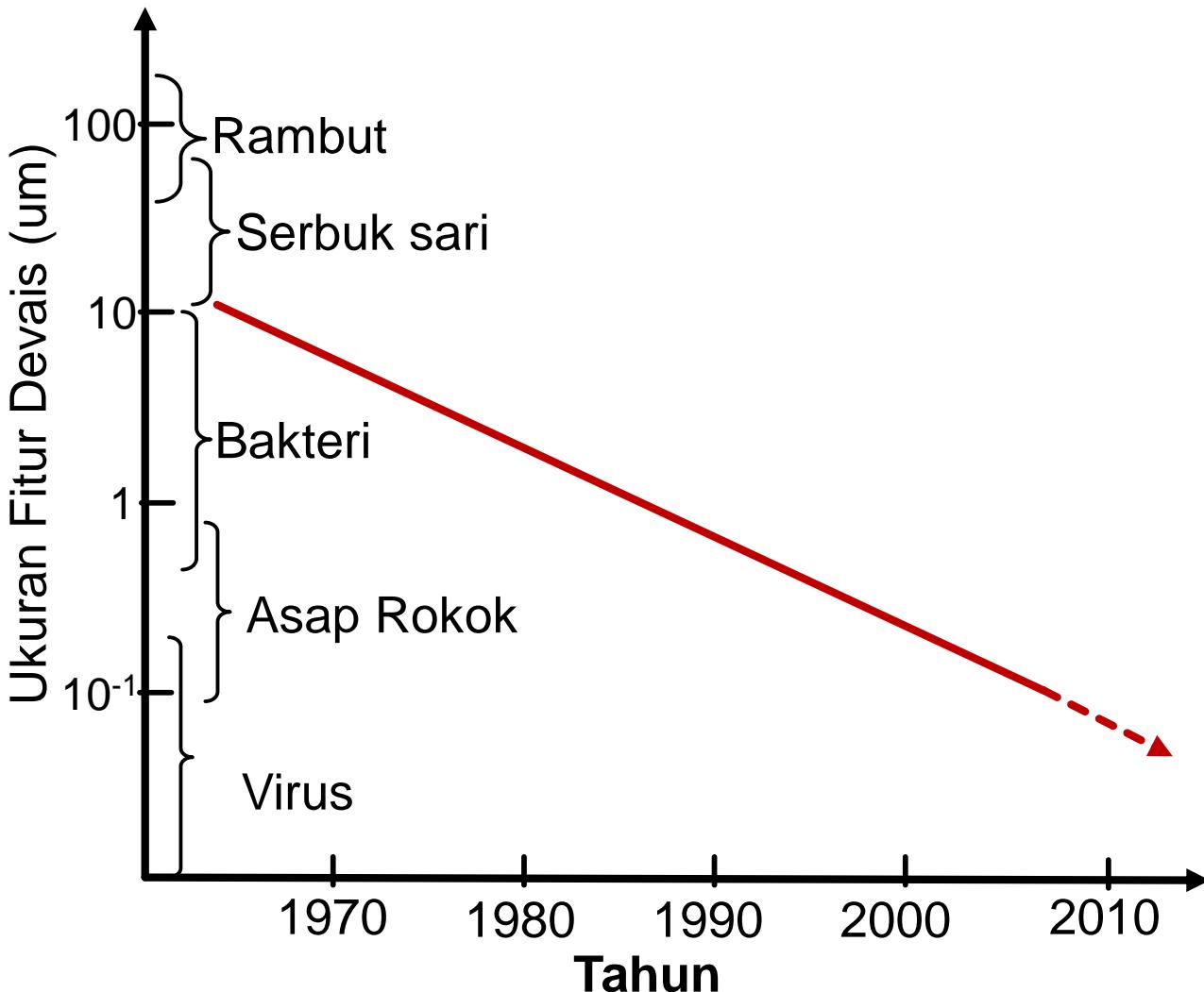
Perkembangan Bio-Microelectronic



KLASIFIKASI TEKNOLOGI MIKROELEKTRONIKA



Trend Perkembangan Ukuran IC



Lower Transistor Leakage

1x
0.1x
0.01x
0.001x

65nm 45nm 32nm 22nm

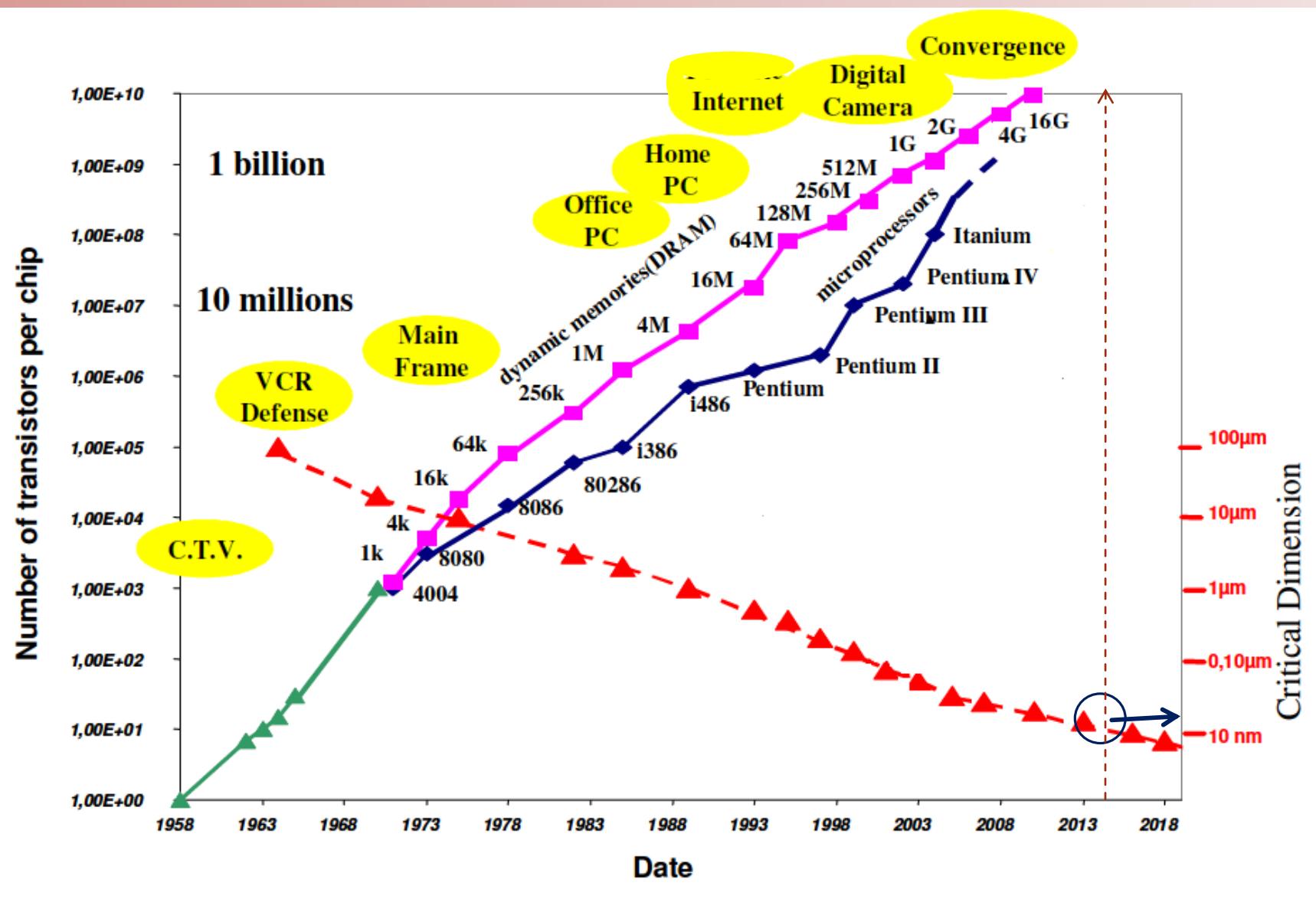
25%

10X

Higher Transistor Performance (Switching Speed)

Source: Intel

Evolution of Electronic Devices



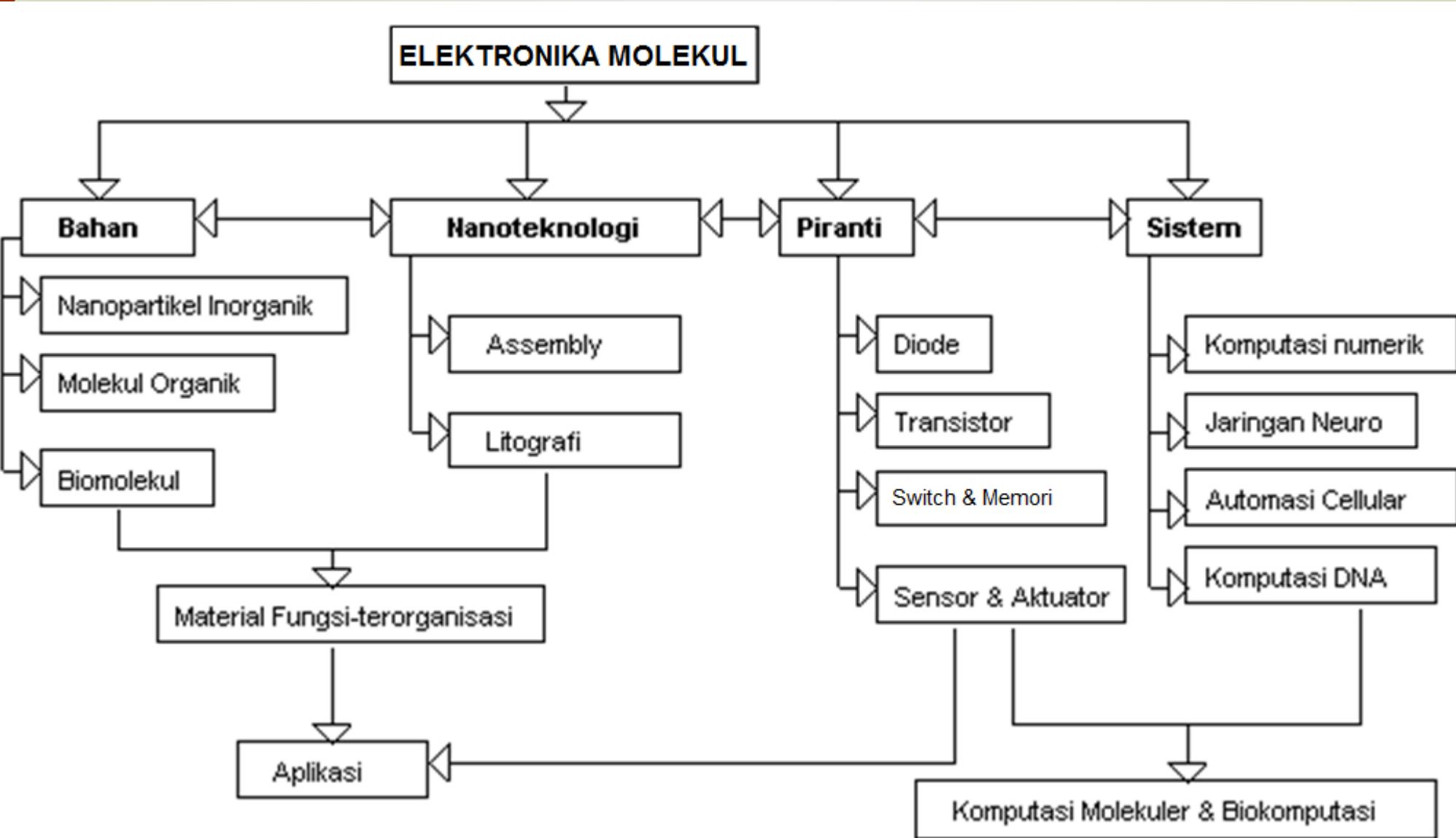
ASPEK KLASIFIKASI DAN PERKEMBANGAN

- ▶ TEKNOLOGI BAHAN
- ▶ TEKNOLOGI PROSES

Silicon Processing, Fabrikasi dan Packaging IC

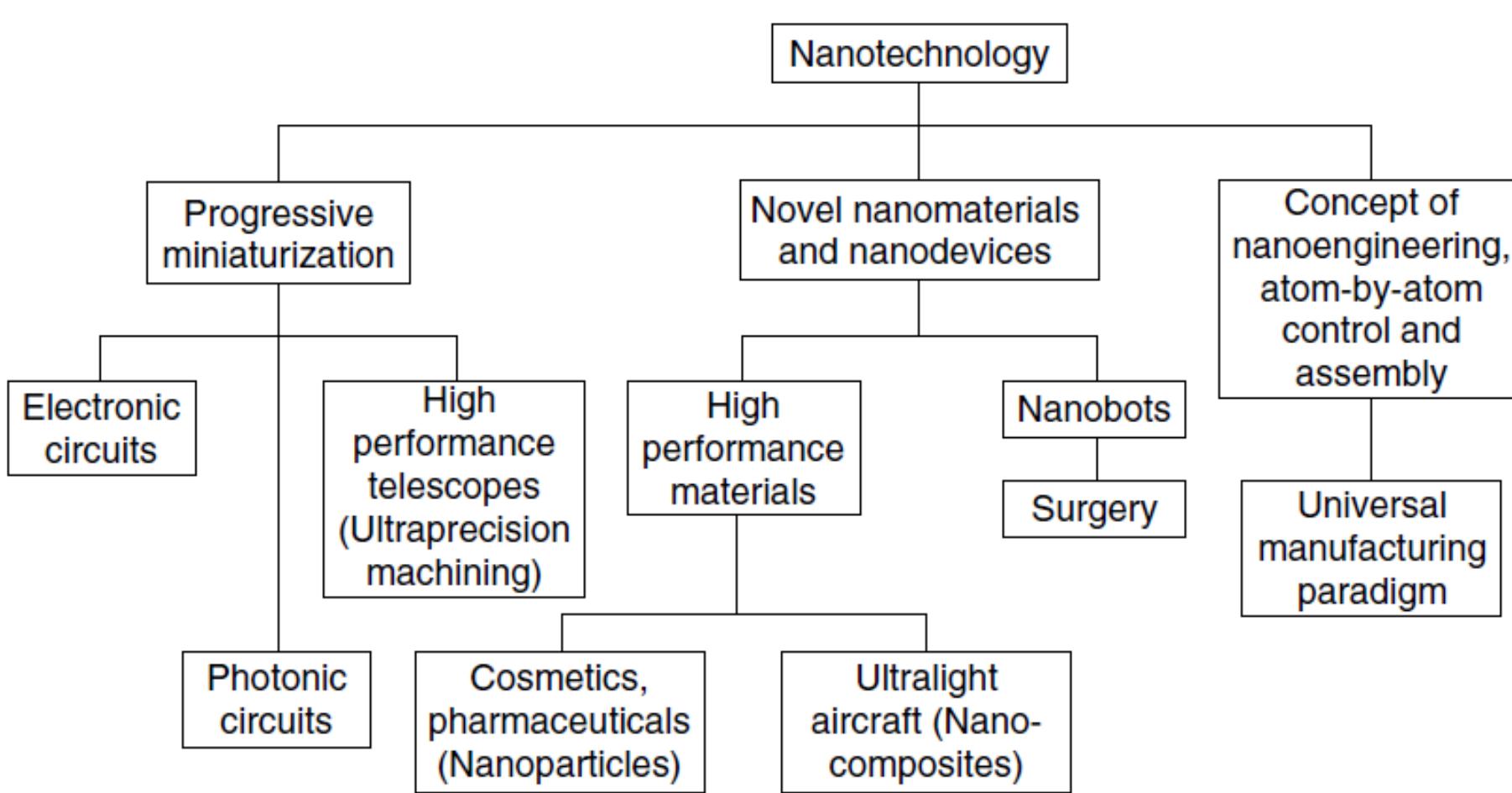
- ▶ TEKNOLOGI DESAIN dan SIMULASI
- ▶ TEKNOLOGI SISTEM INTEGRASI
- ▶ TEKNOLOGI APLIKASI
- ▶ TEKNOLOGI UJI dan VERIVIKASI
- ▶ TEKNOLOGI KOMPUTASI DAN PEMODELAN

Kajian Elektronika Molekul

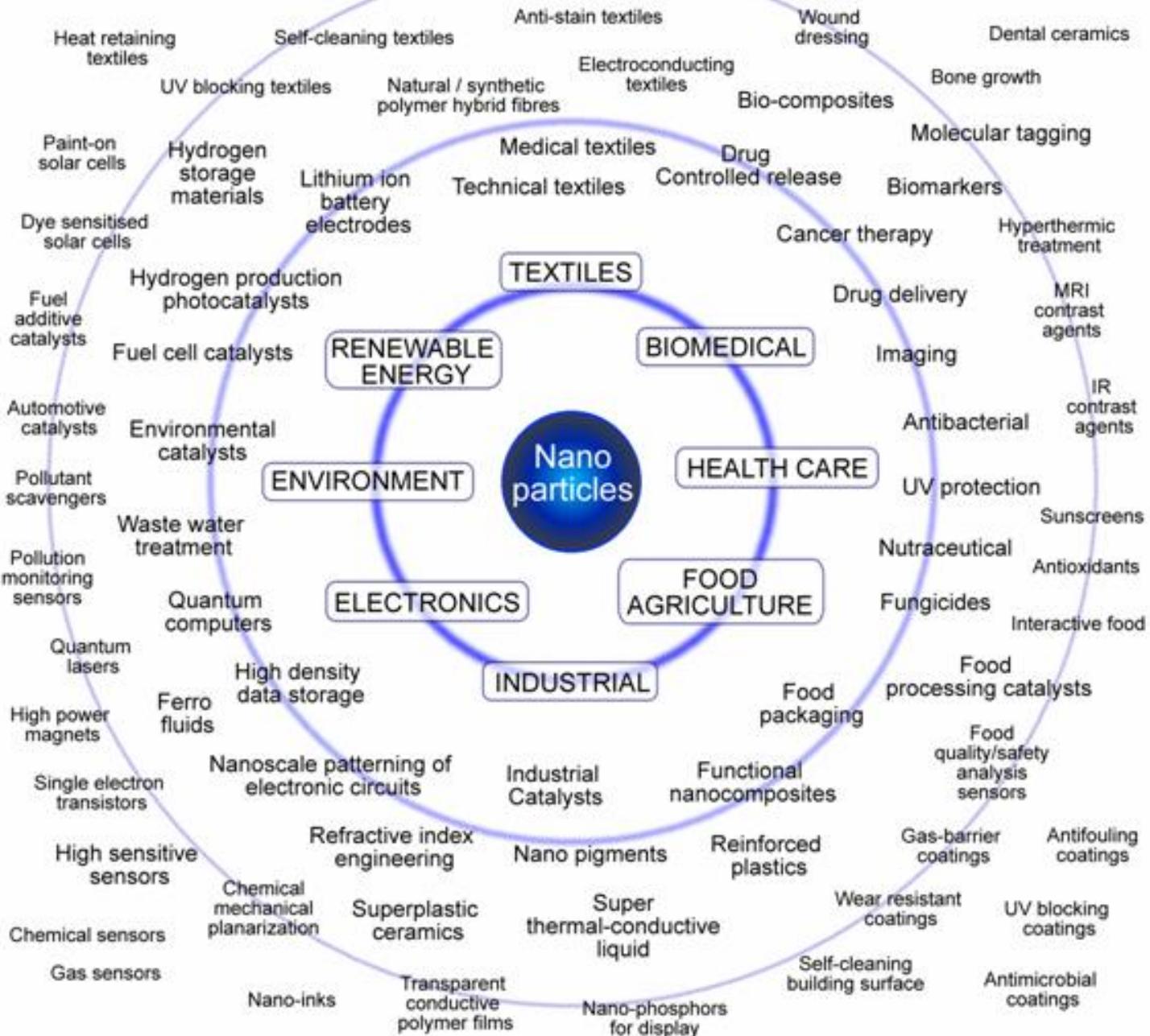




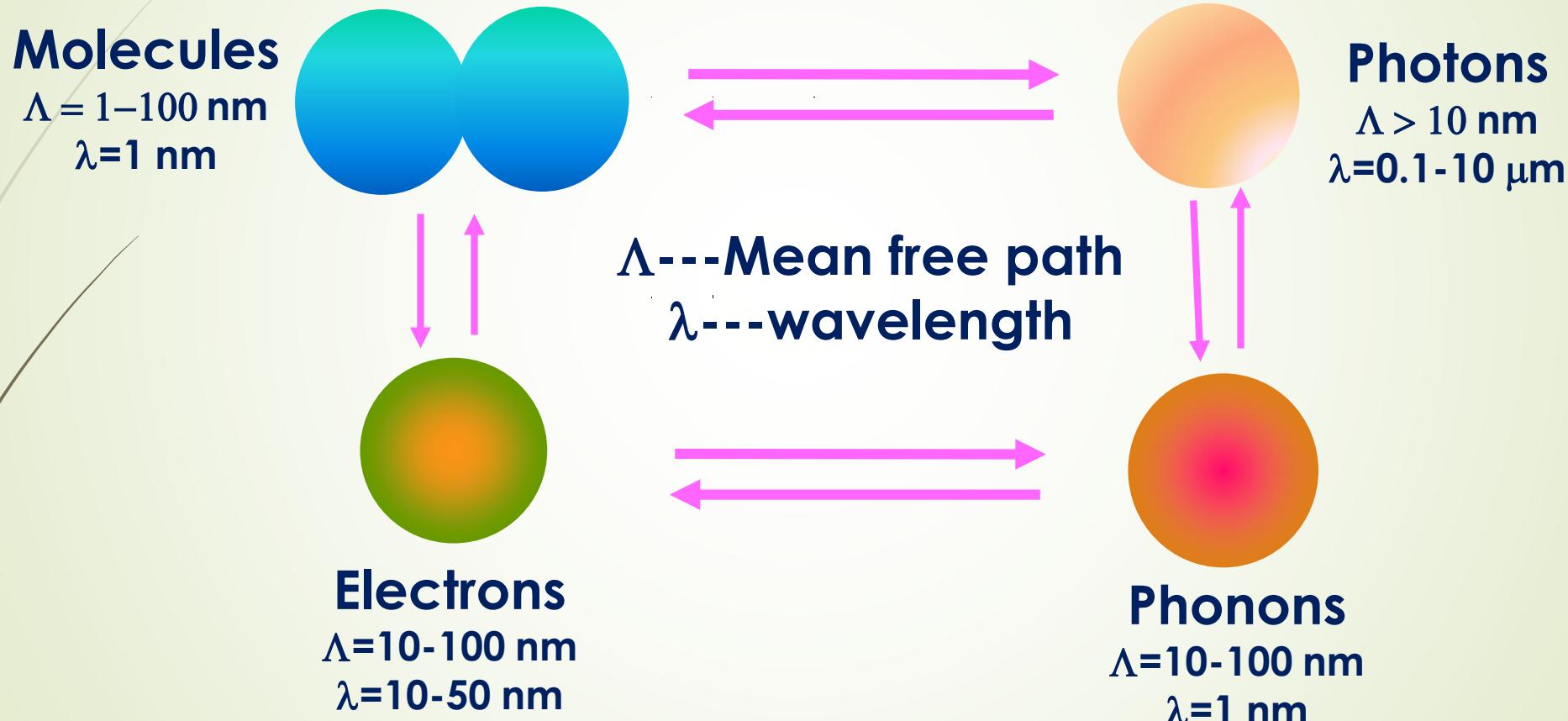
Cabang Konsep Nanoteknologi



APPLICATIONS OF NANOPARTICLES



Fenomena Dasar Teknologi Nano



Solar Cell: Applied Nanotech



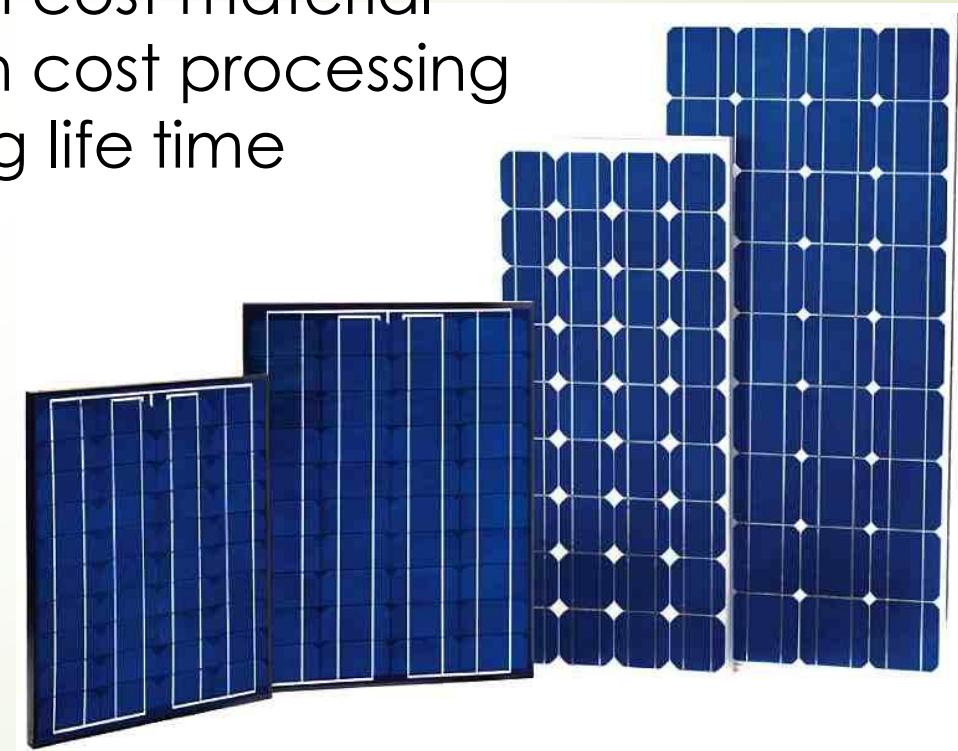
Silicon-Based Material Solar Cell

Efficiency up to 14-25% (market)

High cost material

High cost processing

Long life time



DSSC (Dye-Sensitized Solar Cell)

Natural Dye-Sensitized

Efficiency under 5% (lab)

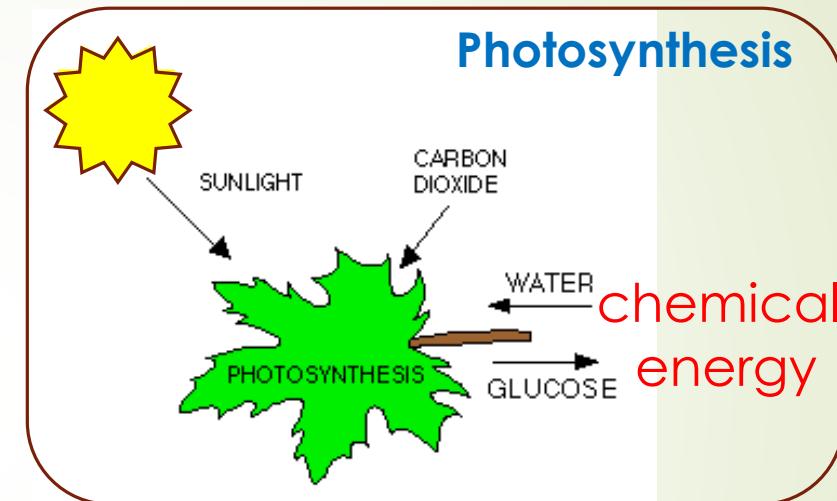
low cost materials

Low cost processing

Flexible substrates



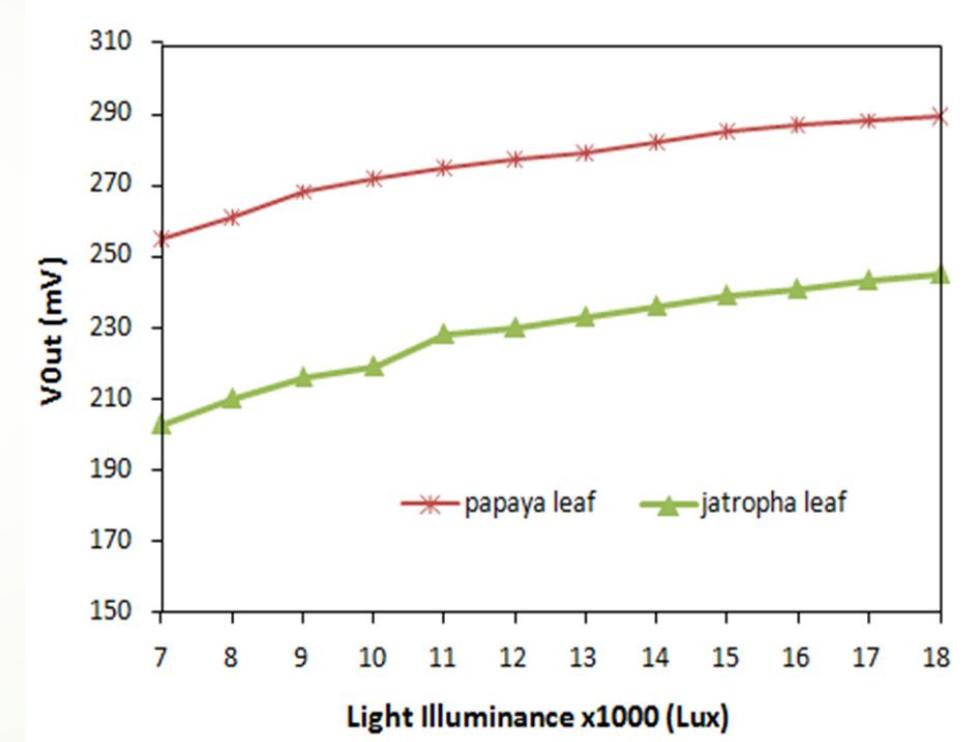
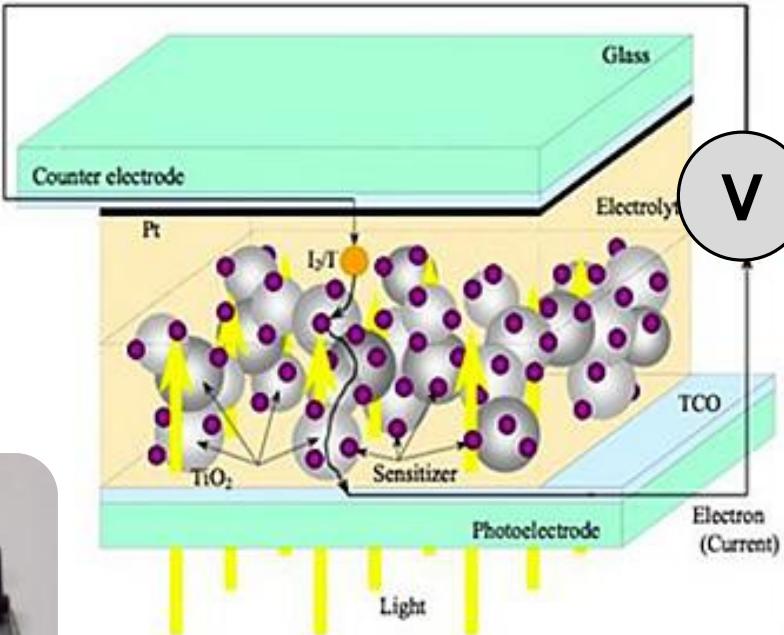
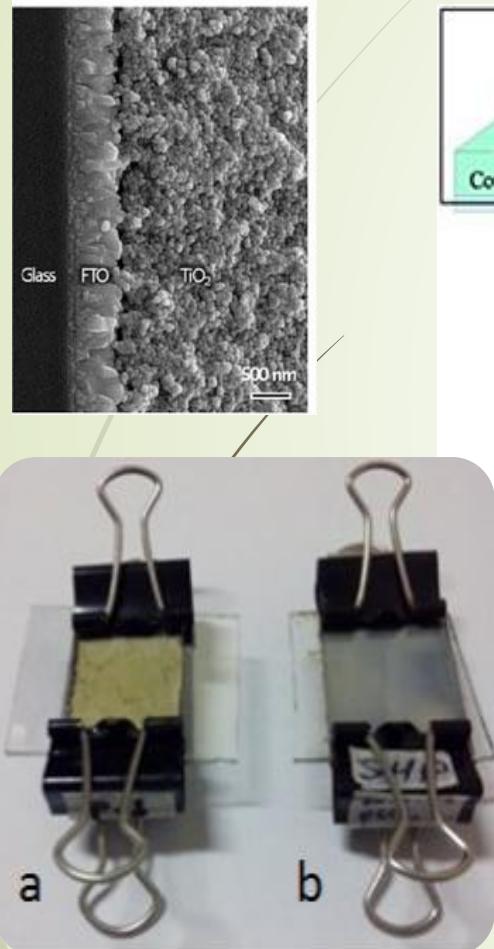
Biomimic Approach



Energy Conversion to Electricity



Chlorophyll extraction of papaya and jatropha leaves in DSSC



Sholeh HP, Eka Maulana, et.al. Organic Solar Cell in DSSC 2013

Nanomaterial Processing

Nanostructured
materials
supplier

- Nanoparticles
- Carbon nanotubes
- Quantum dots
- Dendrimers

Formulations
and additives

- Ready to mix additives
- Dispersions
- Powders in dispensers
- Pastes

Enhanced
materials

- Ready to use polymer composites
- Coated fabrics
- Laminations

Finished goods
incorporating
nanotechnology

- Car body panels
- Clothes
- Wound dressings
- Pharmaceuticals
- Plastic containers
- Household goods



Future Technology:

Liposomes
Bangham, Gregoriadis

Antibodies and their Conjugates
Celltech-UCB

Nanomedicines

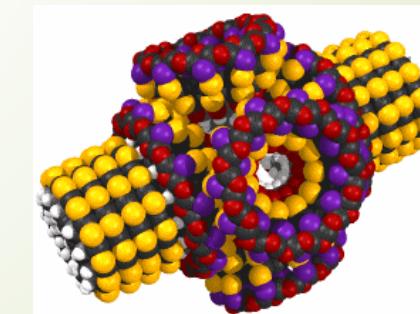
Nanoparticles
Florence, Daves, Illum

Polymer-protein conjugates

Unimolecular Polymeric Drugs and Conjugates
Duncan

Viruses as viral vectors for gene therapy
Seymour

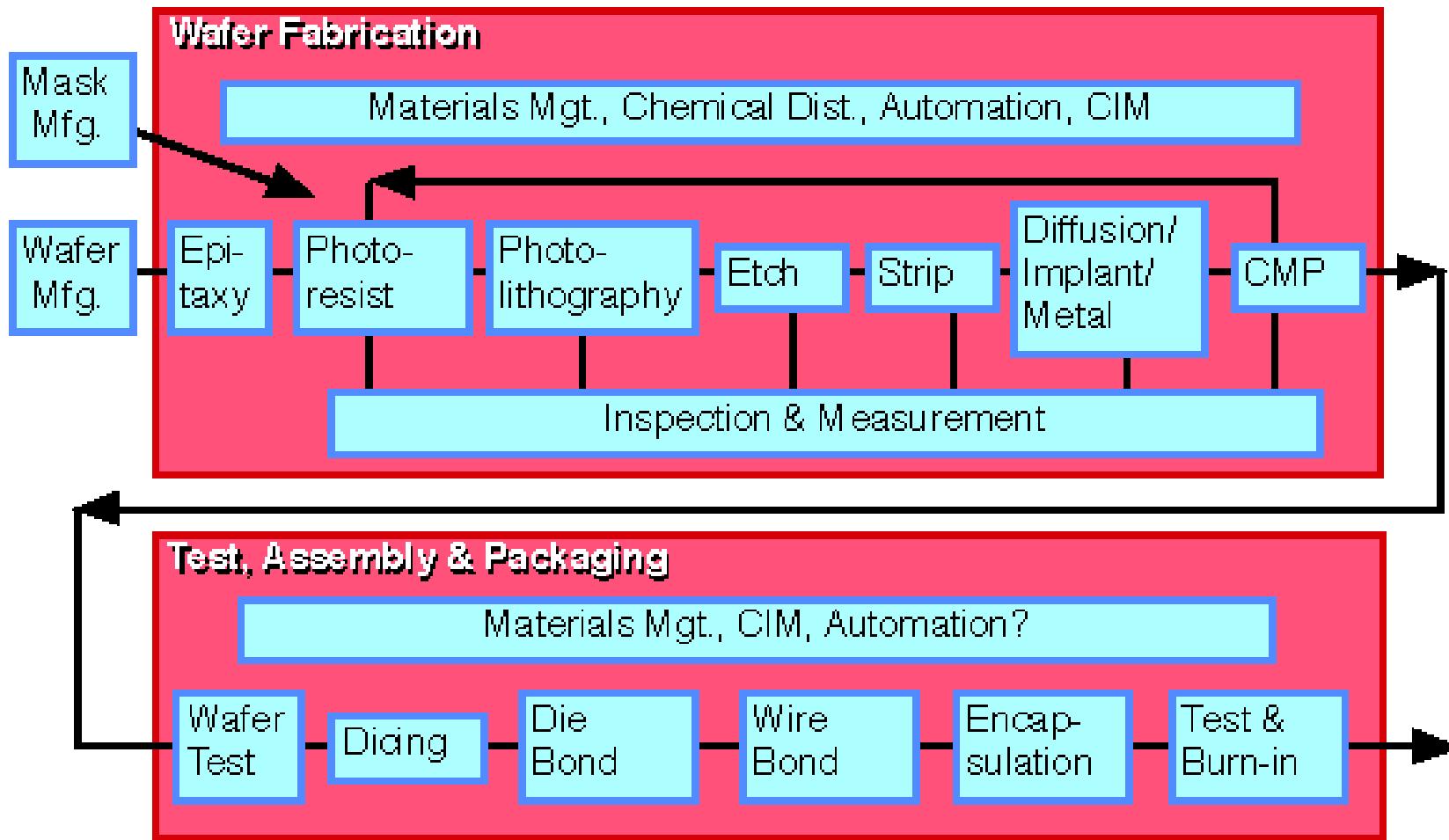
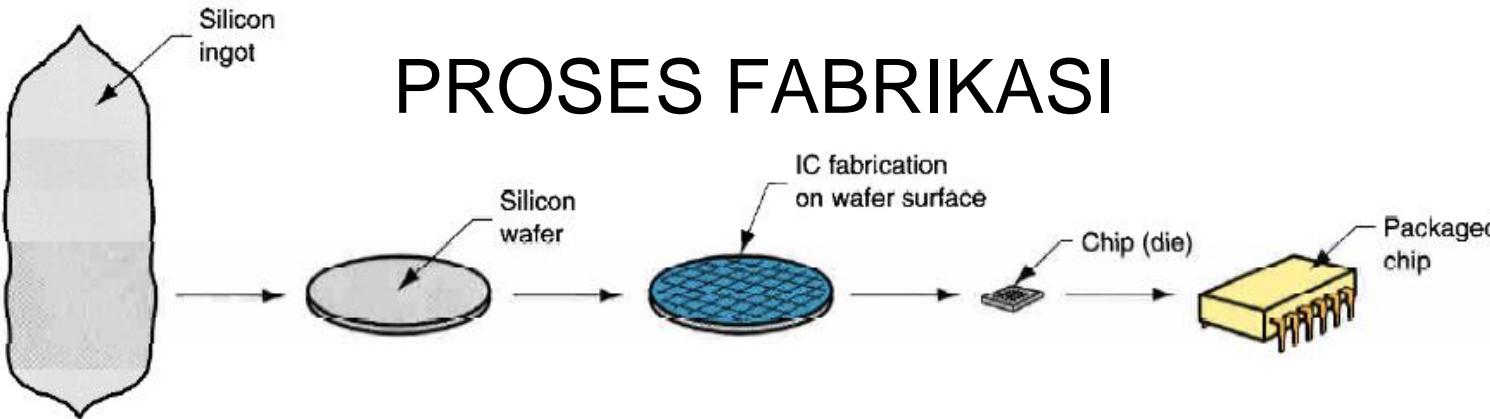
polymer micelles



Levels of Integration in Microelectronics

<u>Integration level</u>	<u>Number devices</u>	<u>Approx. year</u>
Small scale integration (SSI)	10 - 50	1959
Medium scale integration (MSI)	$50 - 10^3$	1960s
Large scale integration (LSI)	$10^3 - 10^4$	1970s
Very large scale integration (VLSI)	$10^4 - 10^6$	1980s
Ultra large scale integration (ULSI)	$10^6 - 10^8$	1990s
Giga scale integration	$10^9 - 10^{10}$	2000s

PROSES FABRIKASI





References

- ▶ M. P. Groover, 2002. "Fundamentals of Modern Manufacturing 2/e", John Wiley & Sons, Inc.
- ▶ Eka Maulana, Applied Science of Nanotechnology in Engineering Seminar, Dec 21st 2013
- ▶ Sholeh HP, Eka Maulana, et.al. Organic Solar Cell in DSSC 2013
- ▶ Simon D, Electronic Device for Nano-CMOS Era, Pan Stanford Publishing
- ▶ G Chan, MIT - Cambrige