

# Multiscale Simulation for Electronic Devices Innovation

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# Introduction

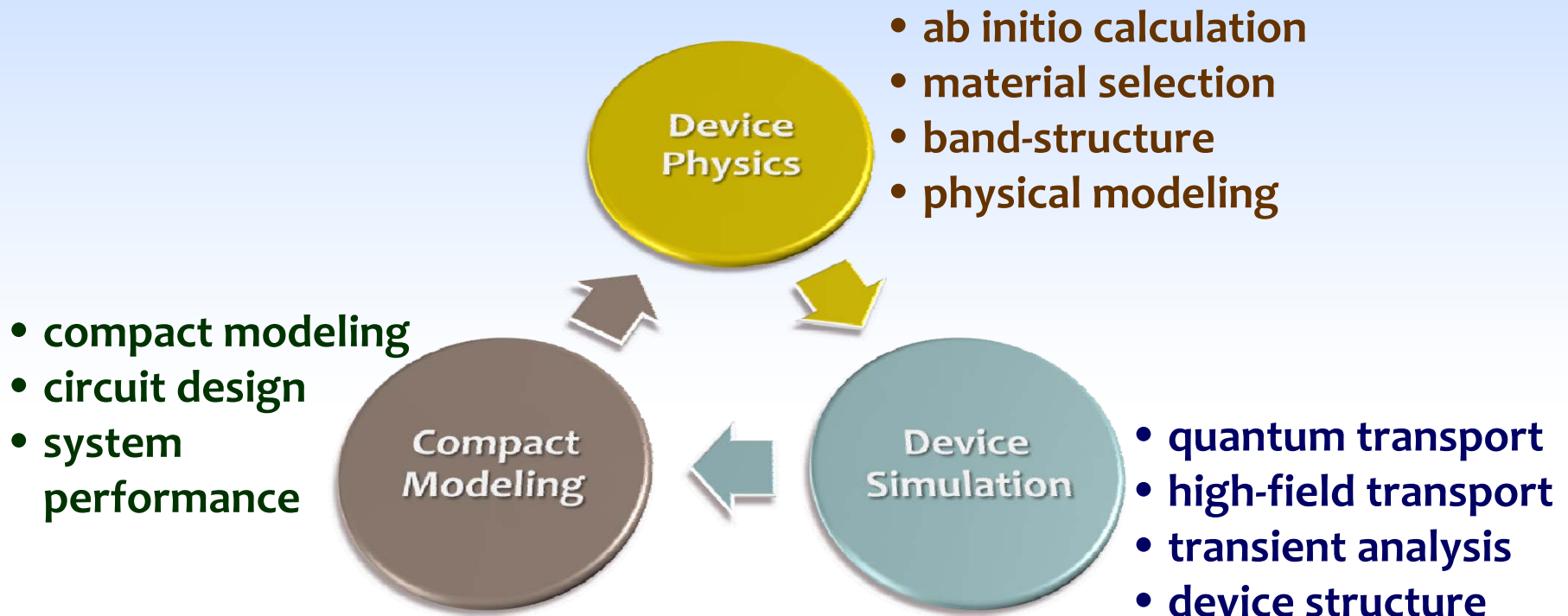
- Computer-aided design (CAD) tools are widely used for modeling and simulation of semiconductor electronic devices.
- To optimize system performance, technology CAD tools should cover circuit design as well as material selection.



- Multiscale simulation techniques, which span the entire length scale from the atomistic to circuit level

# Objective

- A primary goal of our project is the seamless integration of hierarchies from the atomistic approach to compact modeling.



# Multiscale Simulation

Quantum

Classical

High Frequency / Transient

Equilibrium

Compact modeling

Monte Carlo /  
Molecular Dynamics

Non-equilibrium  
Green's function

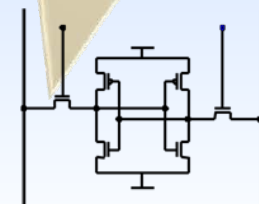
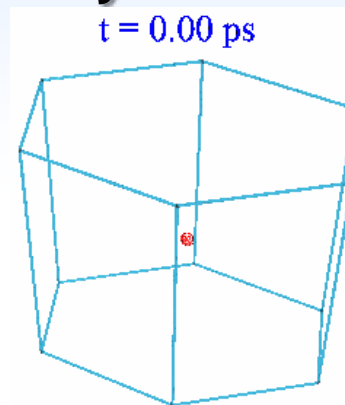
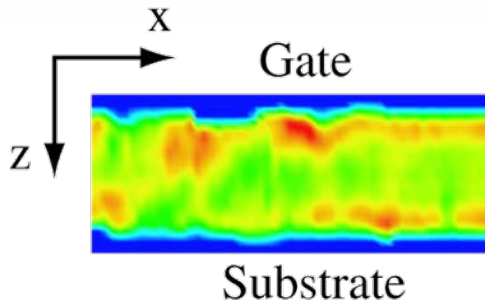
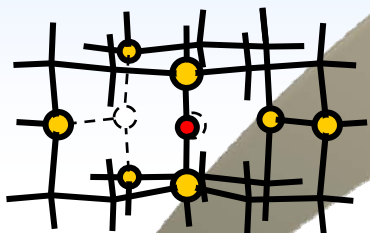
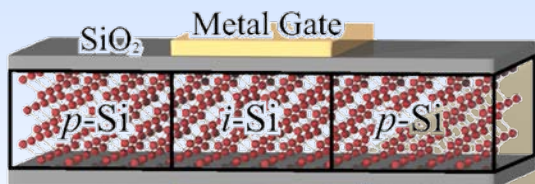
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First-principles /  
Tight-binding

Materials

Devices

Circuits



# Summary

- Our unit focuses on simulation technologies for next-generation high power/ultrafast devices.
- A primary goal of the project is to develop and integrate the following four technologies:
  - band-structure calculation/material selection technology based on the first-principles method
  - transient response modeling technology
  - high-field transport simulation technology
  - compact modeling technology