



## FIRST INTERNATIONAL NANOTECHNOLOGY CONFERENCE ON COMMUNICATION AND COOPERATION

### **Abstract**

#### **Silicon Nano Devices: Taking Full Advantage of Physics in Silicon Nanostructures**

The silicon MOSFET is not the fastest device. The superiority of silicon MOSFETs in VLSI is not the speed but is mainly due to their high manufacturability, integration level, and reliability. Other materials cannot compete with silicon in terms of these characteristics, and silicon devices should be continuously and intensively pursued for future integrated devices. Therefore, the development of the silicon nano devices is the most important and the most practical nanotechnology.

Although silicon MOSFETs are approaching the end of scaling, an effective approach to break the performance limit is the positive utilization of new physics that appear in silicon nano devices even at room temperature. The new physical phenomena often give rise to higher performance and new functionality. They include the mobility enhancement in ultra-narrow or ultra-thin channel MOSFETs by subband engineering, multi-bit operation in silicon nanocrystal memories, and new functionality in single-electron transistors. As an example, the application of room-temperature operating single-electron transistors to analog pattern matching circuits will be introduced in this talk.