OPTIMALLY FUSED NT EDUCATION:
A PROPOSAL FOR COHERENT MIXTURE
OF TECHNOLOGY CONTENTS

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CONTENTS OF DISCUSSION

- Brief review of NT curricula offered
- Educational contents covering CNT
- Fusing mode
- Quantum Mechanics as a fusing vehicle
## COURSES OFFERED @ a Korean NT DEPARTMENT

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<td>Classical Electrodynamics I&amp;II</td>
<td>Synthesis of Natural Product</td>
<td>Chem. NanoMolecular Complex</td>
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<tr>
<td>Organic Analytical Chemistry</td>
<td>Superconductivity Physics</td>
<td>Biomaterials Chemistry</td>
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<td>Quantum Mechanics I&amp;II</td>
<td>Bioorganic Chemistry</td>
<td>Synthesis of Polymers</td>
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<td>Molecular Spectroscopy</td>
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<td>Solid State Chemistry</td>
<td>Intro. to Nano Science I&amp;II</td>
<td>NEMS</td>
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<td>Solid State Physics I&amp;II</td>
<td>Cell Biochemistry</td>
<td>Seminar I&amp;II</td>
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<td>Quantum Optics I&amp;II</td>
<td>Nanostructural Chem</td>
<td>Experiment I&amp;II</td>
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<td>Computational Physics</td>
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<td>Research I&amp;II</td>
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<td>Low Temperature Physics</td>
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<td>Adv. Quantum Mechanics</td>
<td>Nano Catalyst</td>
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17 courses in **physics, electrical, mechanical & materials engineering**

13 courses in **chemistry, chemical engineering & life science**
Over 60 graduate courses offered for physics, chemistry, biology, computer science & electrical, mechanical, chemical and biochemical engineering majors

Basic principles applied to NT based devices, systems & applications

Management courses e.g. Technical Project Management, Materials Processing Economics, Managing the Adoption of Technological Innovation

Concentration Areas
- Molecular Materials and Architecture: dots, wires, quantum wire transistors
- Optoelectronic Materials, Architecture and Devices: SOCs
- Nanosystems S & T: Design, fabrication, integration of NEMS in SOCs
- Thin Film Structures: Self-assembly, deposition and integration of thin films
- Nanomaterials for NT: nanoengineered materials for NT based applications
- Nanoscale Materials Modeling, Characterization, Analysis and Metrology: Theory and simulation, quantum Monte Carlo, Classical Molecular Dynamics
RESEARCH FOCUSES @ CNSE, UNIV. ALBANY

- **Nanoelectronics and Microelectronics**
  for materials and process integration of semiconductor devices

- **Nanosystems and Microsystems including MEMS**
  for micromachining, integrated electronics with sensors and actuators in SOC

- **Nanophotonics and Optoelectronics**
  for LEDs, solid state lasers, optical communications and optoelectronic materials

- **Nanometerology, Analytical Sciences and Process Control**
  for metrology, characterization and process control

- **Nanopower**
  for high efficiency solar cells, fuel cells and compact batteries

- **Advanced Computer Modeling for Nanosystems and Processes**
  for supercomputer based modeling, process & structure simulations
- Growth mechanisms and self-assembly (mat. sci., chem.)
- Structure and properties of SWNTs and MWNTs (mat. sci., chem. phys.)
- Electronic, optical, thermal, mechanical properties with reference to:
  - quantum wire FETs & hetero-junction devices (phys., elec.)
  - field emission sources (mat. sci., elec., phys)
  - lithium ion batteries (mat. sci., chem.)
  - supercapacitors and actuators (elec., phys.)
  - molecular sensors (chem., phys.)
  - hydrogen storage (chem., mat. sci.)
  - scanning probe tips, etc. (mech. mat. sci.)
FUSING OF NT EDUCATIONAL CONTENTS

- **When to start?**
  Graduate program vs. undergraduate & graduate program?

- **How to fuse?**
  Juxtaposing traditional courses from various disciplines?
  Modular teaching under a general title?
  Traditional courses and interdisciplinary research?
  Developing bona fide syllabus including textbooks stressing elementary concepts?
QUANTUM MECHANICS AS A VEHICLE FOR FUSION

- Mode of lecture:
  Minimum formulation & Maximum application, emphasizing concepts?

- Topics to be covered:
  Schroedinger equation & eigenvalue problems; atoms & molecules; atomic and molecular spectra; molecules & chemical bonds; harmonic oscillator; potential barriers & tunneling; band theory of solids; quantum statistics and distribution laws; interaction of radiation with matter; scattering & charge transport;

- Application examples:
  p-n junctions; homo and hetero junction transistors; MOSFETs, quantum wire transistors, CNT transistors; SETs; optical & semiconductor lasers; molecular electronics; sensors and transducers
Center for Excellence for Nano Education

assessing evolving NT
updating NT knowledge base
fusing the education contents
exchanging expertise among centers