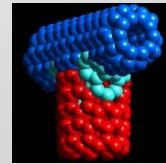




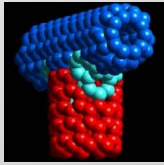
CONCLUDING REMARKS

Mission Relevant Projects



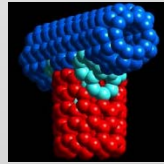
- Nanomaterials for radiation protection in CEV
- Synthetic gecko for tile repair
- Implantable nanoelectrodes for crew health monitoring, surgery
- Carbon nanotube biocompatible ‘buckypaper’
- Thermoelectric refrigeration
- Molecular nanoelectronics
- Advanced life support applications using carbon nanotubes
- Plasma based sterilization for planetary protection
- Intelligent nanomaterial design by computational nanotechnology
- Radiation effects on nano devices and electronics

Assessment of Opportunities



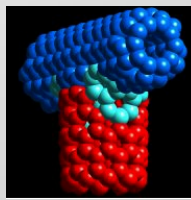
- **Short term (< 5 years)**
 - Nanoparticles
 - * Automotive industry (body moldings, timing belts, engine covers...)
 - * Packaging industry
 - * Cosmetics
 - Flat panel displays
 - Coatings
 - CNT-based probes in semiconductor metrology
 - Tools
 - Catalysts (extension of existing market)
 - High power microwave devices

Assessment of Opportunities (Cont.)



- **Medium term (5-10 years)**
 - Memory devices
 - Fuel cells, batteries
 - Biosensors (CNT, molecular, qD based)
 - Biomedical devices
 - Advances in gene sequencing
 - Advances in lighting
- **Long term (> 15 years)**
 - Nanoelectronics (CNT)
 - Molecular electronics
 - Routine use of new composites in Aerospace, automotive (risk-averse industries)
 - Many other things we haven't even thought of yet

Summary



- Nanotechnology is an enabling technology that, together with material science, will impact electronics and computing, materials and manufacturing, energy, transportation....
- The field is interdisciplinary but everything starts with material science. Challenges include:
 - Novel synthesis techniques
 - Characterization of nanoscale properties
 - Large scale production of materials
 - Application development
- Opportunities and rewards are great and hence, tremendous worldwide interest
- These emerging technologies will help us to live on the moon, but also to create a better world on earth