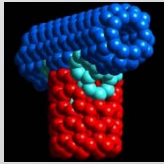
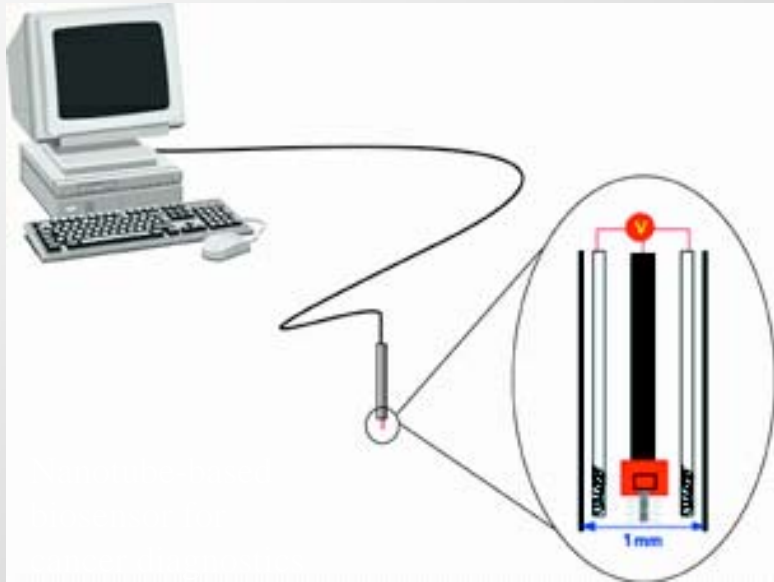




NANO-BIO FUSION

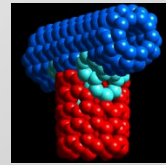


- Expanding ability to characterize genetic makeup will revolutionize the specificity of diagnostics and therapeutics
 - Nanodevices can make gene sequencing more efficient
- Effective and less expensive health care using remote and in-vivo devices

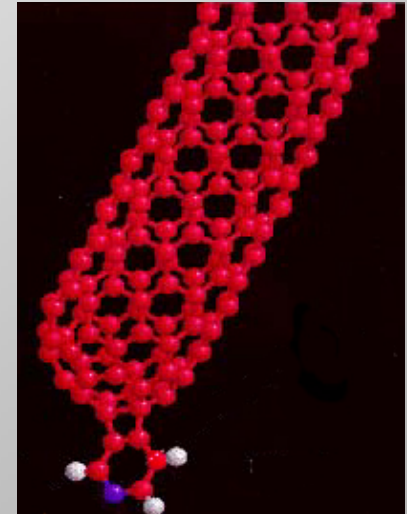


- New formulations and routes for drug delivery, optimal drug usage
- More durable, rejection-resistant artificial tissues and organs
- Sensors for early detection and prevention

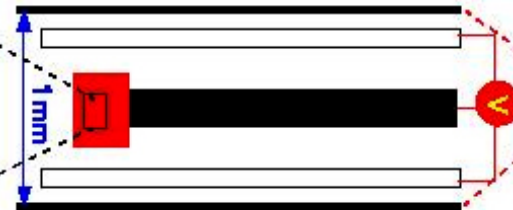
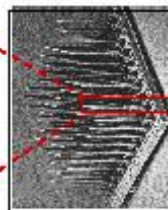
CNT Based Biosensors



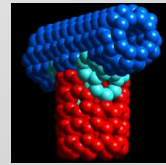
- Our interest is to develop sensors for astrobiology to study origins of life. CNT, though inert, can be functionalized at the tip with a probe molecule. Current study uses AFM as an experimental platform.
- The technology is also being used in collaboration with NCI to develop sensors for cancer diagnostics
 - Identified probe molecule that will serve as signature of leukemia cells, to be attached to CNT
 - Current flow due to hybridization will be through CNT electrode to an IC chip.
 - Prototype biosensors catheter development



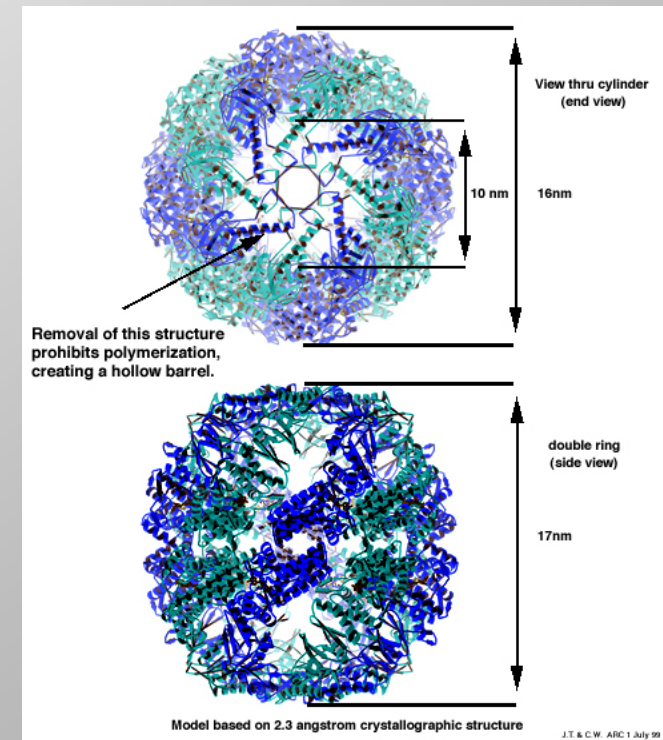
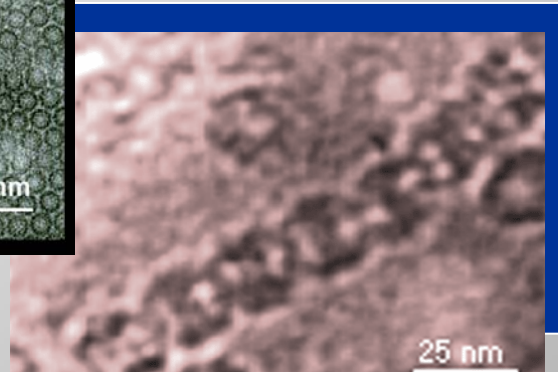
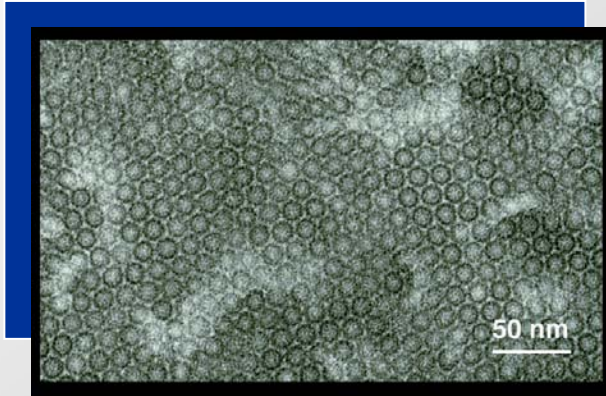
- **High specificity**
- **Direct, fast response**
- **High sensitivity**
- **Single molecule and cell signal capture and detection**



Protein Nanotubes



- Heat shock protein (HSP 60) in organisms living at high temperatures (“extremophiles”) is of interest in astrobiology
- HSP 60 can be purified from cells as a double-ring structure consisting of 16-18 subunits. The double rings can be induced to self-assemble into nanotubes.



Extremophile Proteins for Nano-scale Substrate Patterning



Nano-scale engineering for high resolution lithography

Future: Bio-based lithography

- Batch self-assembly
- Evolving
- Inexpensive

“quantum dots”
nm resolution

