



NANOMATERIALS – A MINISCULE INTRODUCTION

Jack Bennett

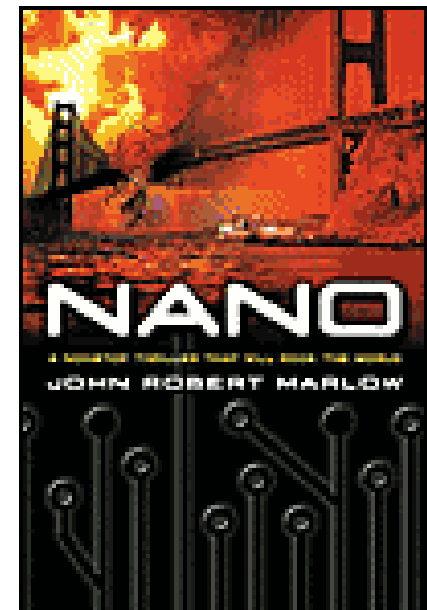
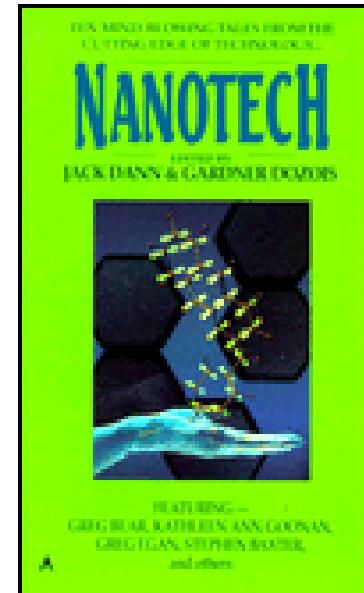
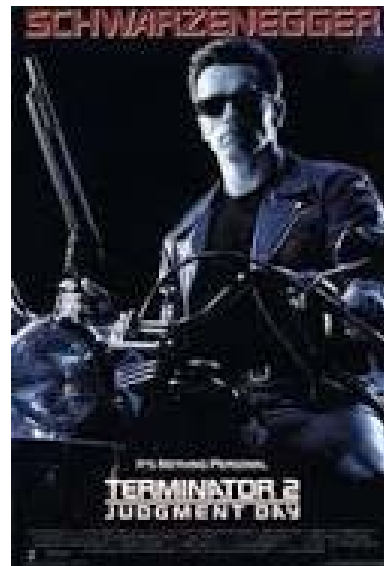
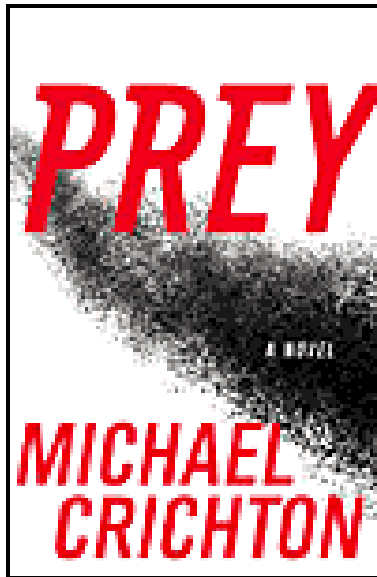
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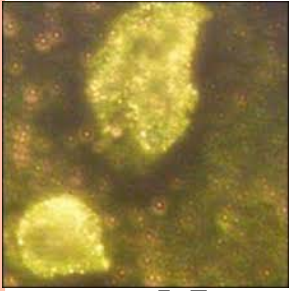
APHL Annual Meeting

June 4, 2013

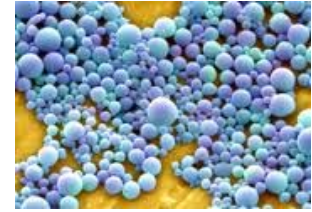
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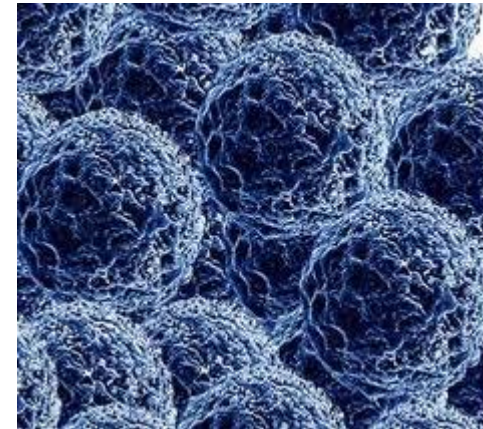
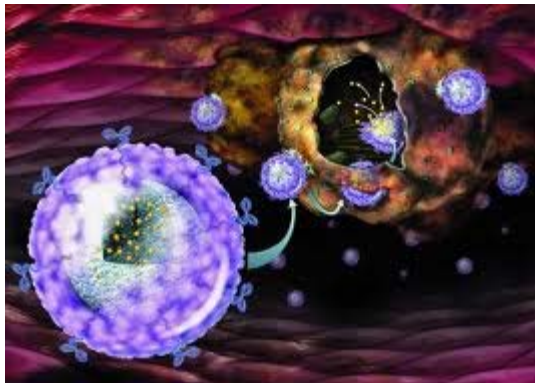




WHAT IS NANOTECHNOLOGY?

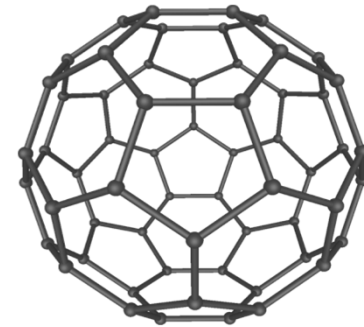
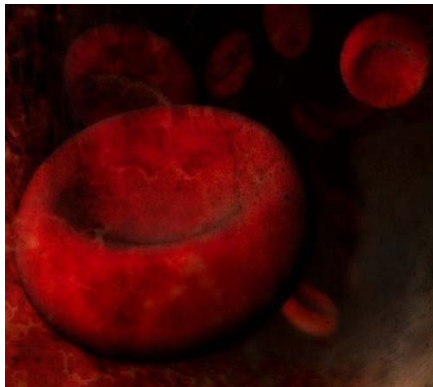


- Nanoscience and nanotechnology are the study and application of extremely small things and can be used across all the other science fields, such as chemistry, biology, physics, materials science, and engineering.
 - Definition from nano.gov





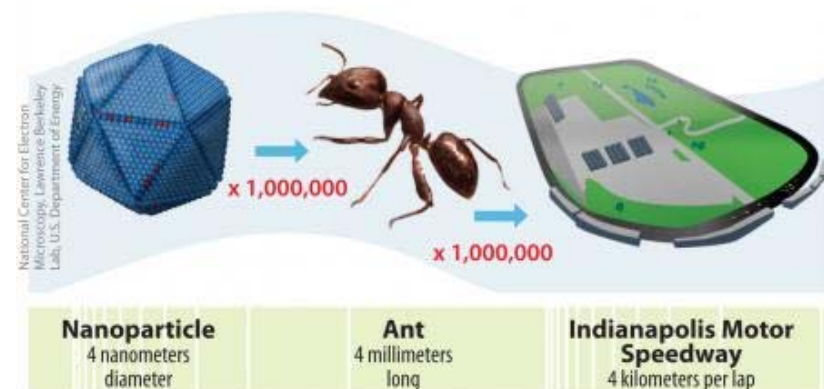
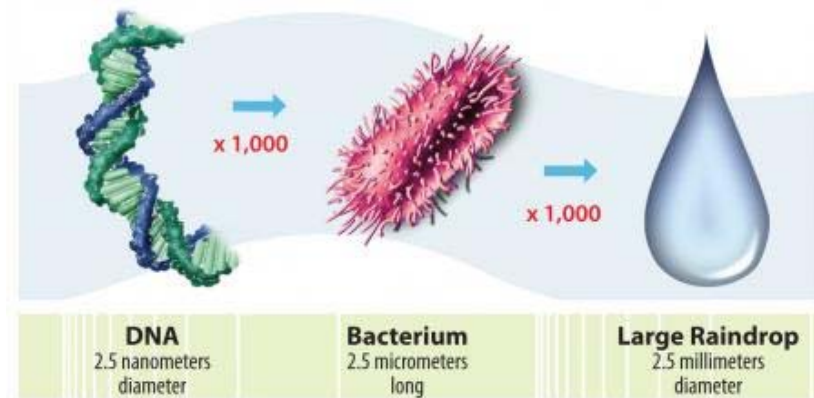
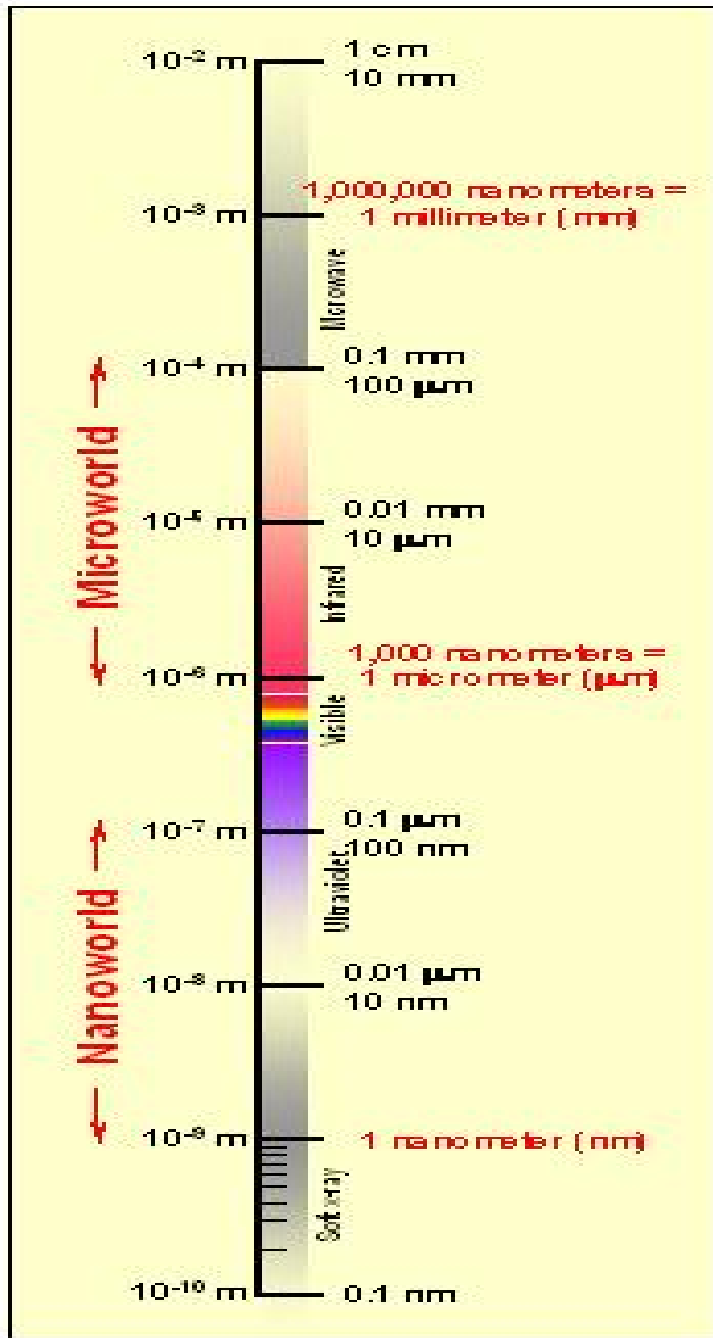
- Nanomaterials - Purposefully created chemical structures with one dimension less than 100 nanometers in length
- Nanoparticles – Nanomaterials with at least two dimensions less than 100 nanometers in length



OK, SO WHAT'S A NANOMETER?

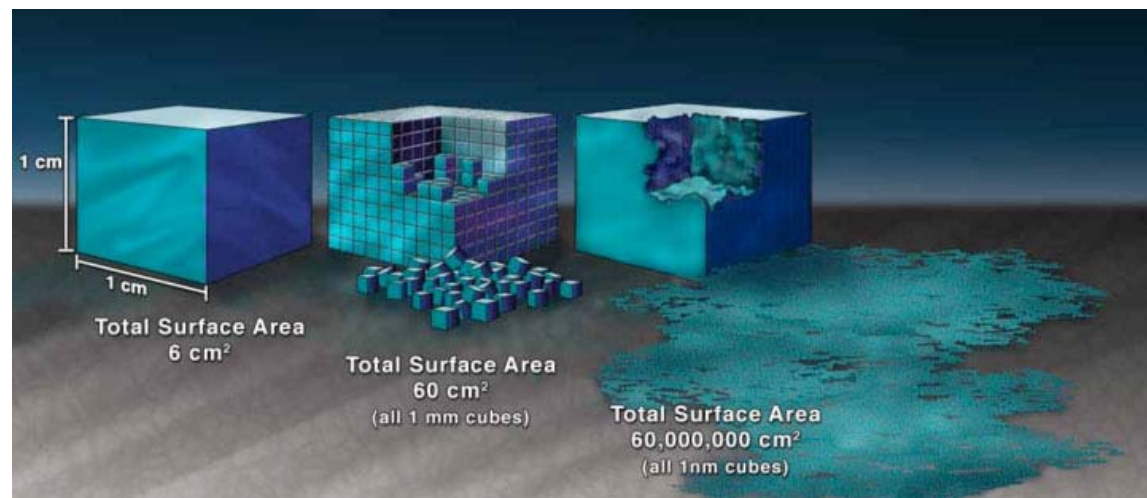
- 1 nanometer = 1-billionth of a meter
 - 1×10^{-9} meters
 - 0.00000001 meters
- In other words:
 - 1 inch = 25,400,000 nanometers
 - Sheet of paper = 10,000 nanometers thick
 - Diameter of red blood cell = 5,000 nm
 - Width of DNA = 2 nanometers





SCIENCE OF NANOTECHNOLOGY

- Now able to create and manipulate chemical structures on nearly the molecular level
- Governed by:
 - Surface Area
 - Quantum mechanics
- Unique and unexpected behavior as a result





ENGINEERED NANOMATERIALS

- Our ability to produce materials at the nanosize has increased dramatically
- In many instances, this unique behavior can be very useful
- Nanotechnology was a \$1 billion business in 2005; in 2015 it is estimated that it will be \$2.4 trillion



- Nanomaterial Use In Agriculture: Use and Potential Risks – Jason White, PhD, CTAES
- Environmental Implications of Nanotechnology – Christine Hendren, PhD, Duke University
- Nanotechnology, The Perspective of a Food Company – Tim Spitzenberger, PhD, ConAgra Foods

