2016 LEARN Conference

Theme: Bringing Informal STEM Education in Foreign Languages into the Classroom

National Foreign Language Center

College Park, MD

Researcher and Presenter: Dr. Mina Kobraei, Ph.D.

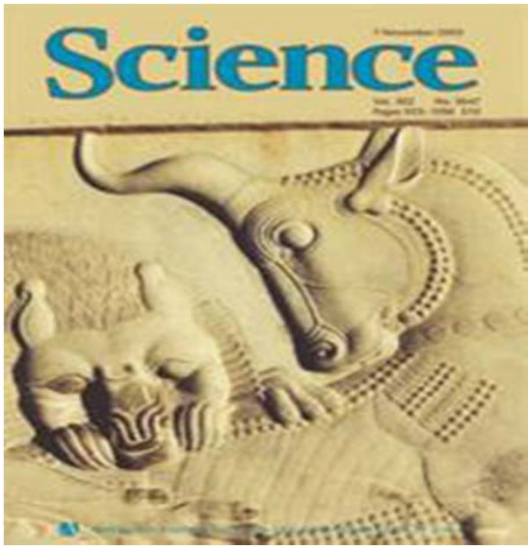
13 July

Kaleidoscopic Learning: Integrating STEM Education into Foreign Language Skills and Knowledge Enhancement

with

Introduction to Nano Science Education

Persian Cradle of Science and Technology



Purpose
STEM Competitiveness Initiative

- Presenting a successful ***Model*** to bolster linguist S&T-focused language skills which the NCS and relevant communities of practice can apply on a broader scale
- Suggestions for Boosting STEM Education in Foreign Language Formal Classrooms
- Proposal: Creating STEM Innovation Resource Center (one-stop-shop) to include Nano Science Education
- **Focus**: Promoting, recruiting and supporting of STEM Education for all including Women and Underrepresented

Overview

- **Informal Model**
  - Gap and Approach
  - Products
  - Benefits
- **Suggestions to Apply**
  - Formal Instruction
  - Informal Instruction
- **Introduction to Topics in nanoSTEM Education**

Informal Science Learning

- “learning that is self-motivated, voluntary, guided by the learner’s needs and interests, learning that is engaged in throughout his/her life”
  - Source: National Association for Research in Science Teaching (NARST)

Gap and Approach

- **Lack of STEM Education**
- **Lack of Nano Science Education**

- **“**The nation will require approximately one million more science, technology, engineering, and Math (STEM) professionals than what will be produced at current rates over the next decades.”
  - President’s Council of Advisors on S&T, February 2012 report to the President

Gap and Approach

- Identified lack of course offering in S&T in Persian/Farsi language
- Spearheaded a monthly 1-hour classes in S&T during 2009-2013, for the first time offered by a SME and native Farsi language specialist
- **Characteristics**: Informal, round-table, reading, extracting key technical terms and definitions, writing, listening, speaking, discussion and analysis both in Farsi (ILR level of 3/3 and 3+/3+), and English languages.
  - Topics: Nanotechnology, Biotechnology, NanoBiotechnology, Nuclear Science, Energy and Environmental Science, and Cyber Security

Presentation
2008

- **Theme**: Emerging Technologies: Basic Concepts and Application of NanoBiotechnology, in English
  - Contents: Brief history, definitions of technical terms, nano scale, research and development, global application of nano materials and products

Future Plan: Updating and delivering the above presentation in Farsi

Nanotechnology = نانوتکنولوژی

Biotechnology = بیوتکنولوژی

NanoBiotechnology = نانوبیوتکنولوژی

Community Programs
2008-2016

- Spearheaded and Founded a comprehensive virtual Iran Community Program – The Iran HUB – "*go icp*", on the NSAnet in 2008 and populated its content with her technical glossaries, presentations and other educational web link resources.
  - به فرهنگ سرای فارسی زبانان درصحنه مجازی ویکی
  - خوش آمدید!
  - **Iran Community Program for CyberS&T Education**
  - **Featuring Technical Glossaries and Language Resources in**
  - **Farsi, Azeri and English**

Community Programs
2008-2016

- Built, populated, updated and maintained educational content and resources of the **Iran Community Program**,

  "***go icp***"

  --Viewed 5200+ times.

- Built, populated, updated and maintained educational content and resources of the **Azerbaijan Community Program**, "***go acp***" - 2012-2016

  --Viewed 1600+ times.

Community Programs 2008-2016

- Both the ICP and the ACP offer a rich learning resources and an opportunity for information sharing, knowledge transfer and networking.

MODEL

- The ICP is served as a model for designing virtual Resource Programs in other languages

Products

- Authored technical scientific glossaries
  - The Digital Working Aids:
    - Farsi Cyber Glossary, 1030 alphabetically-ordered entries, 2012-2013. Merged with DoD dictionary.
    - Civil and Engineering, 900+ entries, 2010-2012
    - Energy and Environment, 2010
    - Nuclear Technology, 2009
    - Biotechnology, 2008
- Posted all glossaries on the ICP for analyst use

Research Presentations 2009-2011

Theme: S&T in Farsi - Monthly one-hour in-house classes

“Selected Topics in Biotechnology, NanoBiotechnology, Nuclear Technology”

Resources: Academic articles in research and development, scientific journals

Wikipedia in Farsi

[some image here]

Research Presentations 2011-2013

- **Theme: S&T in Farsi -** Monthly one-hour in-house classes
- “Introduction to Cyber Security and Terminology”
- **Resources:** “The Science of Cyber Security” published by MITRE.
- ***Wikipedia*** in Farsi

Research Presentations 2013

- **Theme: S&T in Farsi – Abstract and PPT slides**

- ”Initiatives in Teaching Science and Technology Subjects in Farsi – An In-House Monthly One-Hour Classes”, Education and Instructional Technology Expert Group (EITEG) Meeting.

Research Presentations
2015

- **Theme**: **S&T in English** – Authored a take-home glossary of environmental terms in 4 scripts: northern Azeri (Latin), Southern Azeri (Perso-Arabic), Persian (Farsi), and English
- Abstract and PPT slides

- **Environmental Issues:**
  - **AREA70050 Seminar Course:** “Ecological Degradation of Lake Urmia, Azerbaijan of Iran”

Benefits of In-House Monthly One-hour Farsi STEM classes

- Help sustain student language skills (reading, listening, speaking, writing, translating, analysis and discussion) both virtually and face-to-face (**HYBRID**) by:
  - Providing opportunity to maintain different language skills levels from $2^{+}/2^{+}$ to 3/3 and higher
  - Integrating STEM education in the foreign language classroom
  - Providing BLOGS for communication, collaboration and information sharing
  - Creating a classroom environment for in-person interactive STEM discussions

Benefits of In-House Monthly One-hour Farsi STEM classes

- Fostering a classroom environment for exercising the critical thinking and problem solving skills
- Continued opportunity for improving foreign language skills and knowledge in STEM fields
- Increasing mission critical occupation skills in STEM and career options
- Cost effective: Taught by experienced SME's

Suggestions for Boosting STEM Education in Foreign Language Formal Classrooms

- AREA Studies Seminar Courses, for example, introduction to Biotechnology concepts and applications, in Farsi language
- Expand STEM Education via eCollege across various IC entities
- VuPort courses, self-paced
- Potential for developing a portal for STEM Education via Joint Language University www.jluwbTrain.com, a language portal serving the US government

Creating STEM Innovation Resource Center (one-stop-shop)

Contents:

• Digital Library Resources:

1 - English STEM Resource websites, video clips, audio clips, digital books and magazines, including English-to-English glossaries of technical terms

2 – Farsi STEM Resource websites, video clips, audio clips, digital books and magazines, including English to Farsi and Farsi to English glossaries

3 – STEM Portal for accessing modules and other learning resources by smart phones, tablets, mobile use of iPads, and other digital devices from anywhere in the world

Creating STEM Innovation Resource Center (one-stop-shop)

STEM Curriculum in Foreign Languages

- Developing specialized curricula and offering in-person and online courses taught by instructors with expertise in STEM field + native or near native language proficiency
- Opportunity for collaboration among the teaching faculty with STEM expertise and foreign language proficiency

Creating STEM Innovation Resource Center (one-stop-shop)

Fostering a culture of STEM Education within the Intelligence Community

- Creating Resources for Educators Online
- Creating Resources for Students Online
- Supporting conference participation and presentation
- Promoting STEM education in English and in foreign languages
- Actively recruiting women and underrepresented to STEM fields

Creating STEM Innovation Resource Center (one-stop-shop)

Nano Science and Nanotechnology Education

Digital Library Resources:

1 - English Nano Resources Websites, video clips, digital books and magazines, including English-to-English glossaries

2 - Farsi Nano Resources Websites, video clips, digital books and magazines, including English to Farsi and Farsi to English glossaries

3 - Nano Portal for accessing modules and other learning resources by smart phones, tablets, mobile use of iPads, and other digital devices from anywhere in the world

Creating STEM Innovation Resource Center (one-stop-shop)

NanoSTEM Curriculum in Foreign Languages

- Developing specialized curricula and offering in-person and online courses taught by instructors with expertise in Nano Science and Nanotechnology fields + native or near native language proficiency
- Opportunity for collaboration among the teaching faculty with expertise in nano science and nanotechnology and foreign language proficiency

Introduction to Topics in NanoStem Education

- Nanotechnology
- Biotechnology
- NanoBiotechnology

Introduction to Nano Science

www.shutterstock.com · 76352191

- Brief History
- Definitions
- Applications
- Examples

Premodern Examples of Nanotechnologies

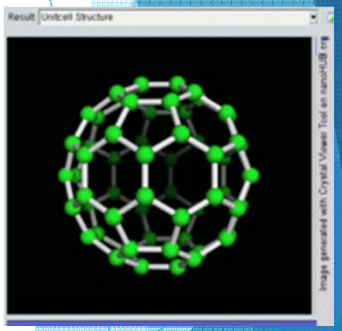
4th Century: The **Lycurgus Cupp** (Rome) is an example of **dichroic glass**; colloidal gold and silver in the glass allow it to look opaque green when lit from outside but translucent red when light shines through the inside.

Premodern Examples of Nanotechnologies

- **6th-15th Centuries:** Vibrant **stained glass windowss** in European cathedrals owed their rich colors to nanoparticles of gold chloride and other metal oxides and chlorides;

Recent History of Nanotechnology

- **1959:** Richard Feynman of the California Institute of Technology gave the first lecture on technology and engineering at the atomic scale, "**There's Plenty of Room at the Bottom**" at an American Physical Society meeting at Caltech
- **1985:** Rice University researchers Harold Kroto, Sean O'Brien, Robert Curl, and Richard Smalley discovered the **Buckminsterfullerene** (C60), **buckyball**, which is a molecule resembling a soccerball in shape and composed entirely of carbon, as are graphite and diamond. 1996 Nobel Prize winners in Chemistry for discovery of fullerene class of molecules.

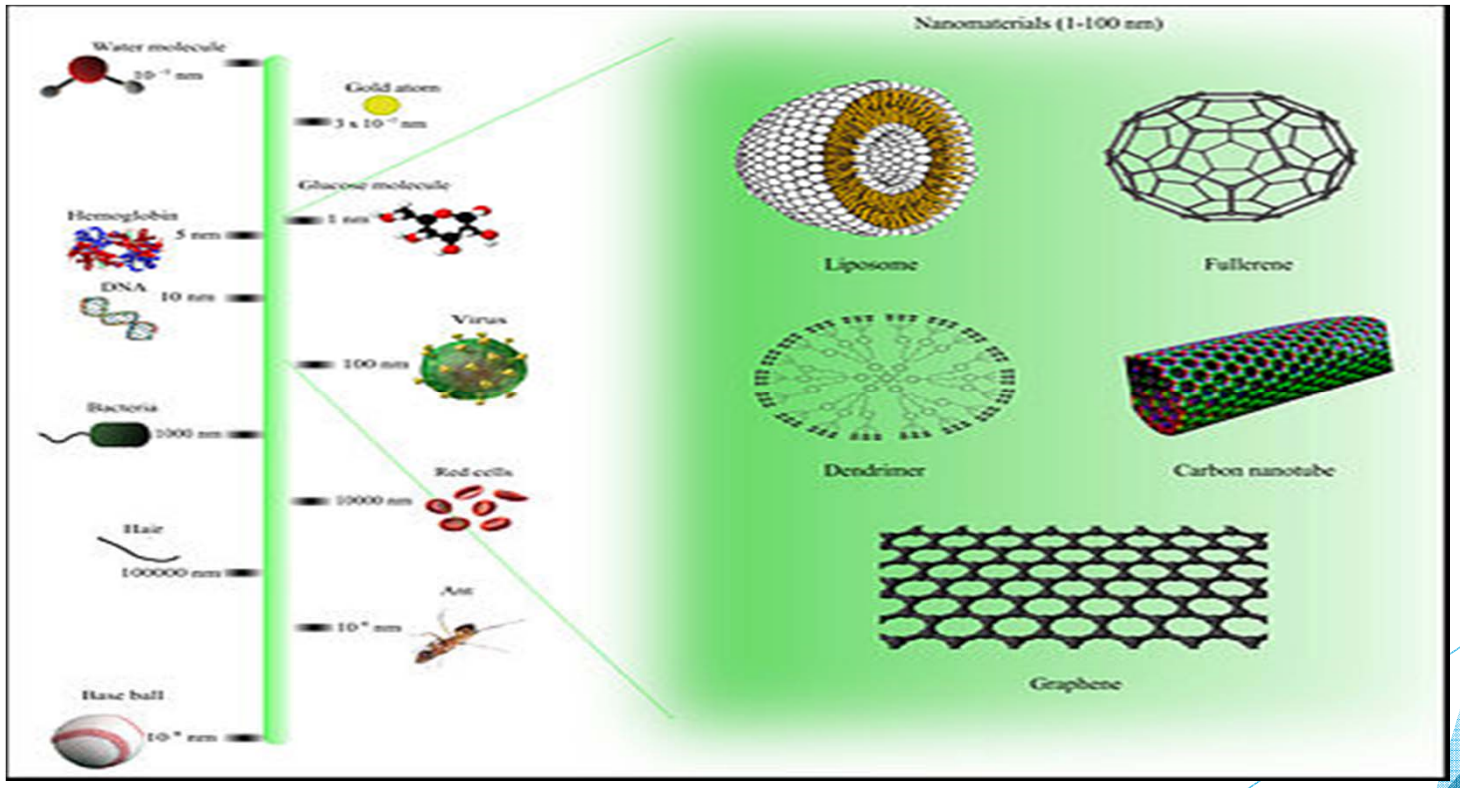


Nanotechnology History

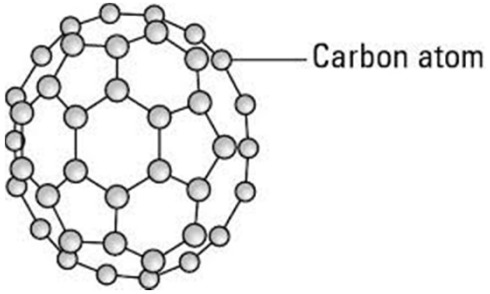
National Nanotechnology Initiative
NNI

- **2000:** President Clinton launched the National Nanotechnology Initiative (NNI) to coordinate Federal R&D efforts and promote U.S. competitiveness in nanotechnology.
- Congress funded the NNI for the first time in FY2001.
- The NSET Subcommittee of the National Science and Technology Council (NSTC) was designated as the interagency group responsible for coordinating the NNI.

Nanotechnology is super small science

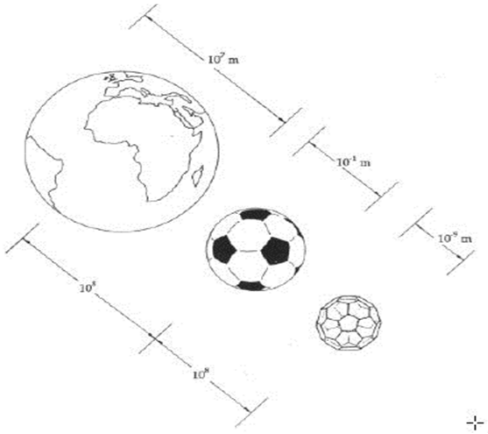


Brief History



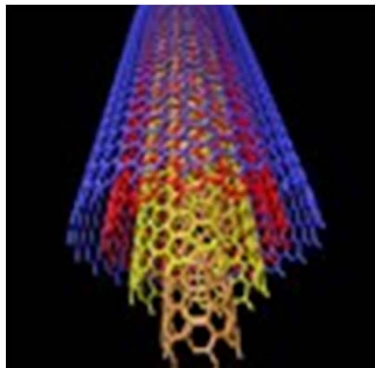
- C60 or buckyball is a representative member of carbon structures known as fullerenes which are a major subject of research

The size scale of C60:

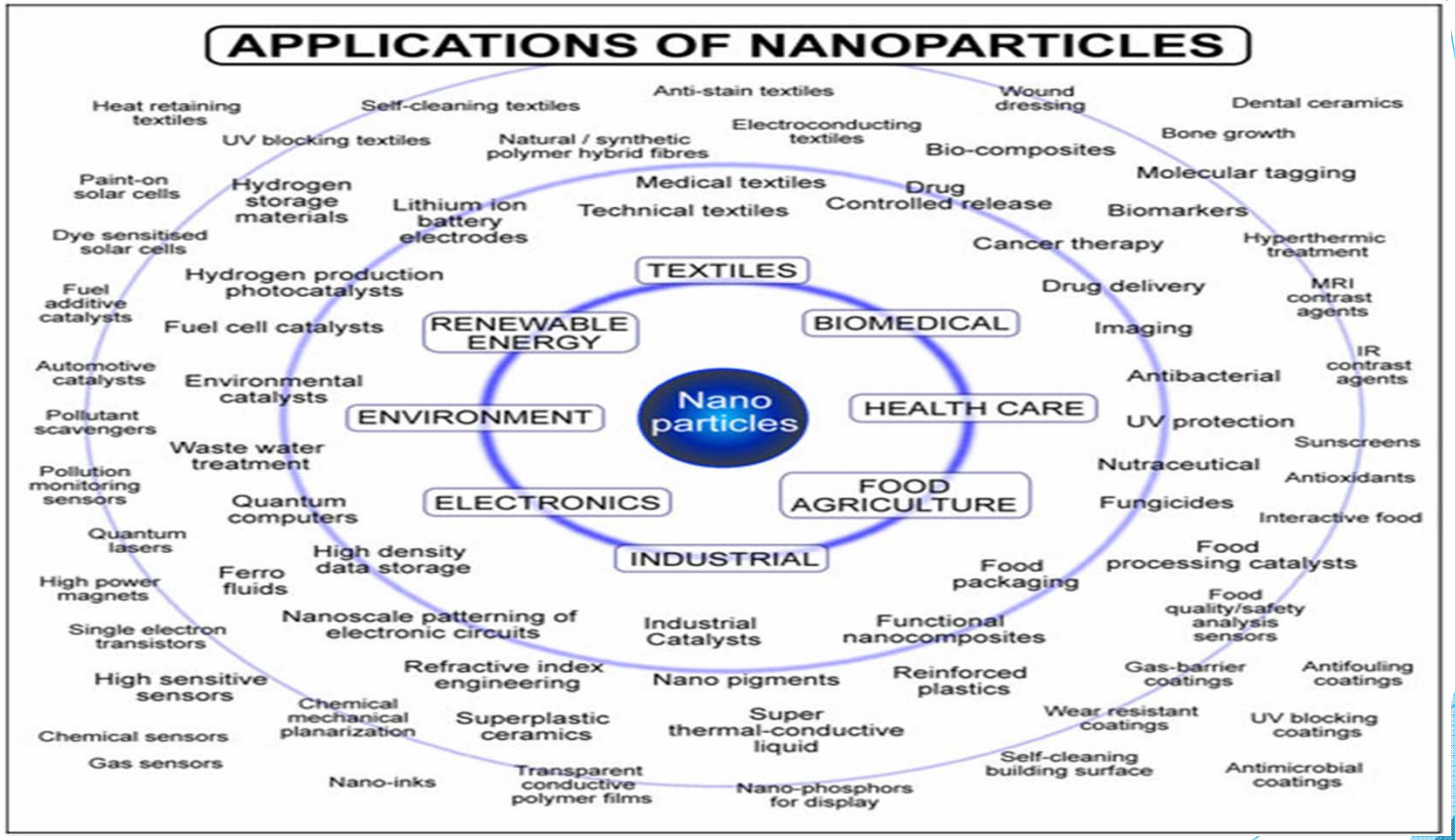


Nanomaterials

- Nanoparticles: 1-100 nm
- Nanomaterials usually between 1-100 nm
- Carbon Nanotube diameter is about 4 nm
- Size of an atom: 0.1 nm



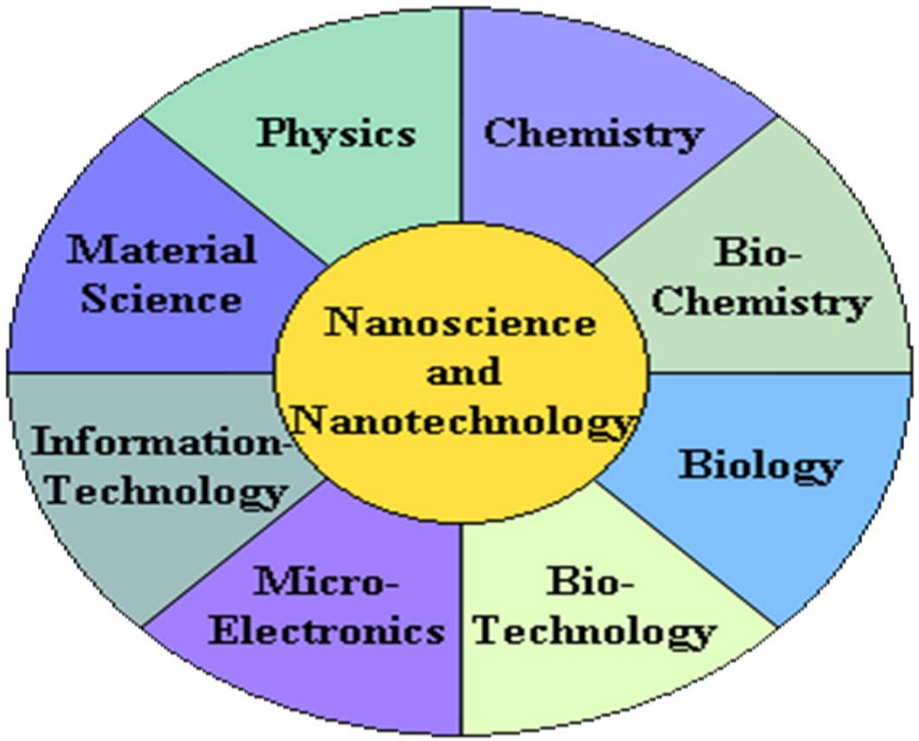
Application of Nanoparticles



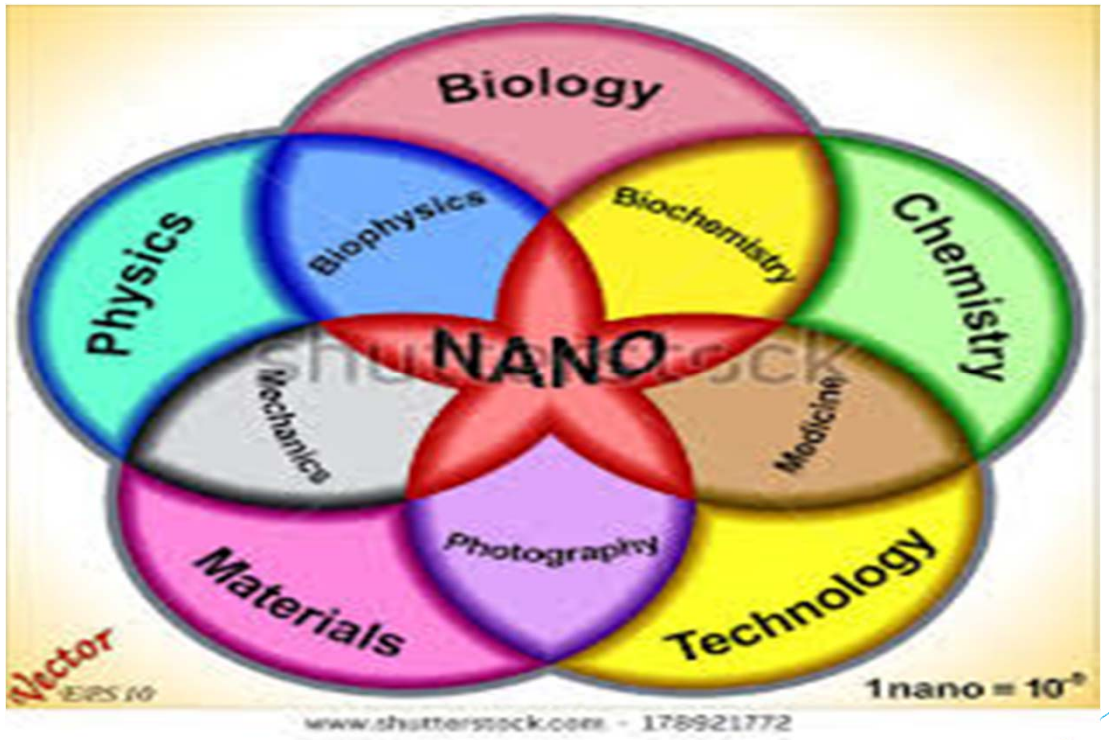
Nanotechnology

- **Definition:** Branch of technology that deals with dimensions of less than 100 nanometers, especially the manipulation of individual atoms and molecules.
- **Webster Dictionary:** The science of working with atoms and molecules to build devices (such as robots) that are extremely small.
- Einstein, as part of his doctoral dissertation, calculated the size of sugar molecule as one nanometer.

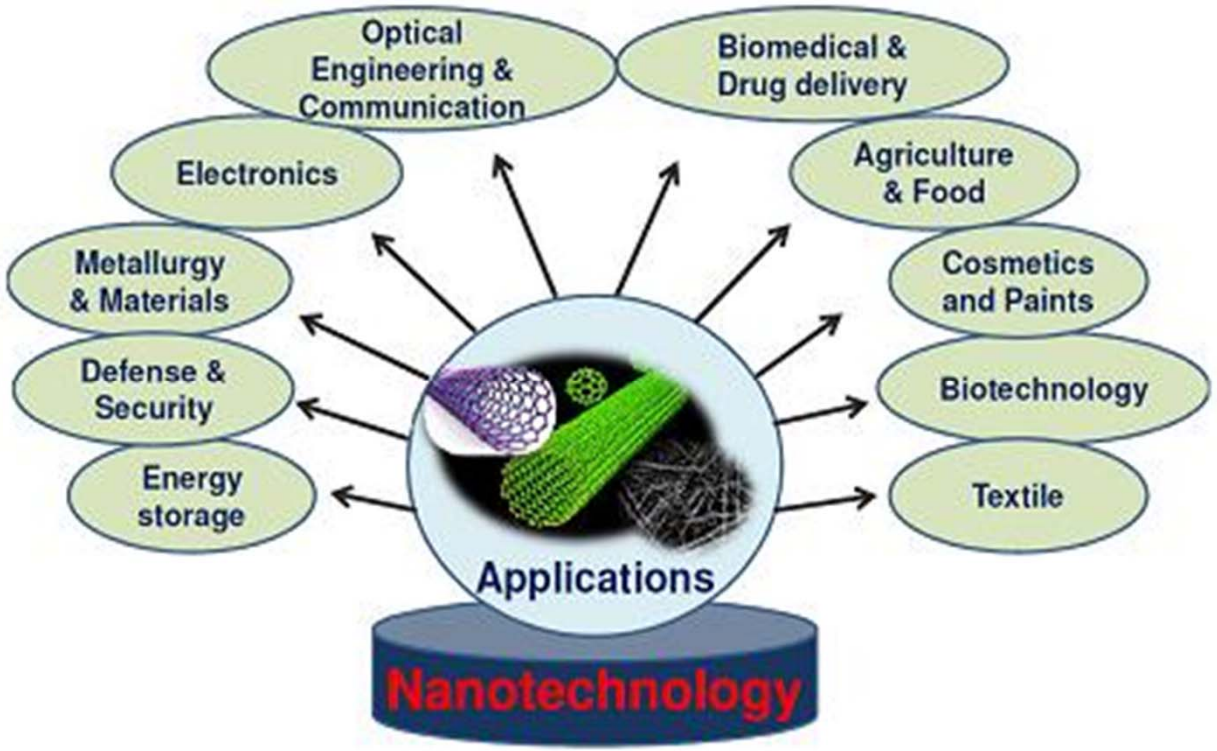
Nanotechnology is Multidisciplinary



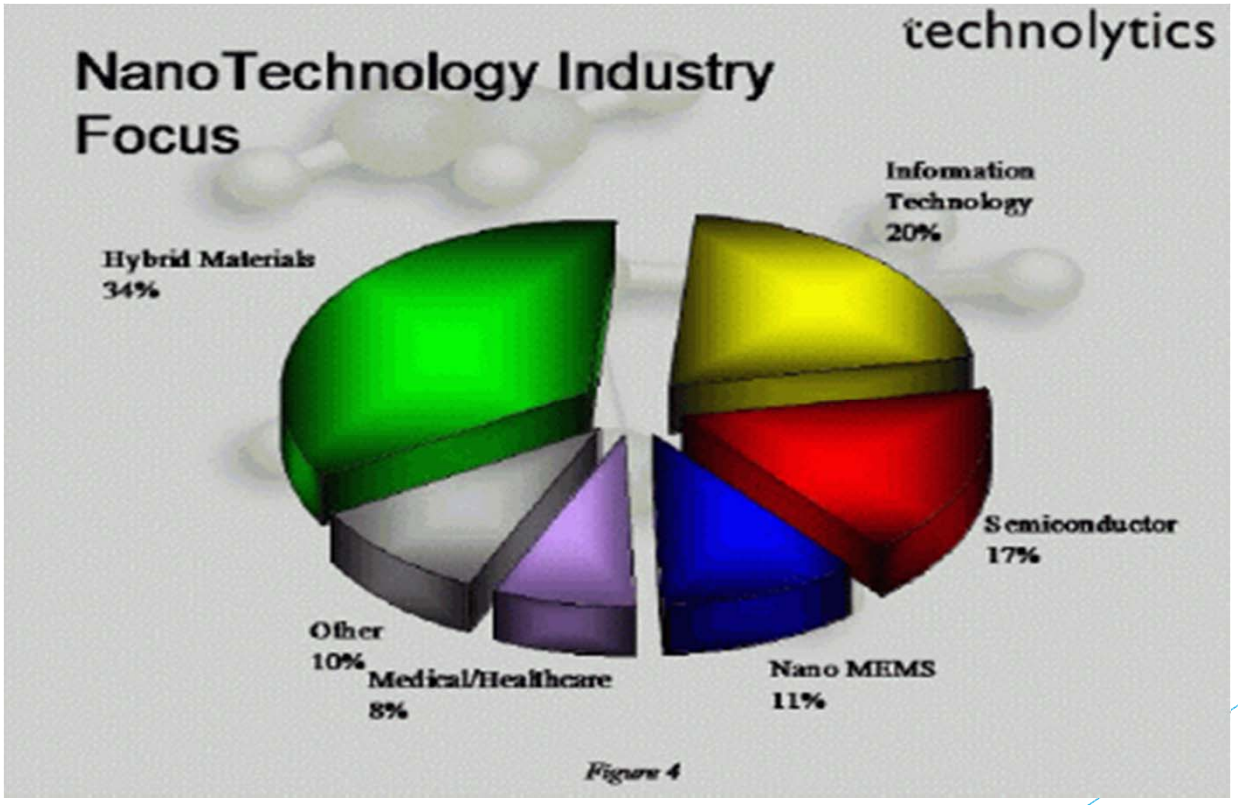
Nanotechnology is Multidisciplinary



Nanotechnology Applications



Nano Technology Industry

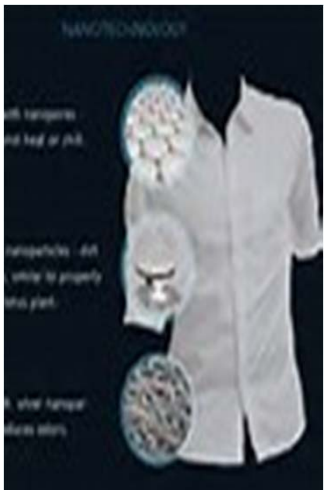


Nanotechnology *is* Applied Technology

- High-strength light-weight materials
- Unique electronic devices: fast, precise, less costly
- Medical diagnosis and treatment

Nanofabrication

- Nanotechnology Fabrics
- Nano Armor Suit
- Everyday Consumer Goods

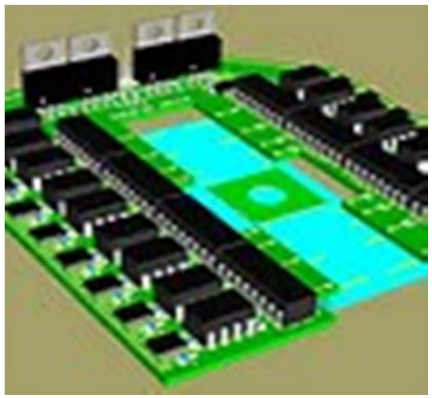


Nanotechnology Application in Defense

- Detoxify an area exposed to toxins
- Detect the onset of disease in an area exposed to biological agents, toxins or radioactive material
- Secure electronic, information, and communication networks
- Protect human lives and troops through nano-fabrics and related materials

Nanotechnology in Computers

- Computer Memory Improvements
  - •Memory chips as small as 20 nm
  - • Used in Tablets



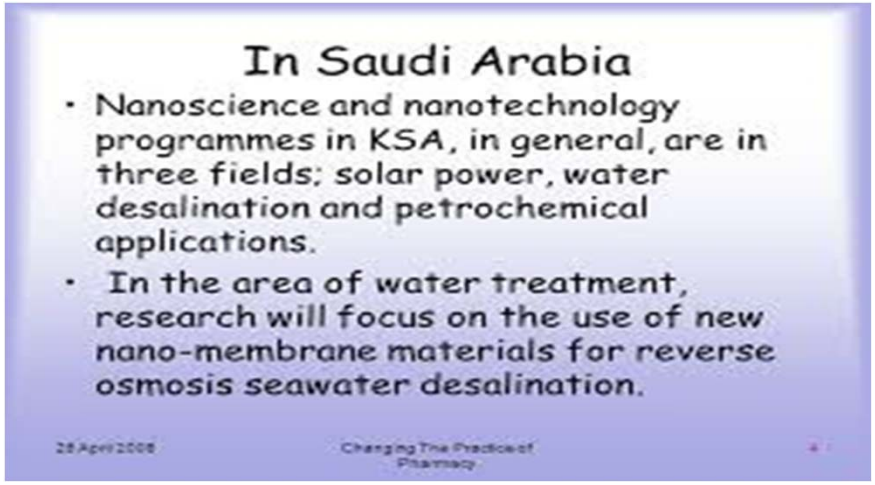
Environmental Applications

Use of products of nanotechnology to enhance sustainability

- Making green nano-products and using nano-products in support of sustainability
- Green nanotechnology is development of clean technologies, "to minimize potential environmental and human health risks associated with the manufacture and use of nanotechnology products
- To encourage replacement of existing products with new nano-products that are more environmentally friendly throughout their lifecycle

Goals of Green Nanotechnology

- Green nanotechnology has two goals:
  - Producing nanomaterials and products without harming the environment or human health
  - Producing nano-products that provide solutions to environmental problems.



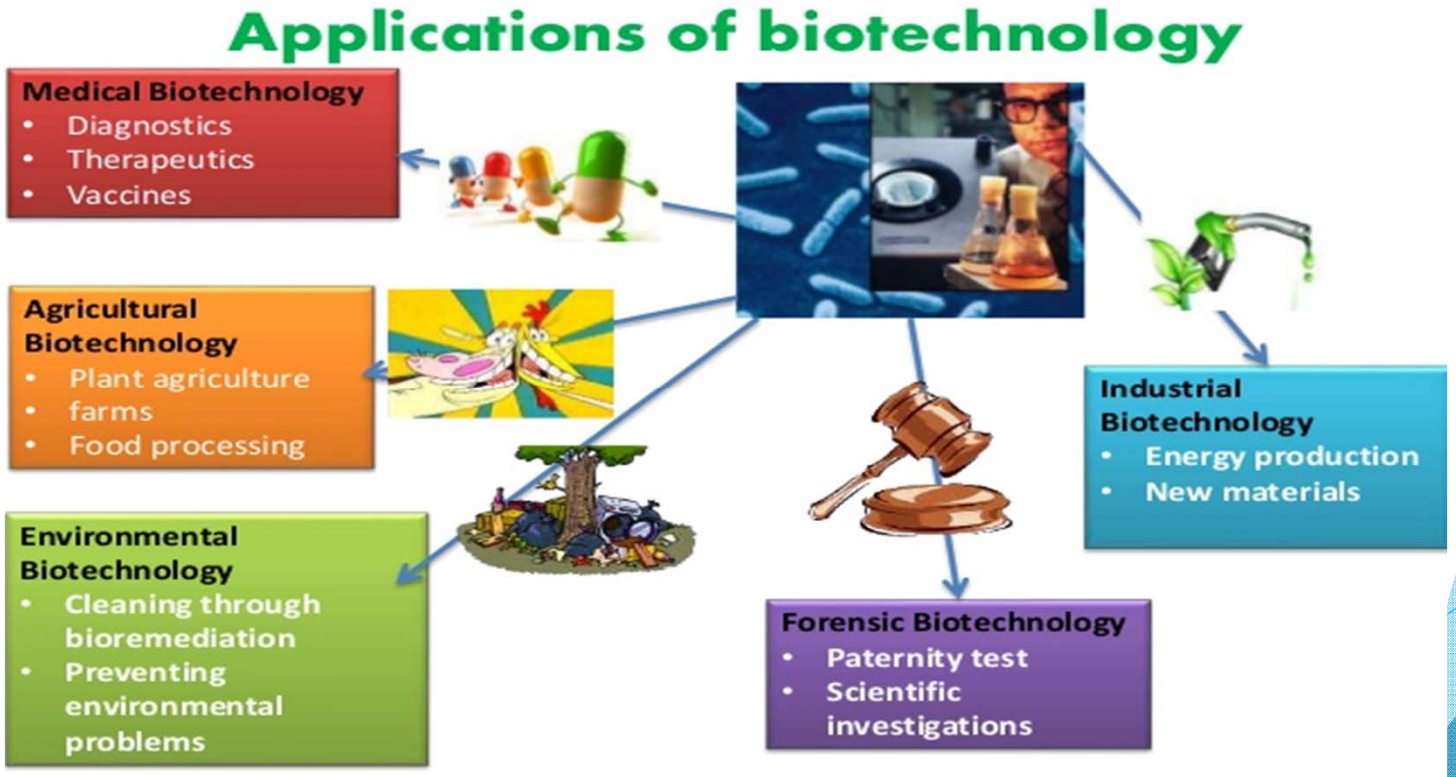
Environmental Impact of Nanotechnology

- Nanotechnology is an emerging field, there is great debate regarding to what extent industrial and commercial use of nanomaterials will affect organisms and ecosystems.
- Nanotechnology's environmental impact can be split into two aspects:
  - Potential for nanotechnological innovations to help improve the environment
  - Possibly novel type of pollution that nanotechnological materials might cause if released into the environment

Introduction to Biotechnology

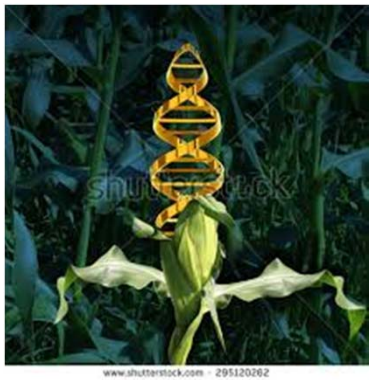
- **Definition:** The exploration of biological processes for industrial and other purposes, especially the genetic manipulation of microorganisms for the production of antibiotics, hormones, etc.
- **Webster Dictionary: ----------**

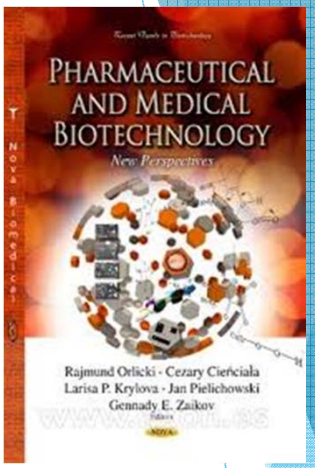
Biotechnology Applications

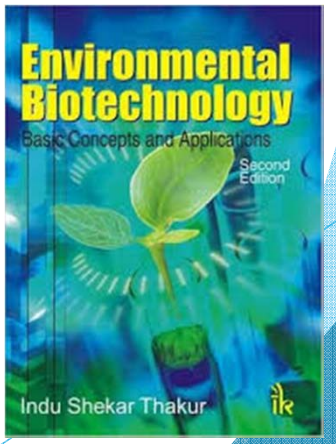


Biotechnology Applications

- Medical Biotech
- Agricultural Biotech
- Environmental Biotech







Current Research Interests

- NanoBiotechnology Research, Development and Application

Introduction to NanoBiotechnology

- **Marriage between:**

Nanotechnology + Biotechnology = NanoBiotechnology

Definitions:

- **Wikipedia:** Nanobiotechnology (sometimes referred to as nanobiology) is best described as helping modern medicine progress from treating symptoms to generating cures and regenerating biological tissues

NanoBiotechnology Application

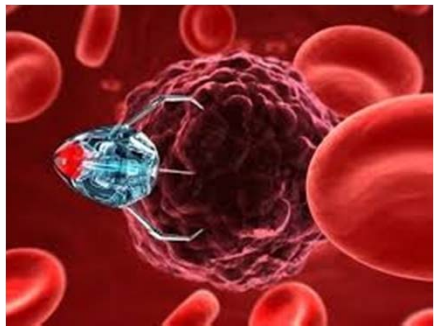
- Thriving in academia, in the private sector, and in global state science and technology programs.

- NanoBiotechnology has great potential to provide new and possibly revolutionary countermeasures:
  - •Improved methods for detection of biological agents
  - •Medical therapeutics.

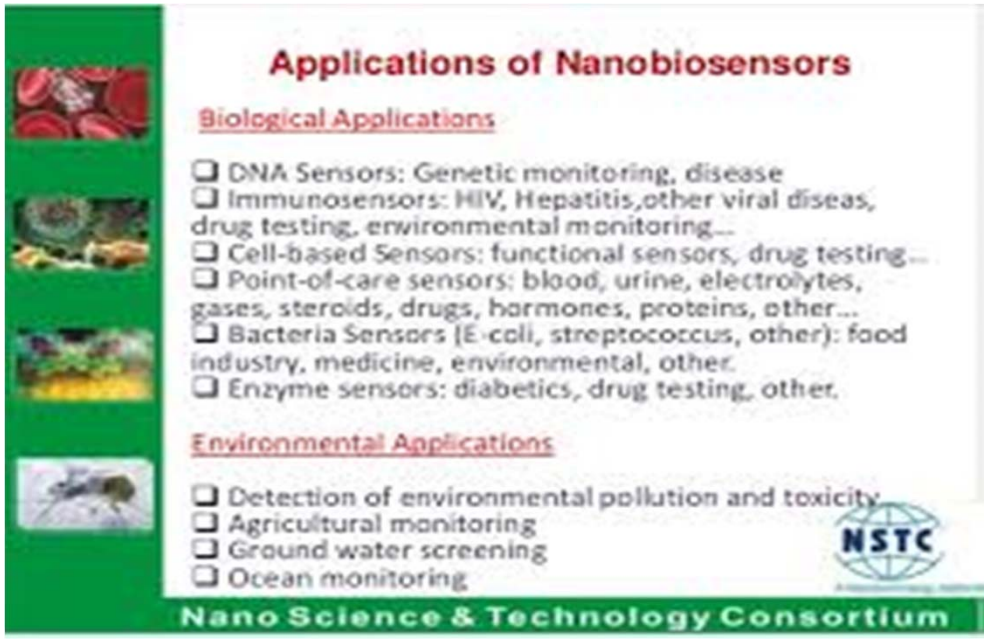
NanoBiotechnology Applications

- Nanomedicine: Drug Delivery by Nanorobots

- Targeted Drug Delivery



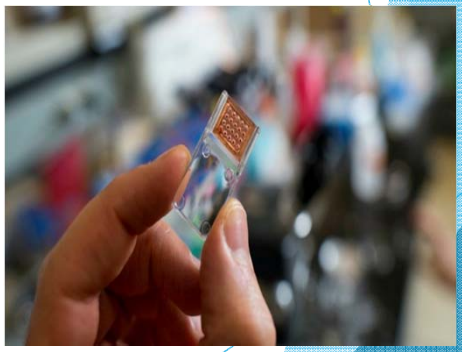
Nanobiosensors



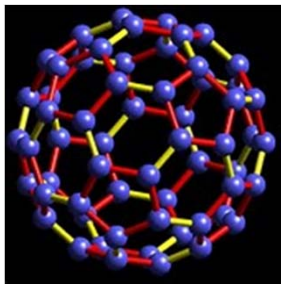
NanoBiotechnology Applications

Lab-on-A-Chip: A device that integrates one or several laboratory functions on a single chip of only millimeters to a few square centimeters to achieve automation and high-throughput screening

•Miniaturisation for chemistry, physics, biology, materials science and bioengineering



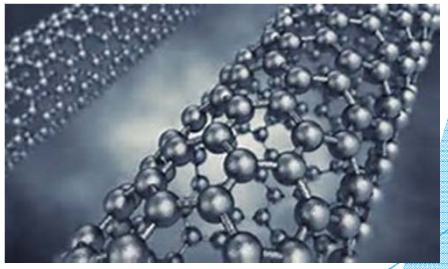
Thank you for your attention!



- References/Research Resources Provided upon Request

- **Request for your Feedback**

Please fill out the Evaluation Form



Thank you for your Participation!

Questions?

mekobra@nsa.ic.gov