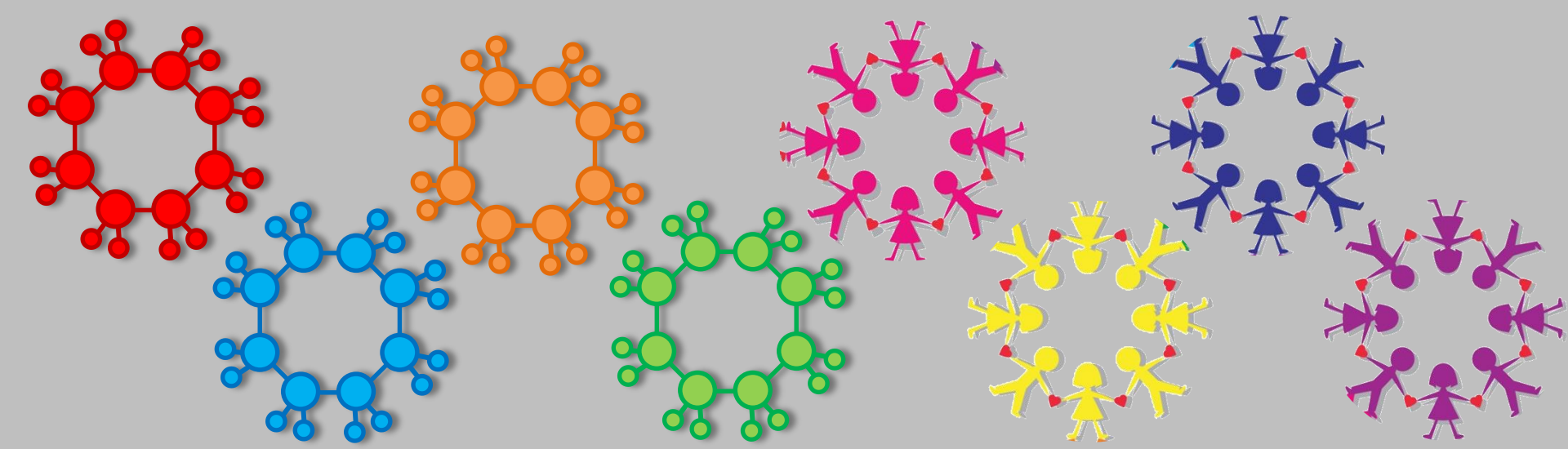

Democratic Visions for (Nano)technology vs. (Nano)technologic Visions for Democracy

Leili Fatehi
Initiative on Governance of Emerging Technological Systems

UNIVERSITY OF MINNESOTA
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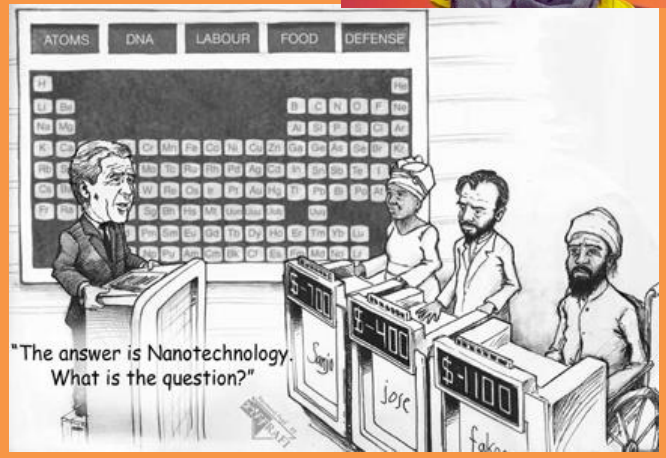
Technologies Supporting Democracy

Technologies in Need of Democracy



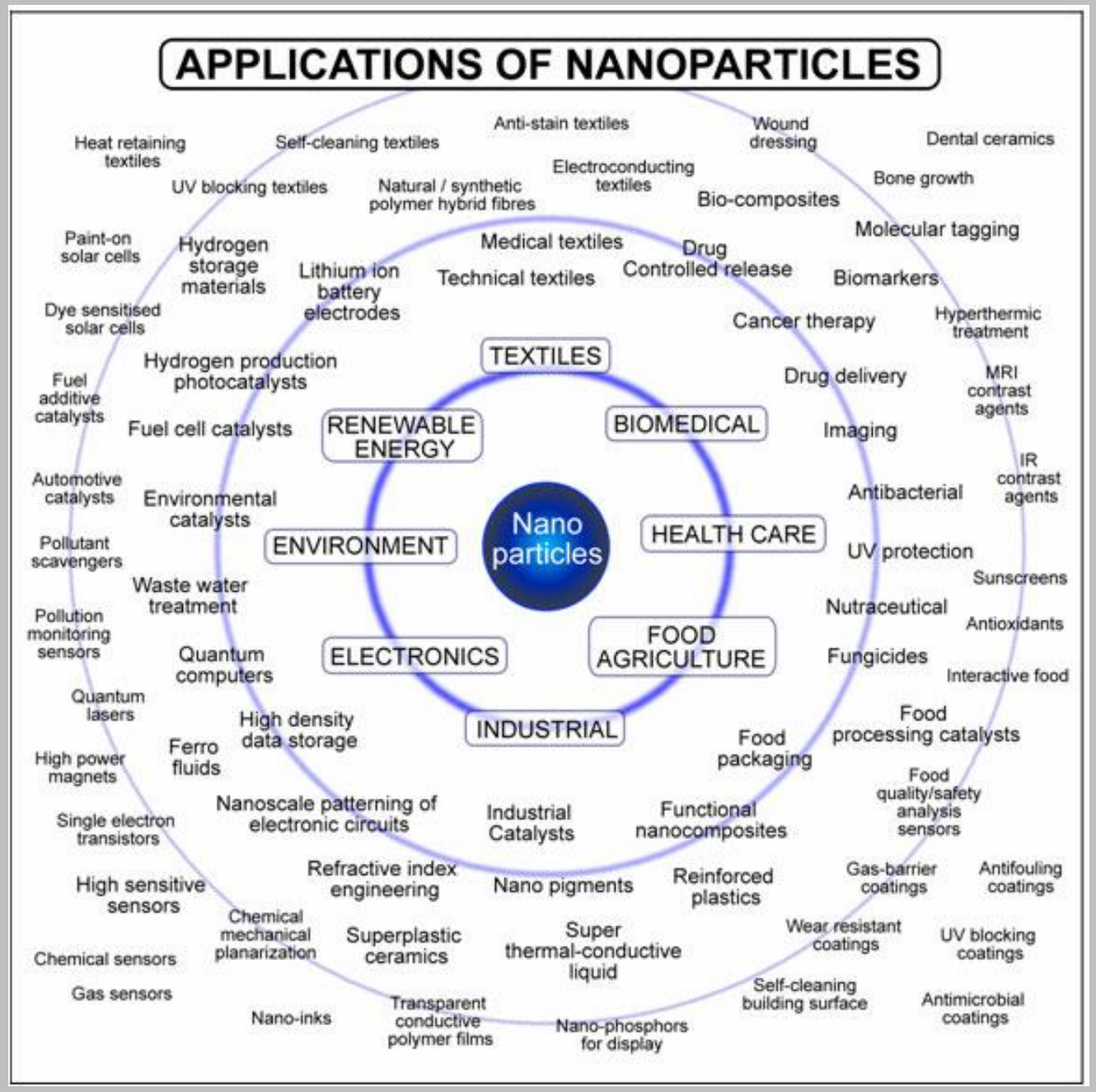
- Ability to participate in and have a meaningful effect on decision-making
- Transparency and accountability of organizations and systems responsible for governance
- Equity and equality across and within segments of society
- Distributional justice and fairness
- Ability of political and governance institutions to reflexively acknowledge the indeterminacy of their goals and legitimacy

- At the organizational, local, national, regional, or global scale

- Expert-Lay Divide
- North-South Divide
- South-South Divide
- Rich-Poor Divide
- Knowledge Divide
- Haves vs. Have Nots
- The Nano-Divide

Nanotechnology

- Nanotechnology is the understanding, control, and manipulation of matter and materials at the molecular and sub-molecular scales where useful size-dependent novel properties emerge.
- It's a platform or enabling technology
- It's cross-disciplinary, cross-industry, and convergent
- Emergent properties are a double-edged sword
  - Research on EHS (tox) and ELSI are paltry as compared to and significantly lagging behind R&D and commercialization
  - Lots of uncertainties
  - Existing oversight mechanisms may not be adequate



http://www.inderscience.com/offer.php?id=24647

Ranking (Score)	Applications of Nanotechnology	Examples	Comparison with the MDGs
1 (766)[a]	Energy storage, production, and conversion	Novel hydrogen storage systems based on carbon nanotubes and other lightweight nanomaterials Photovoltaic cells and organic light-emitting devices based on quantum dots Carbon nanotubes in composite film coatings for solar cells Nanocatalysts for hydrogen generation Hybrid protein-polymer biomimetic membranes	VII
2 (706)	Agricultural productivity enhancement	Nanoporous zeolites for slow-release and efficient dosage of water and fertilizers for plants, and of nutrients and drugs for livestock Nanocapsules for herbicide delivery Nanosensors for soil quality and for plant health monitoring Nanomagnets for removal of soil contaminants	I, IV, V, VII
3 (682)	Water treatment and remediation	Nanomembranes for water purification, desalination, and detoxification Nanosensors for the detection of contaminants and pathogens Nanoporous zeolites, nanoporous polymers, and attapulgite clays for water purification Magnetic nanoparticles for water treatment and remediation TiO_2 nanoparticles for the catalytic degradation of water pollutants	I, IV, V, VII
4 (606)	Disease diagnosis and screening	Nanoliter systems (Lab-on-a-chip) Nanosensor arrays based on carbon nanotubes Quantum dots for disease diagnosis Magnetic nanoparticles as nanosensors Antibody-dendrimer conjugates for diagnosis of HIV-1 and cancer Nanowire and nanobelt nanosensors for disease diagnosis Nanoparticles as medical image enhancers	IV, V, VI
5 (558)	Drug delivery systems	Nanocapsules, liposomes, dendrimers, buckyballs, nanobiomagnets, and attapulgite clays for slow and sustained drug release systems	IV, V, VI
6 (472)	Food processing and storage	Nanocomposites for plastic film coatings used in food packaging Antimicrobial nanoemulsions for applications in decontamination of food equipment, packaging, or food Nanotechnology-based antigen detecting biosensors for identification of pathogen contamination	I, IV, V
7 (410)	Air pollution and remediation	TiO_2 nanoparticle-based photocatalytic degradation of air pollutants in self-cleaning systems Nanocatalysts for more efficient, cheaper, and better-controlled catalytic converters Nanosensors for detection of toxic materials and leaks Gas separation nanodevices	IV, V, VII
8 (366)	Construction	Nanomolecular structures to make asphalt and concrete more robust to water seepage Heat-resistant nanomaterials to block ultraviolet and infrared radiation Nanomaterials for cheaper and durable housing, surfaces, coatings, glues, concrete, and heat and light exclusion Self-cleaning surfaces (e.g., windows, mirrors, toilets) with bioactive coatings	VII
9 (321)	Health monitoring	Nanotubes and nanoparticles for glucose, CO_2, and cholesterol sensors and for in-situ monitoring of homeostasis	IV, V, VI
10 (258)	Vector and pest detection and control	Nanosensors for pest detection Nanoparticles for new pesticides, insecticides, and insect repellents	IV, V, VI

[a] The maximum total score an application could receive was 819.

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Salamanca-Buentello, et al., 2005

Table 3. Global distribution of nanotechnology activity by country and classification.

Least Developed	Other: Developing	Transitional	Developed
National Activity or Funding			
	Argentina; Armenia; Brazil; Chile; China; Cost Rica; Egypt; Georgia; India; Iran; Mexico; Malaysia; Philippines; Serbia & Montenegro; South Africa, Thailand, Turkey; Uruguay; Vietnam	Belarus; Bulgaria; Cyprus; Czech Republic; Estonia; Hong Kong; Hungary; Israel; Latvia; Lithuania; Poland, Romania; Russian Federation; Singapore; Slovak Republic; Slovenia; South Korea; Ukraine	Australia; Austria; Belgium; Canada; Denmark; Finland; France; Germany; Greece; Iceland; Ireland; Italy; Japan; Luxembourg; Netherlands; New Zealand; Norway; Portugal; Puerto Rico; Spain; Sweden; Switzerland; Taiwan; United Kingdom; United States of America
Individual or Group Research			
Bangladesh	Botswana; Columbia; Croatia; Cuba; Indonesia; Jordan; Kazakhstan; Moldova; Pakistan; Uzbekistan; Venezuela	Macau, (China); Malta; United Arab Emirates	Liechtenstein
Country Interest			
Afghanistan; Senegal; Tanzania	Albania; Bosnia and Herzegovina; Ecuador; Ghana; Kenya; Lebanon; Macedonia; Sri Lanka; Swaziland; Zimbabwe	Brunei Darussalam	

Maclurcan, 2005

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- It’s determined by the technology
- It’s determined by the managerial approach and social environment
- It’s determined by tactical need

- Central paradigm is cheaper, cleaner, fewer resources, less energy, less waste, more recovery and reuse, more flexibility, more decentralization
- Cross-industry=more penetrant
- Can be deployed synergistically with local technologies
- Doesn't necessarily displace natural resources; biodiversity may be an advantage
- Ethos is different
- Developing countries have gotten in early

- Early R&D funded by gov'ts with goal of economic competitiveness
- Heavy private sector investments now
- Aggressive patenting of fundamental research tools and materials
- EHS and ELSI efforts not a priority and not keeping pace

Thanks

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