“Collaboration in Danube: creating an attractive environment to facilitate investments”

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Disciplines …. and relevant themes for the world

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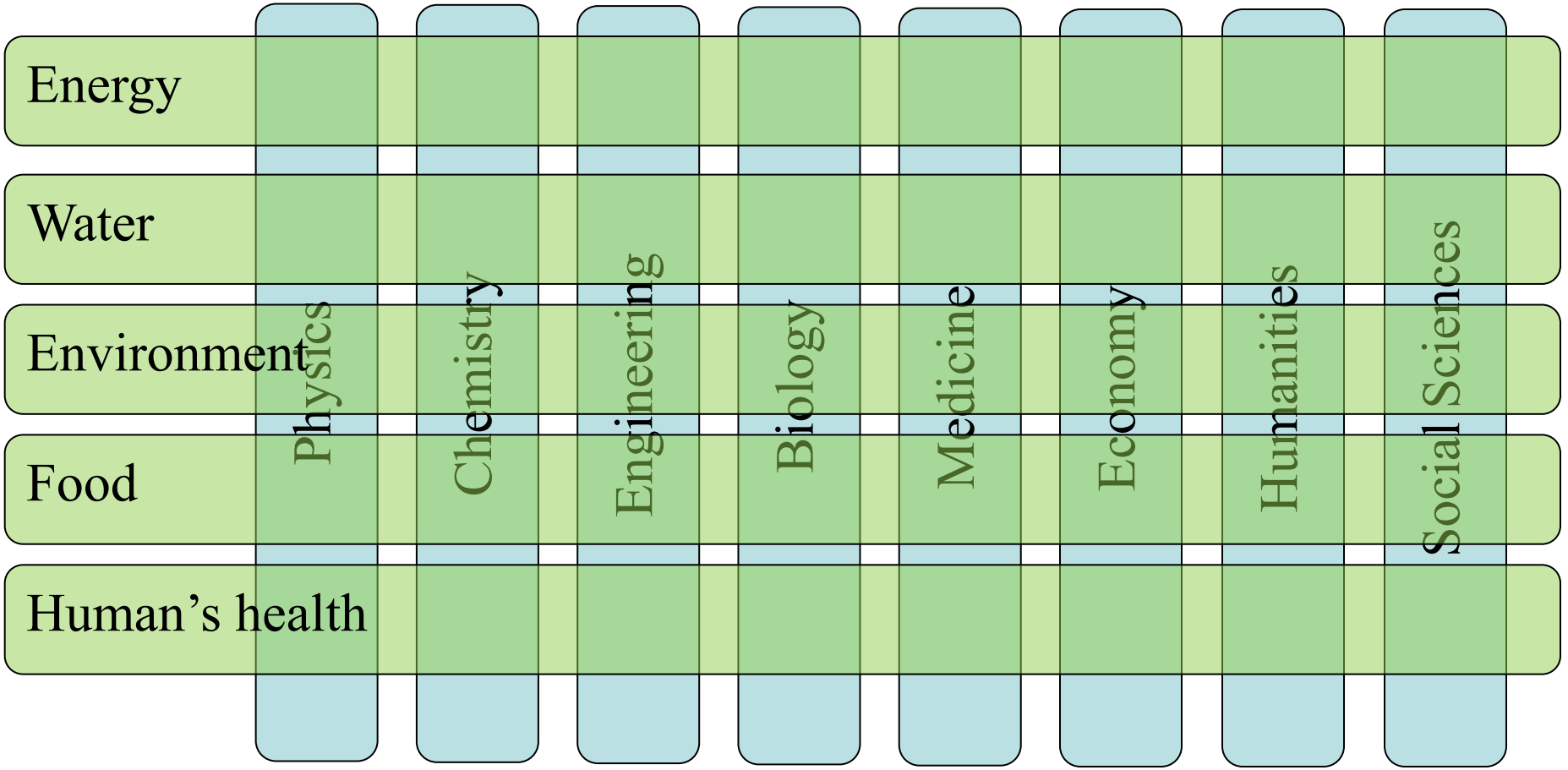

Horizon2020 Structure

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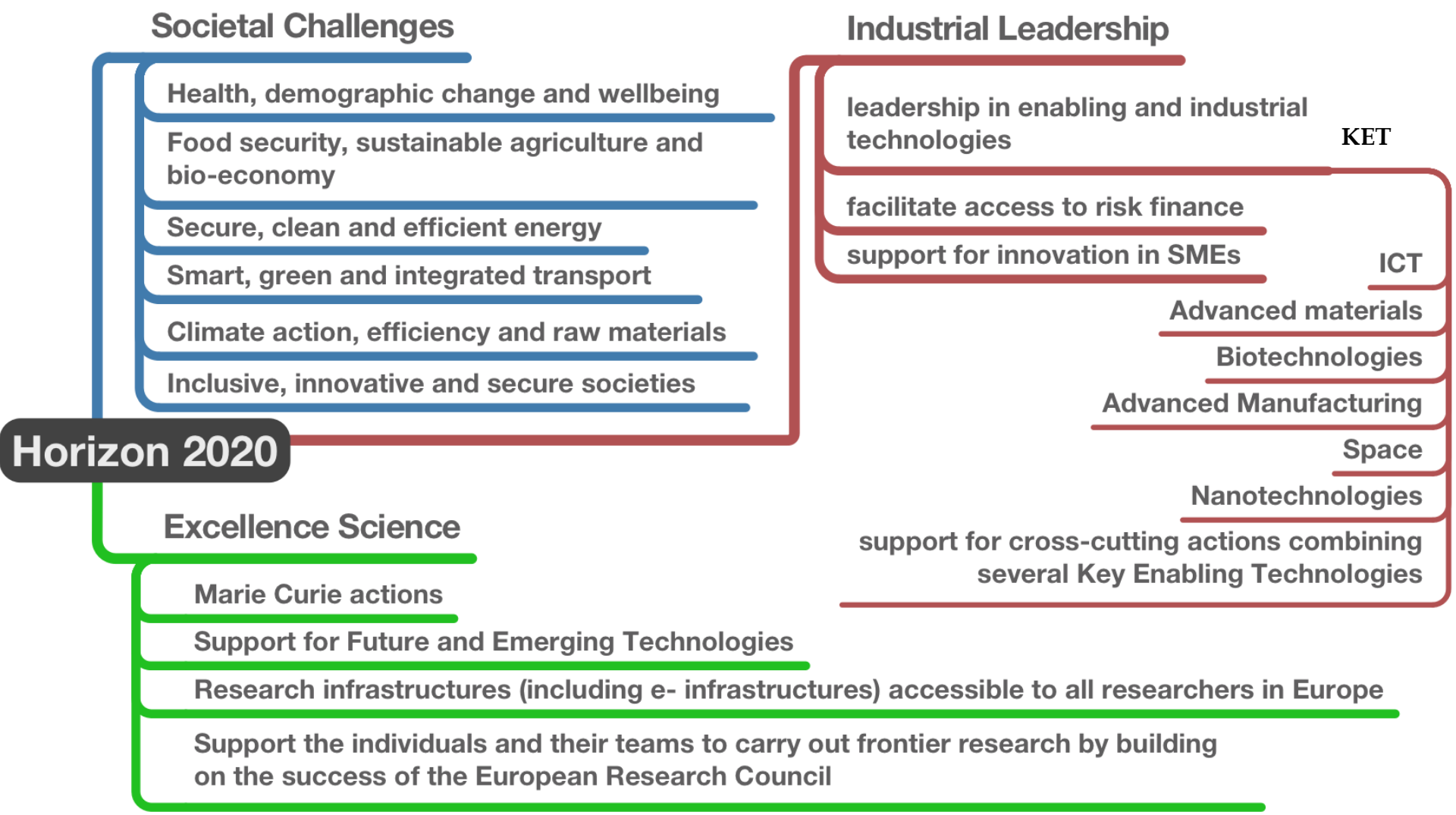
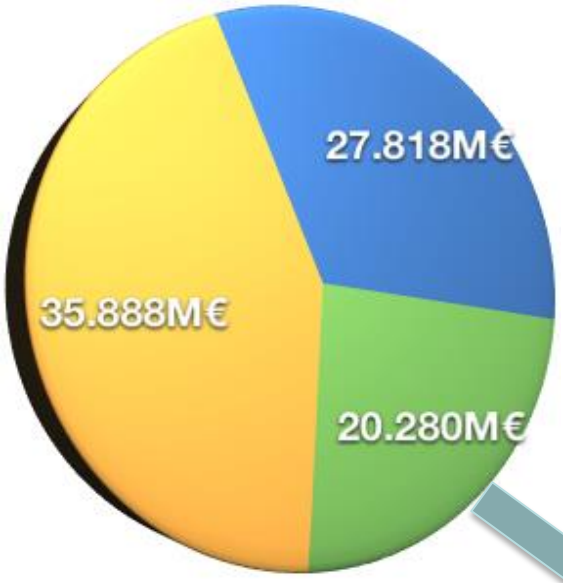
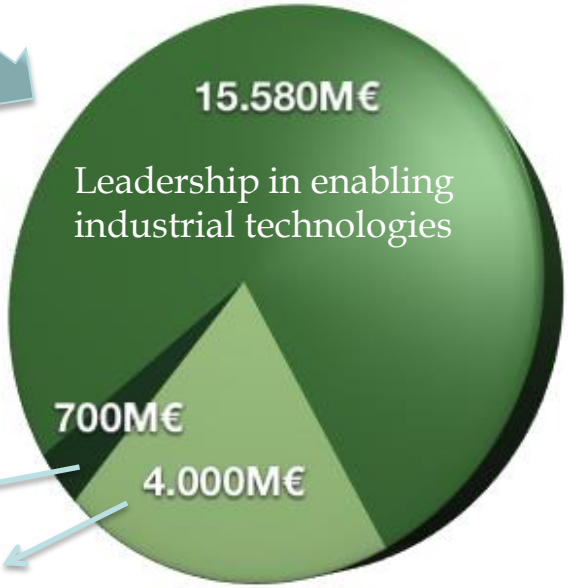


Horizon2020 Budgets

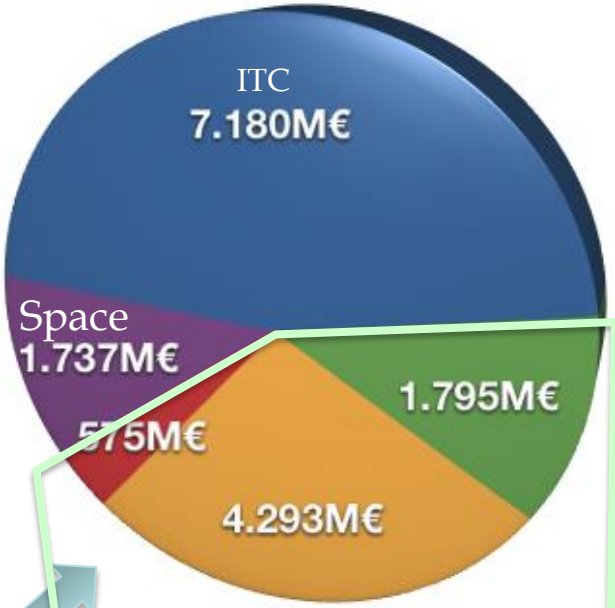


- **Industrial Leadership**
- Societal Challenges
- Excellent Science



Innovation for SMEs

Access to risk finance



KETs

- **Nanotechnology**, Advanced material and Advanced manufacturing/ processing
- Photonics and micro-electronics
- Biotechnology

Trieste System

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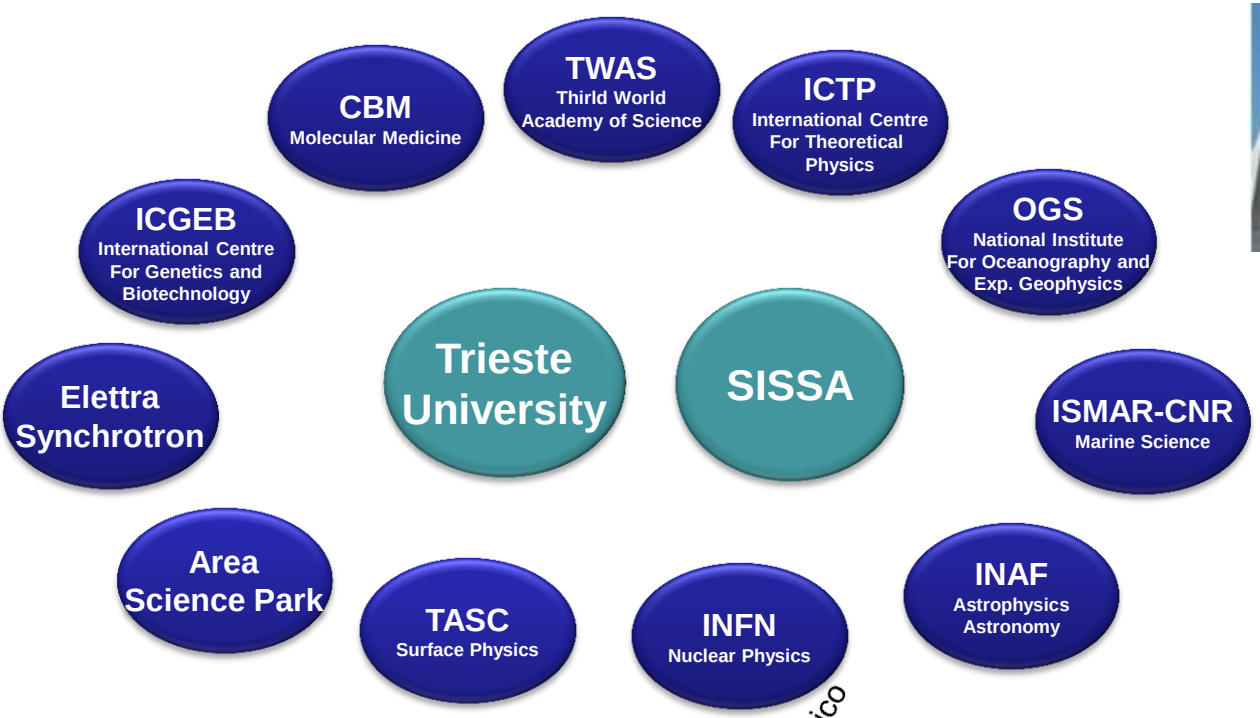
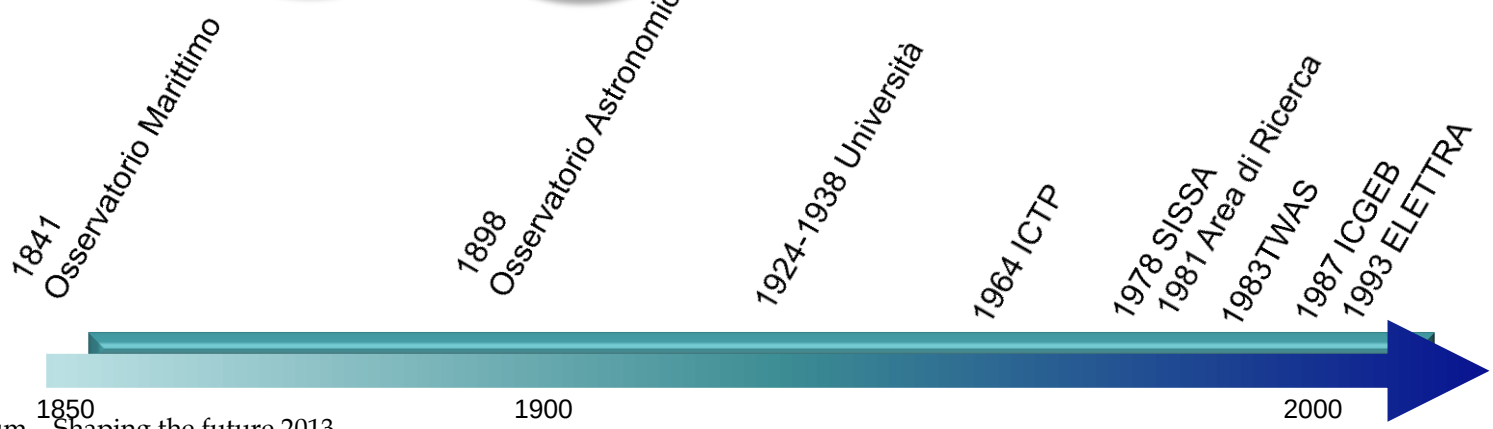


Over 30 researchers every 1,000 active citizens (8.1 in USA, 9.1 in Japan, 5.7 in Europe)



Central-Eastern Europe

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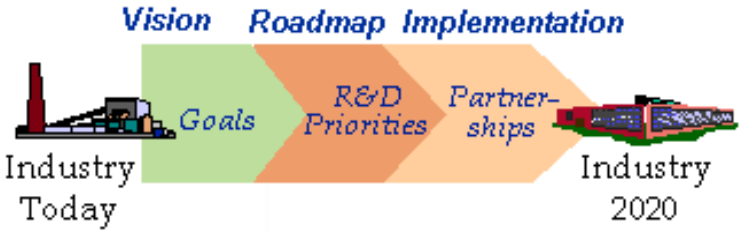
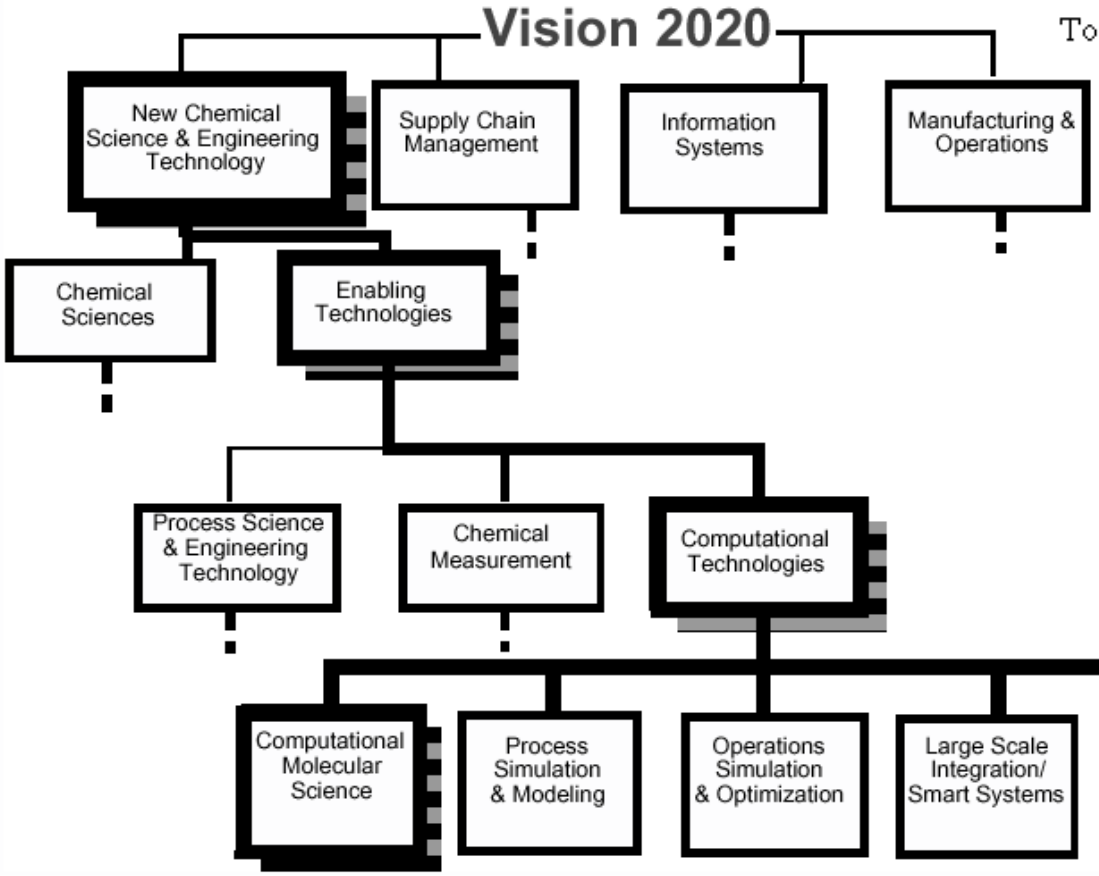
- 2010-2011- President of Alps Adriatic Rectors's Conference (AARC: Albania, Austria, Croatia, Germany, Hungary, North Italy, Slovenia,)
- Collaborative Action (AARC-Conference of Danube Rectors).
- 2012 – Member of DRC
- 2013 – DIANET: Danube Initiative and Alps Adriatic Network. With UNIUD, SISSA, Area Science Park.
- Financed by Region FVG.

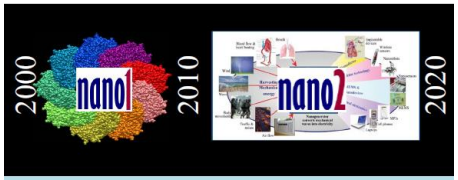
The technology vision 2020





Nanoscale science and engineering

- Ability to work at molecular level, atom by atom, to create large structures with fundamentally new properties and functions*
  - At least one dimension is of the order of nanometers
  - Functionality is critically dependent on nanoscale size
- Promise of unprecedented understanding and control over basic building blocks and properties of natural and man-made objects*
- Recent survey: Nanotechnology Long-term Impacts and Research Directions: 2010 – 2020 **
- Theory, modeling and simulation (TMS)
  - Expected to play key role in nanoscale science and technology
    - INVESTIGATIVE TOOLS: THEORY, MODELING, AND SIMULATION, M. Lundstrom, P. Cummings, M. Alam, M. Ratner, W. Goddard, S. Glotzer, M. Stopa, B. Baird, R. Davis
    - Springer, September 30, 2010
      - Also available on the web at http://www.wtec.org/nano2/



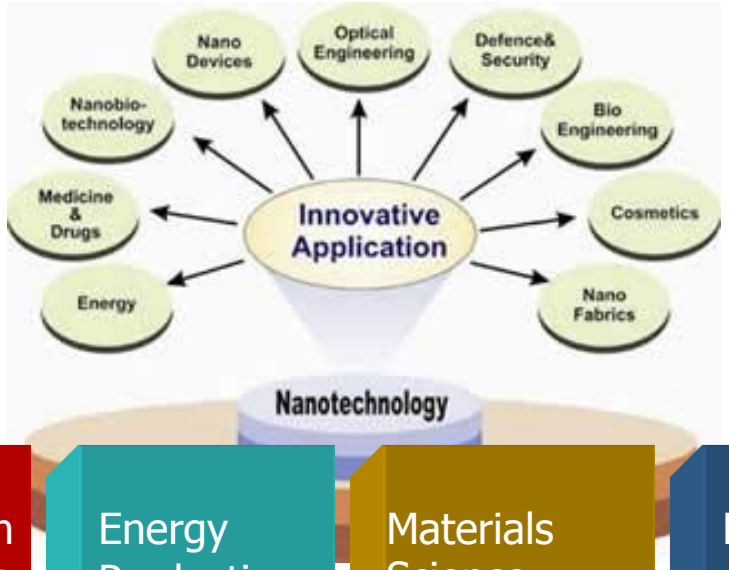
Nanotechnology Long-term Impacts and Research Directions: 2000 – 2020

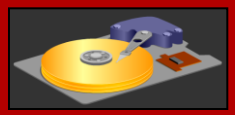
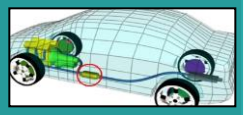
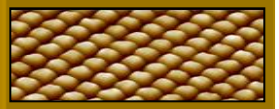
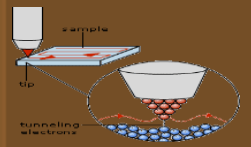
Springer, September 30, 2010

*** M. Roco, FY 2002 National Nanotechnology Investment Budget Request**

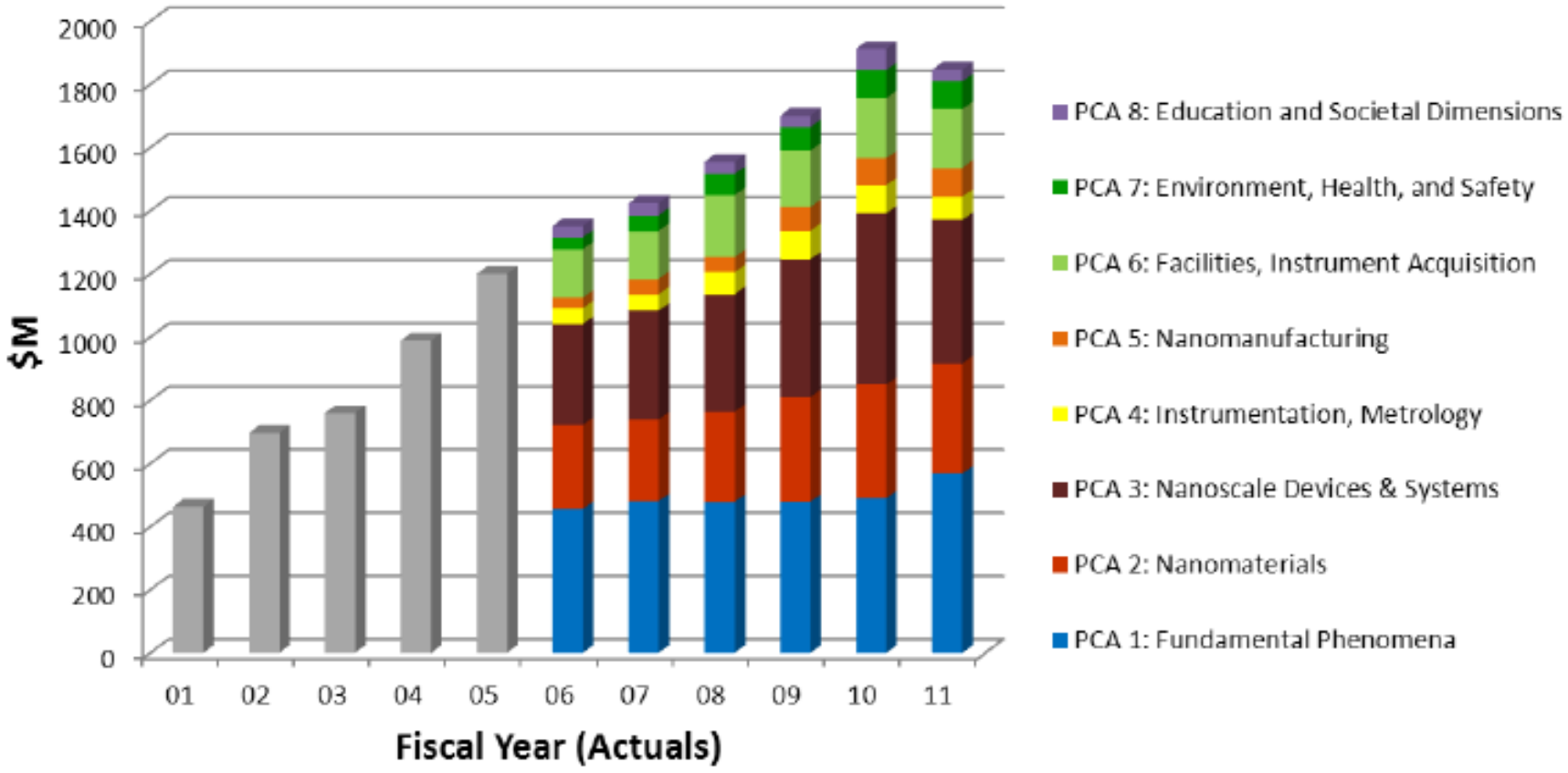
**** M.Roco, FY 2010 WTEC, Inc., 2010**

Nanotecnology



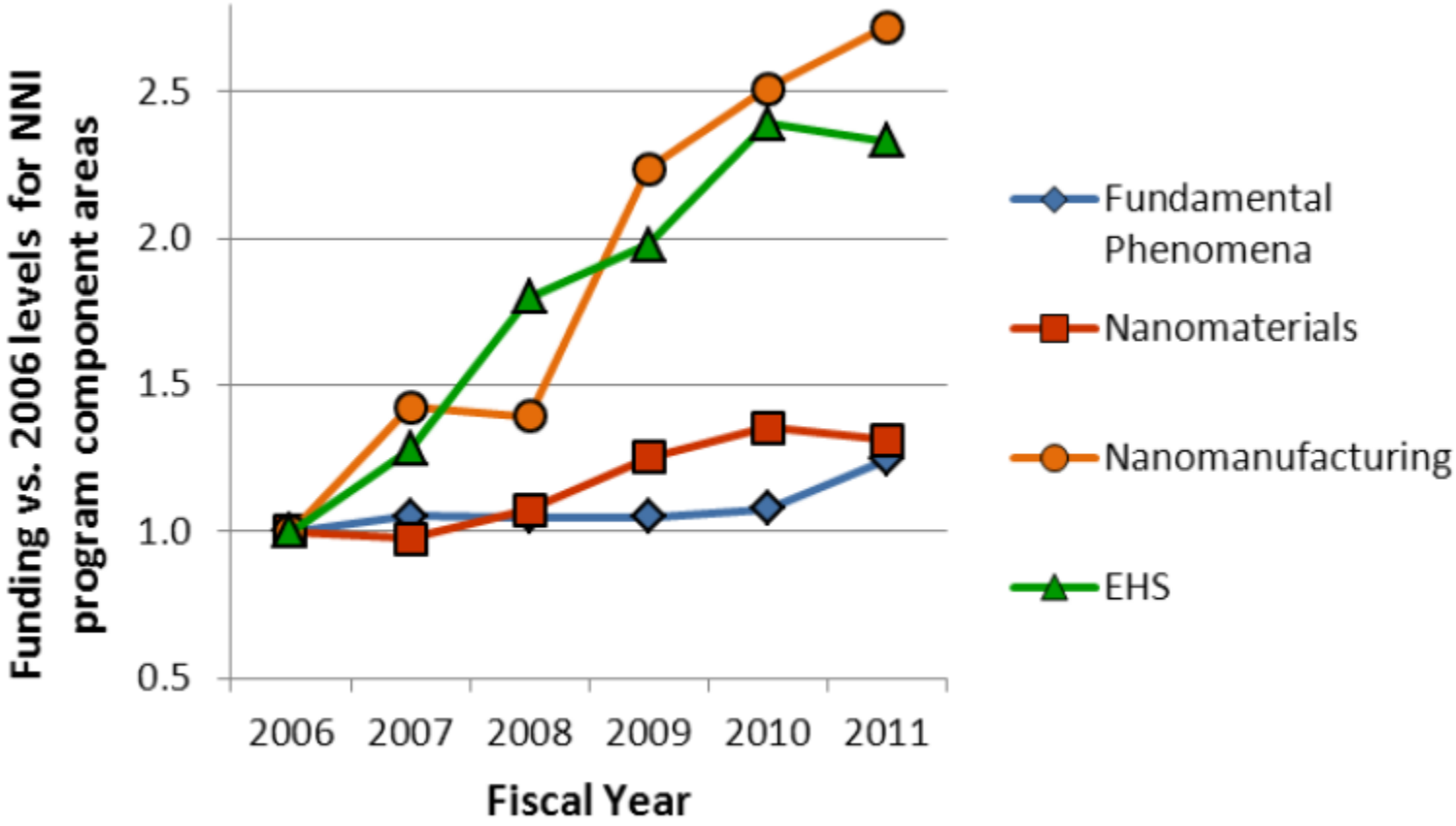
Medicine and Health	Information Technology	Energy Production / Storage	Materials Science	Food, Water and the Environment	Instruments
 Drug delivery	 GMR Hard Disk	 Hydrogen Fuel Cells	 Lightweight and strong	 Remediation methods	 Tunneling microscopy

National Nanotechnology Initiative Investments



Evolution of NNI investments

- Funding for more fundamental work maintained
- Large percentage increases for nano manufacturing and for environment, health, and safety



Nanotechnology: global market evolution

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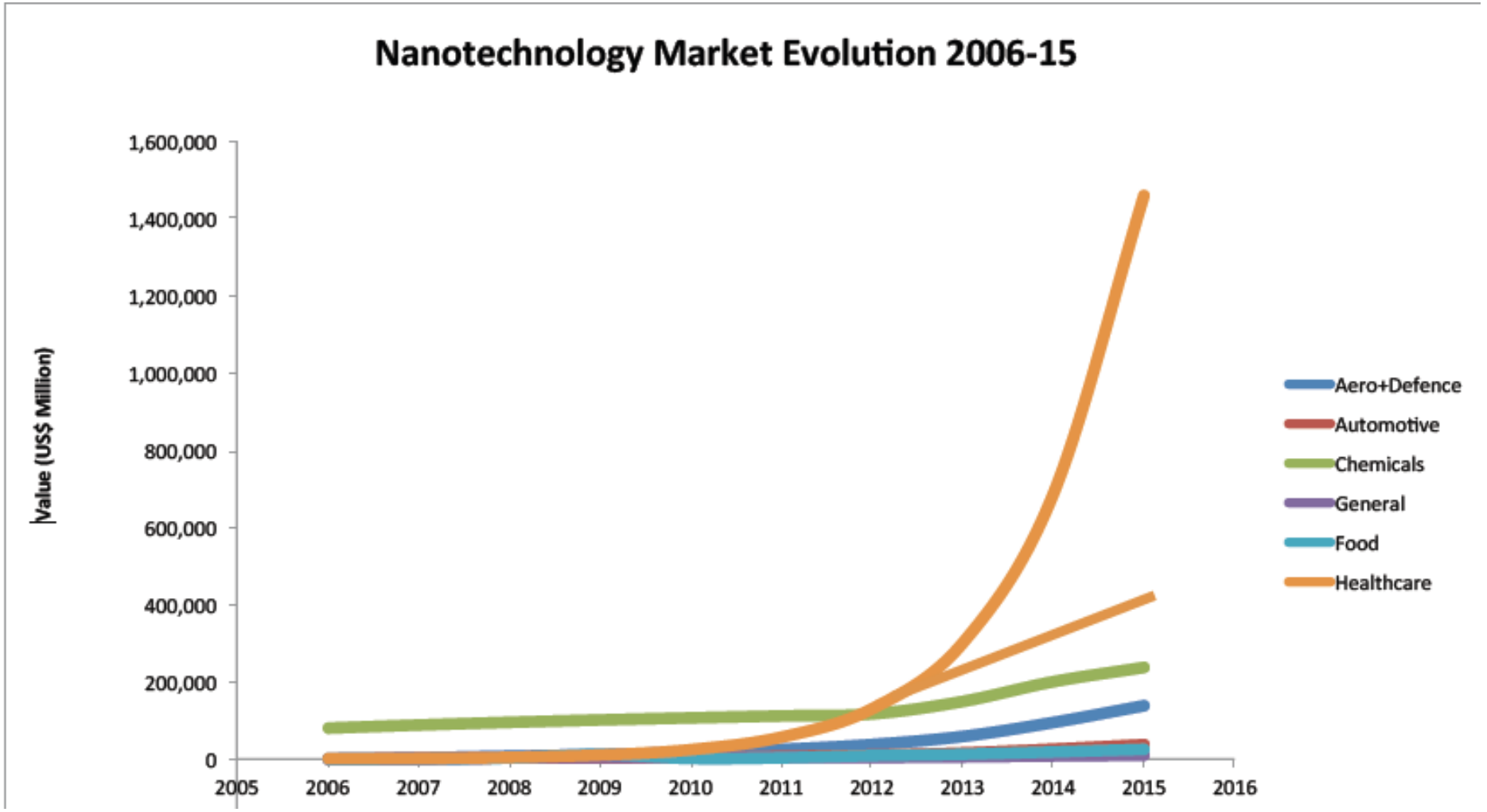
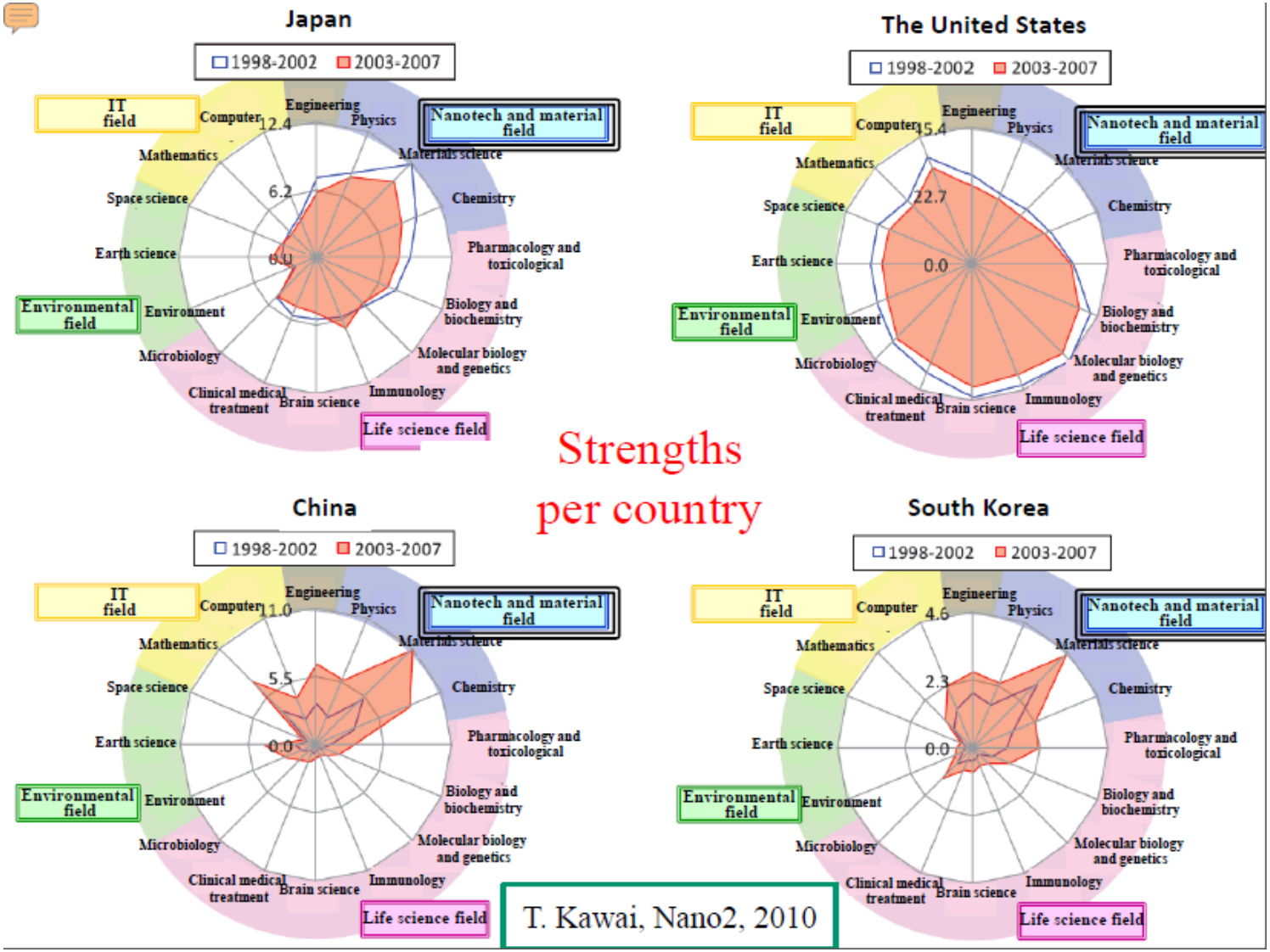
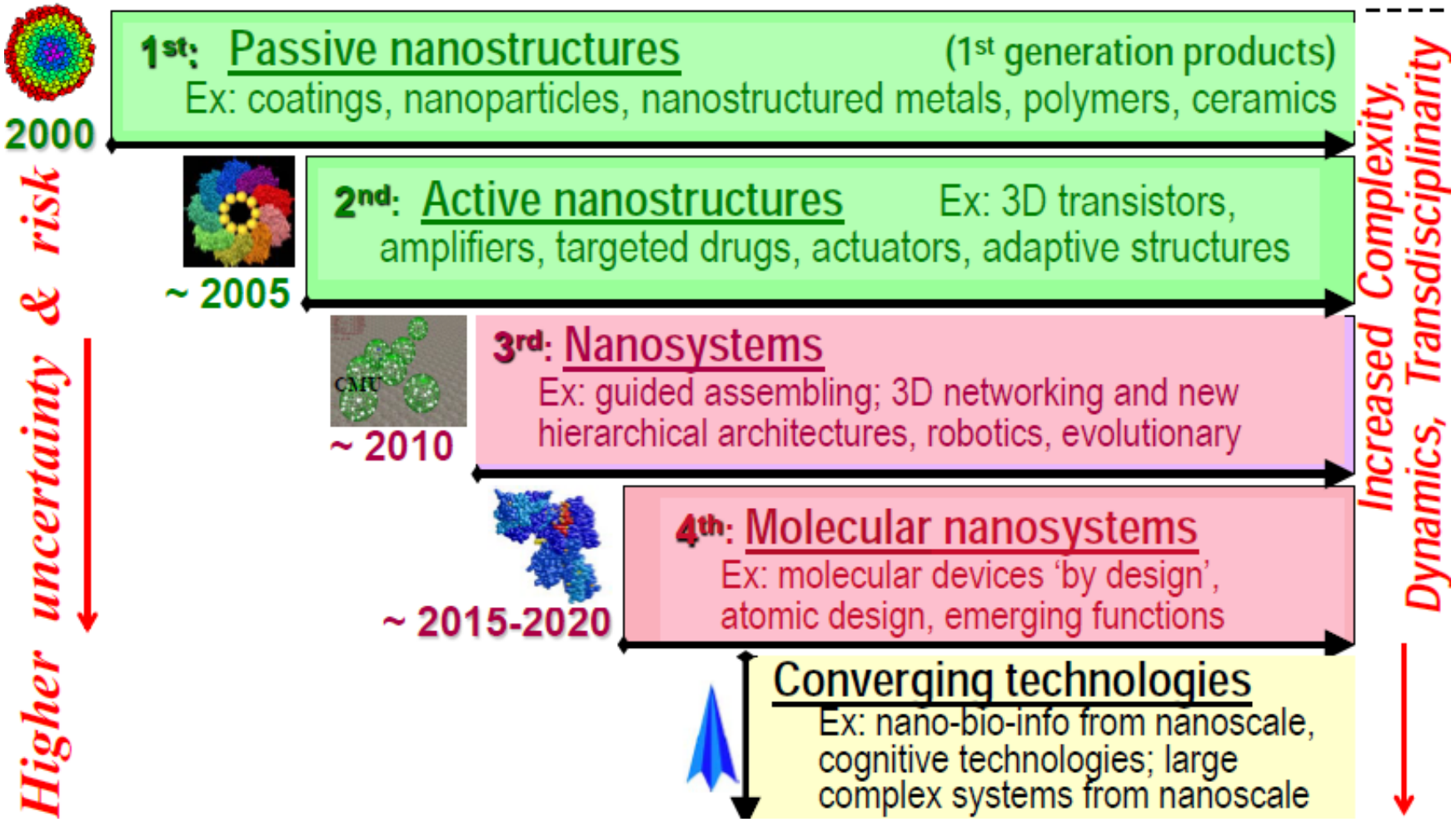


Nanotechnology in different countries



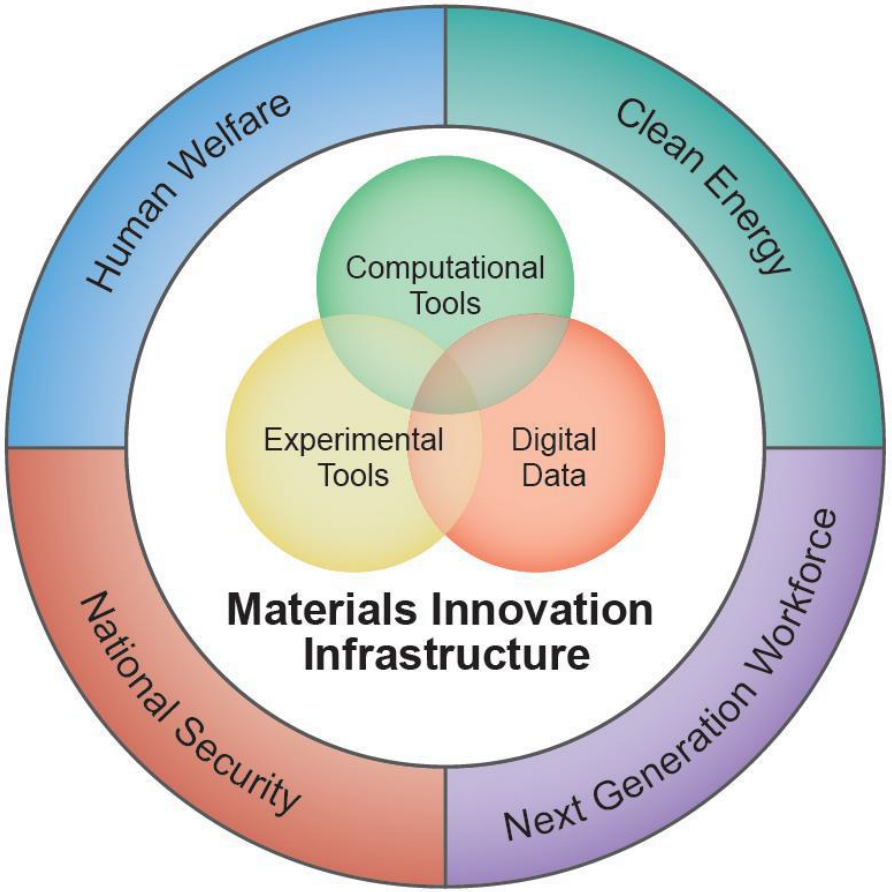
New generation of products and productive processes (2000-2020)

- Timeline for beginning of industrial prototyping and nanotechnology commercialization



Materials Genome Initiative (MGI)

- Developing a materials innovation infrastructure, through advances in and integration of:
  - Computational tools
  - Experimental tools
  - Digital data and informatics
- Achieving National goals in energy, security, and human welfare with advanced materials
- Equipping the next generation materials workforce



The power of simualtion

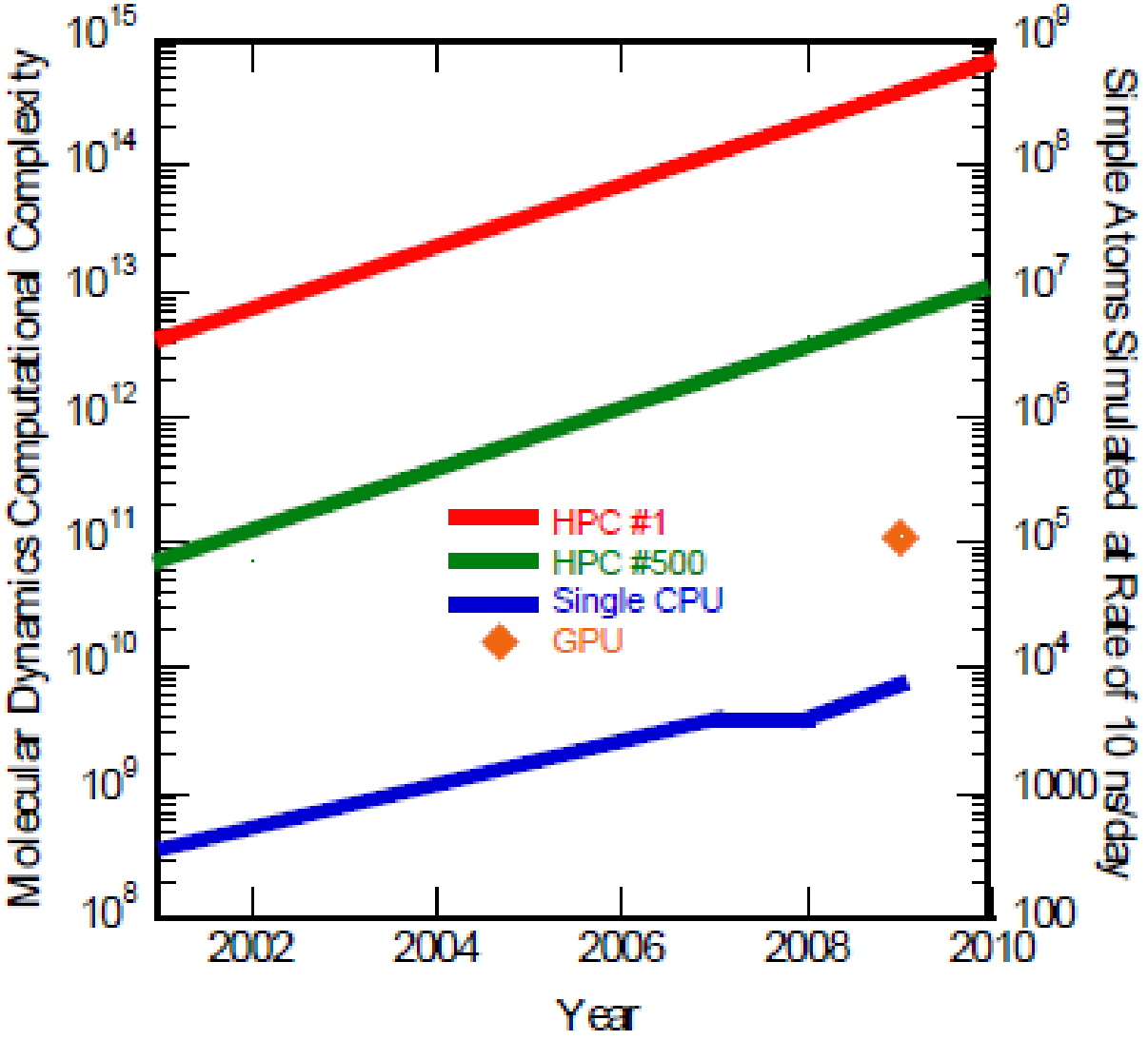
… and the role of GPUs

Molecular complexity

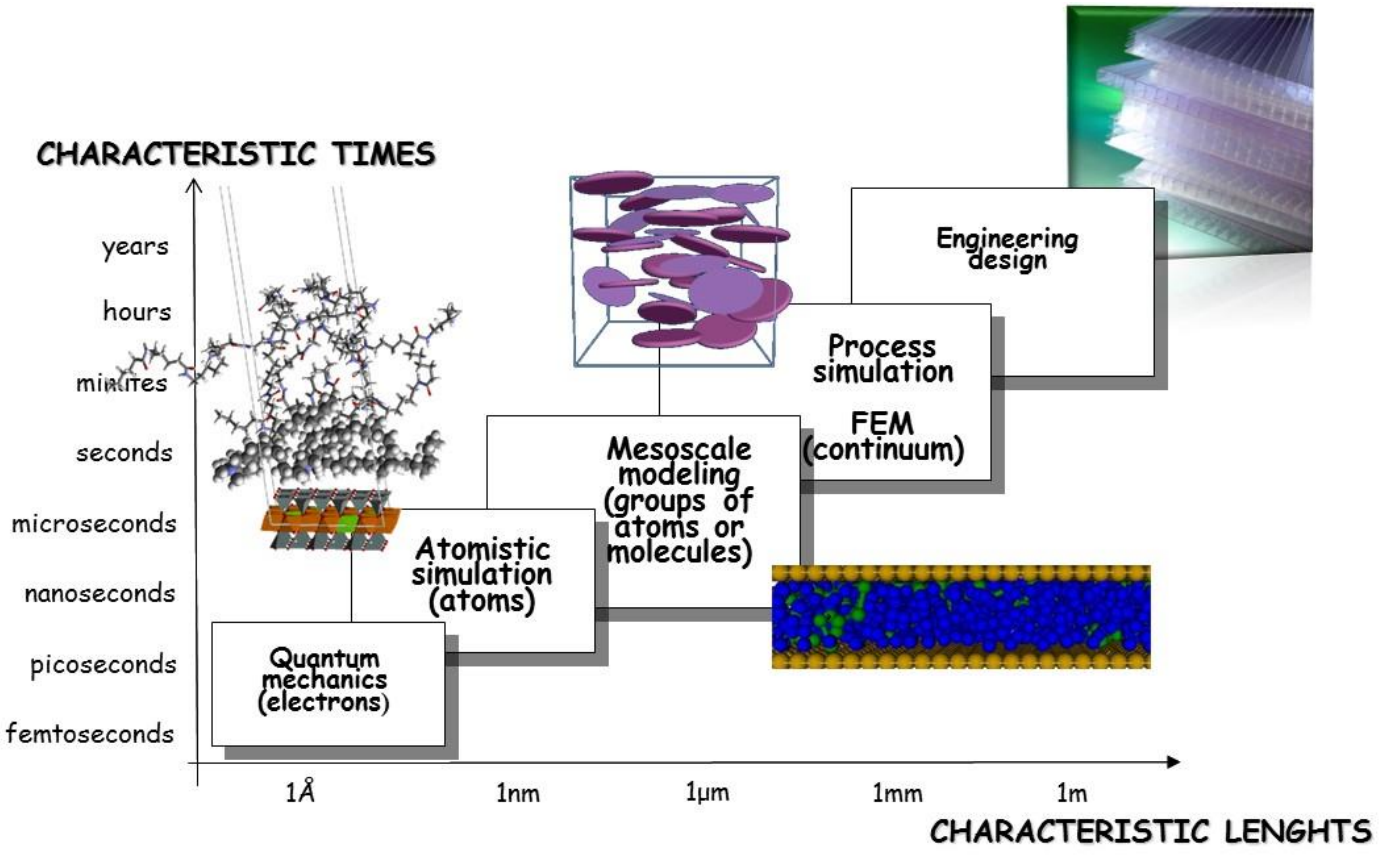
N. of time steps * n. atoms simulated in one day

Simple atom simulation

For a simple monoatomic fluid is the n. of atoms that can be simulated for 10ns in one day



Multiscale Molecular Modeling



Multiscale Molecular Modeling

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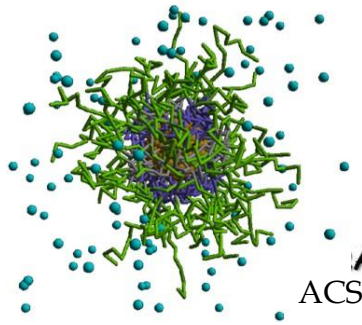
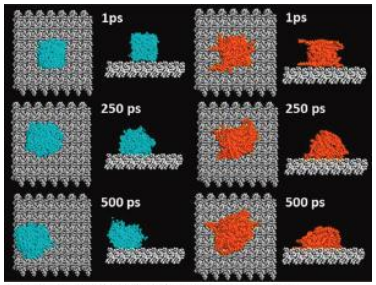
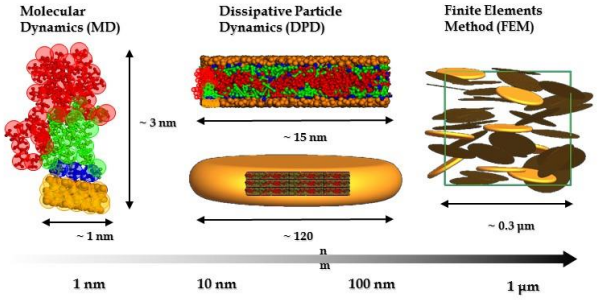


ACS Nano, 2012, 6(8): 7243-53

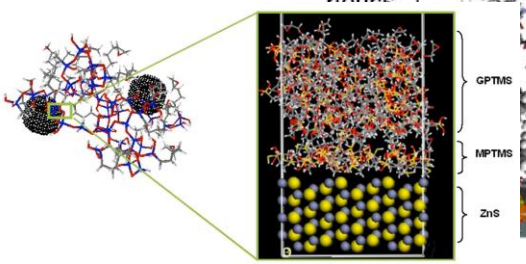


ACS App.Mat.Int., 2012, 4, 2855–2859

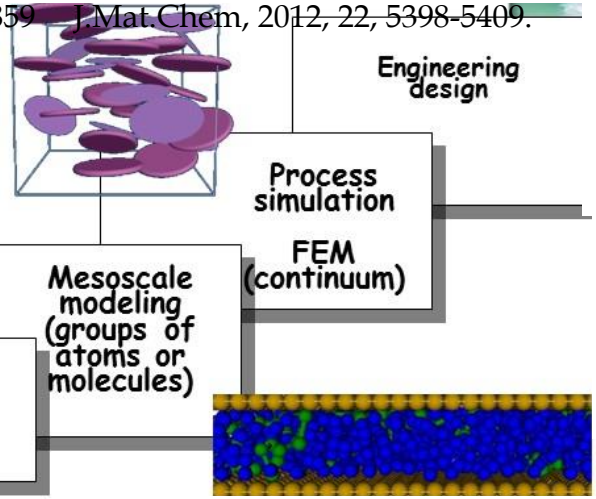


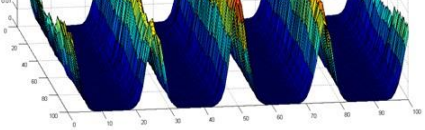
J.Mat.Chem, 2012, 22, 5398-5409.

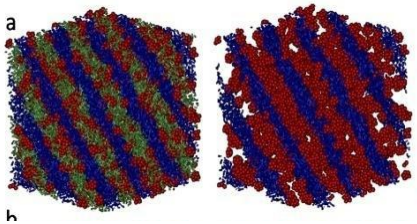
J.Multiscale. Mod., 3:151-176(2011)



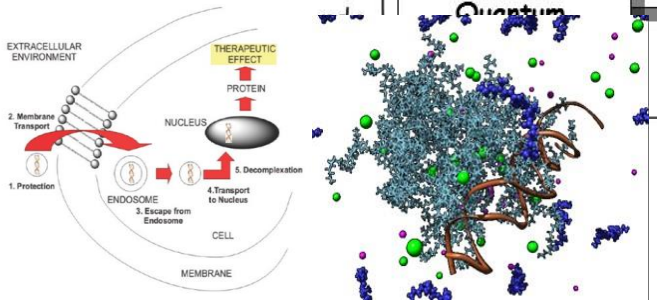
Mol. Simulation, 34, 1215-1236 (2008)



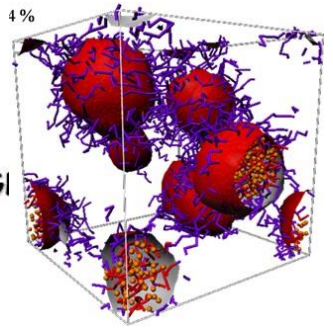




Soft Matter, 2013, 9, 2936-2946.

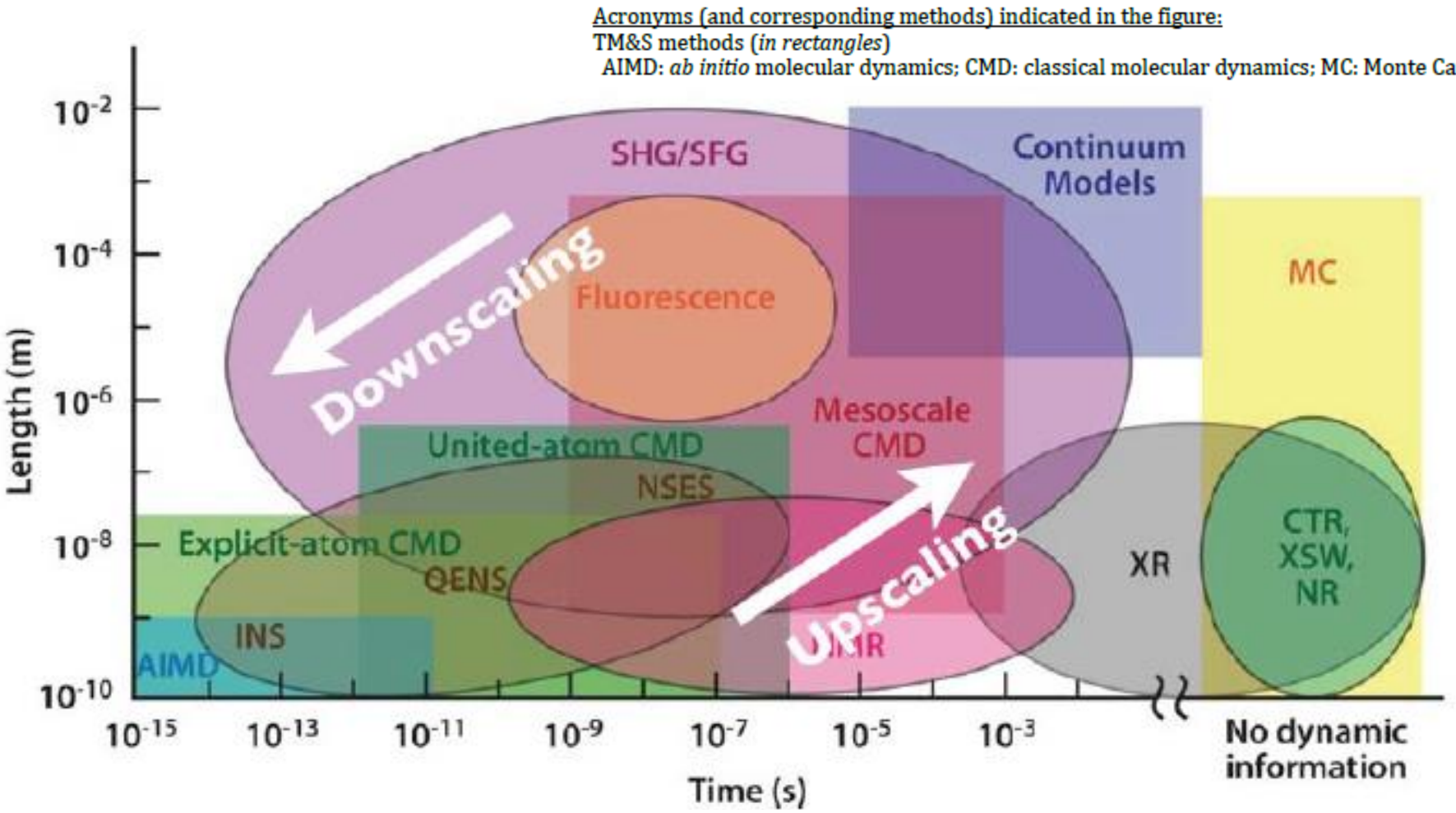


JACS, 133:20288-300 (2011)



J.Mat.Chem, 20:7742-7753 (2010)

Modelling and experiments

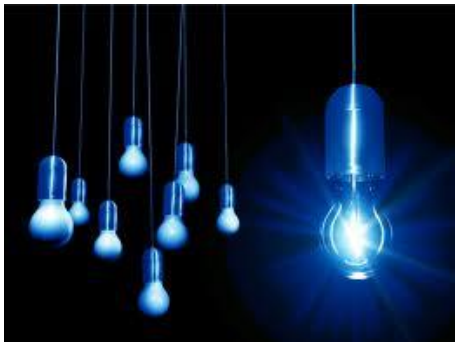


Research and innovation

Money

Research

Results



Innovation

Innovation is discontinuity in knowledge ….

…. Generating an advance of productivity

Re-paving the Gemina roman road