Ethical, Social & Legal Aspects

Nanotechnologies for Sustainable Development

Presentation for the NAN0-2010 Conference

in Nanochemistry & Nanotechnologies

In the St. Andrew the First-Called Georgian University

23-24 March

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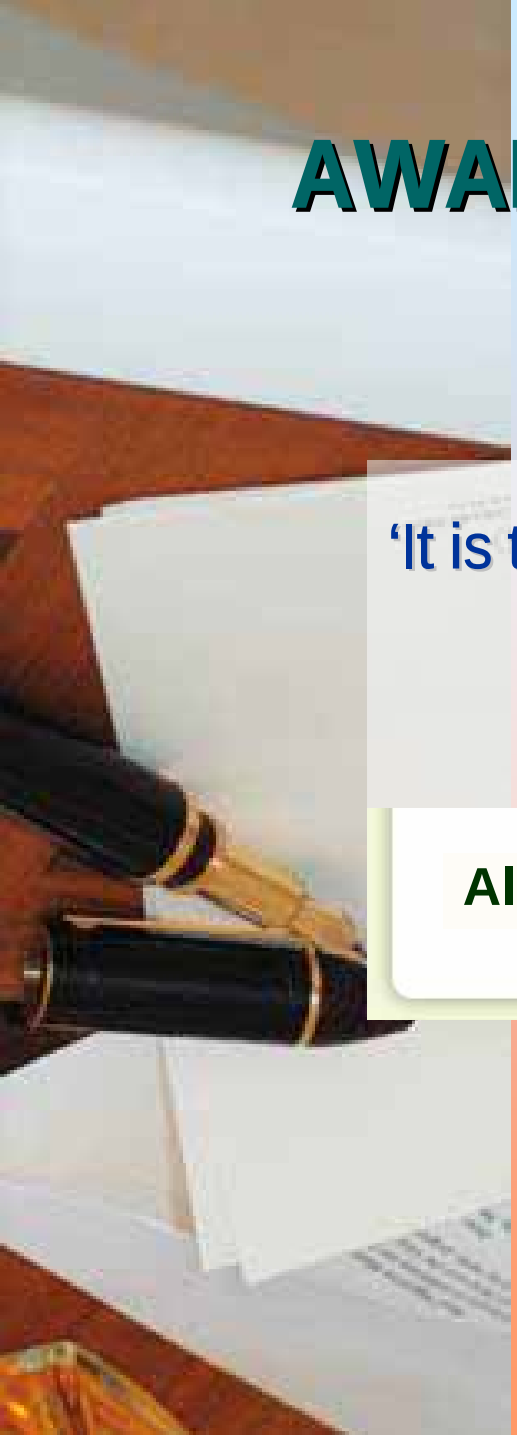


AWARNESS OF THE FUTURE

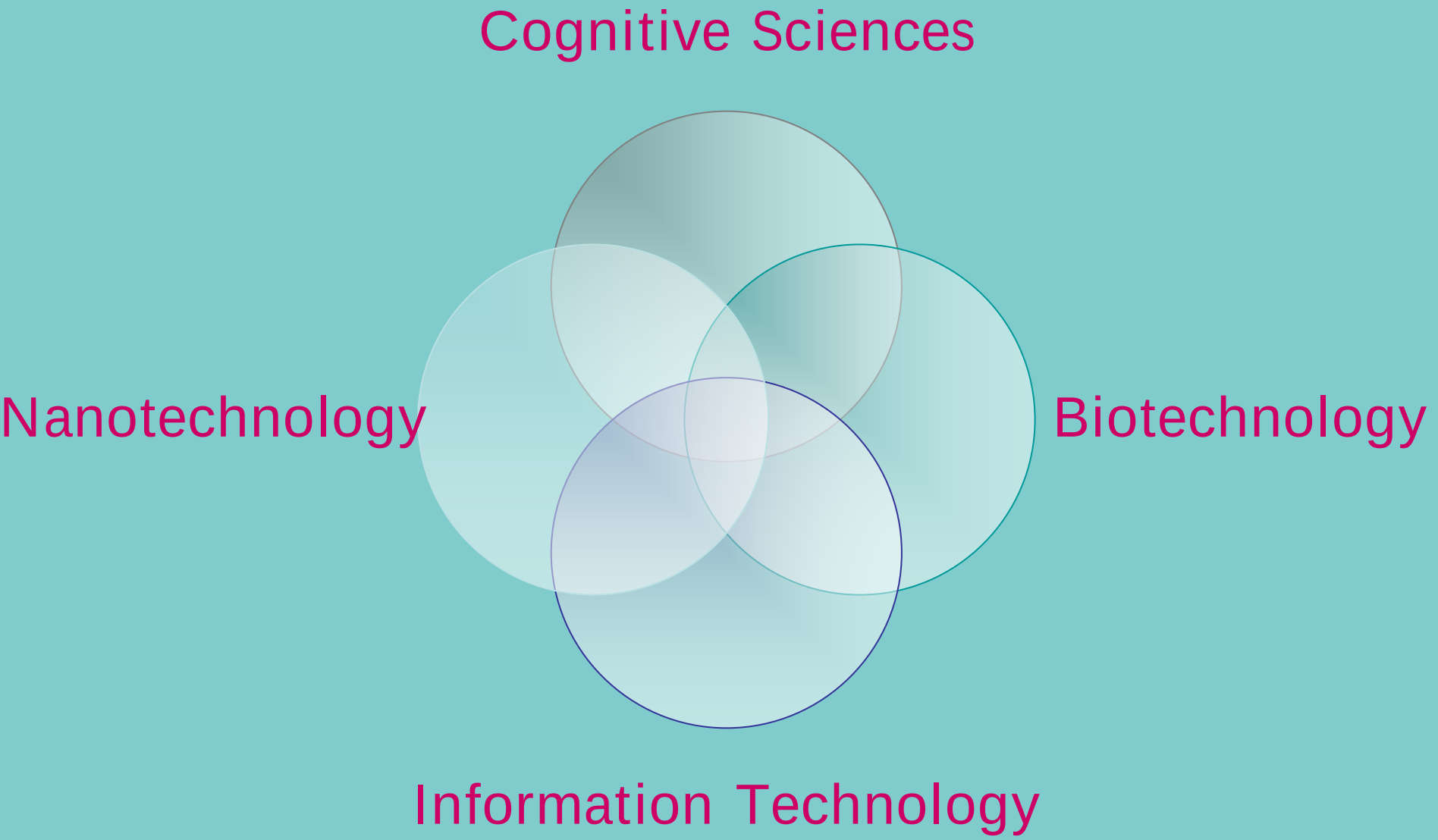
‘It is time that we educate ourselves about our possible future and ‘the best way to predict the future is to create it’

Alan Kay

Sustainability is based on the three core pillars of economy, ecology and social responsibility. Sustainability means long-term far-sighted economical success combined with protection of environment and being socially responsible.

21st Century - New Era of Convergent Technologies

Convergent Technologies of 21st Century



Convergent Technologies

Information technology controls: **Bits**

Nanotechnology controls and manipulates: Atoms

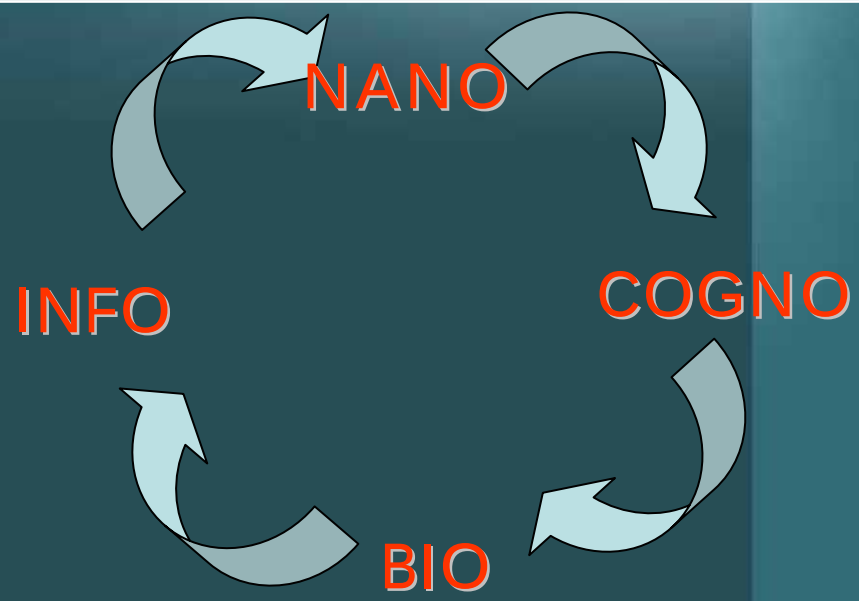
Cognitive Neurosciences enables control of the mind by manipulating: Neurons

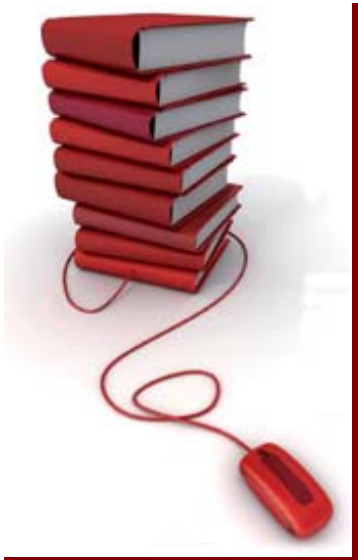
Biotechnology controls and manipulates life by engineering: Genes

Currently,
Atomic Coup Goes BANG!

the term "BANG" *theory* describes *technological* convergence of Bits, Atoms, Neurons and Genes

- to control all matter, life and knowledge.





Bibliometric & Patent Analysis reflecting university inventions rate and commercialization opportunities

We can look how publications and patents change recently according to certain technology. Patents and publications are two main domains of economic growth.
Bibliometric analysis reflect rate of university inventions, while patent analysis is indicator of industrial activity.

State governments support and funding is also main indicator of excellence of technology.

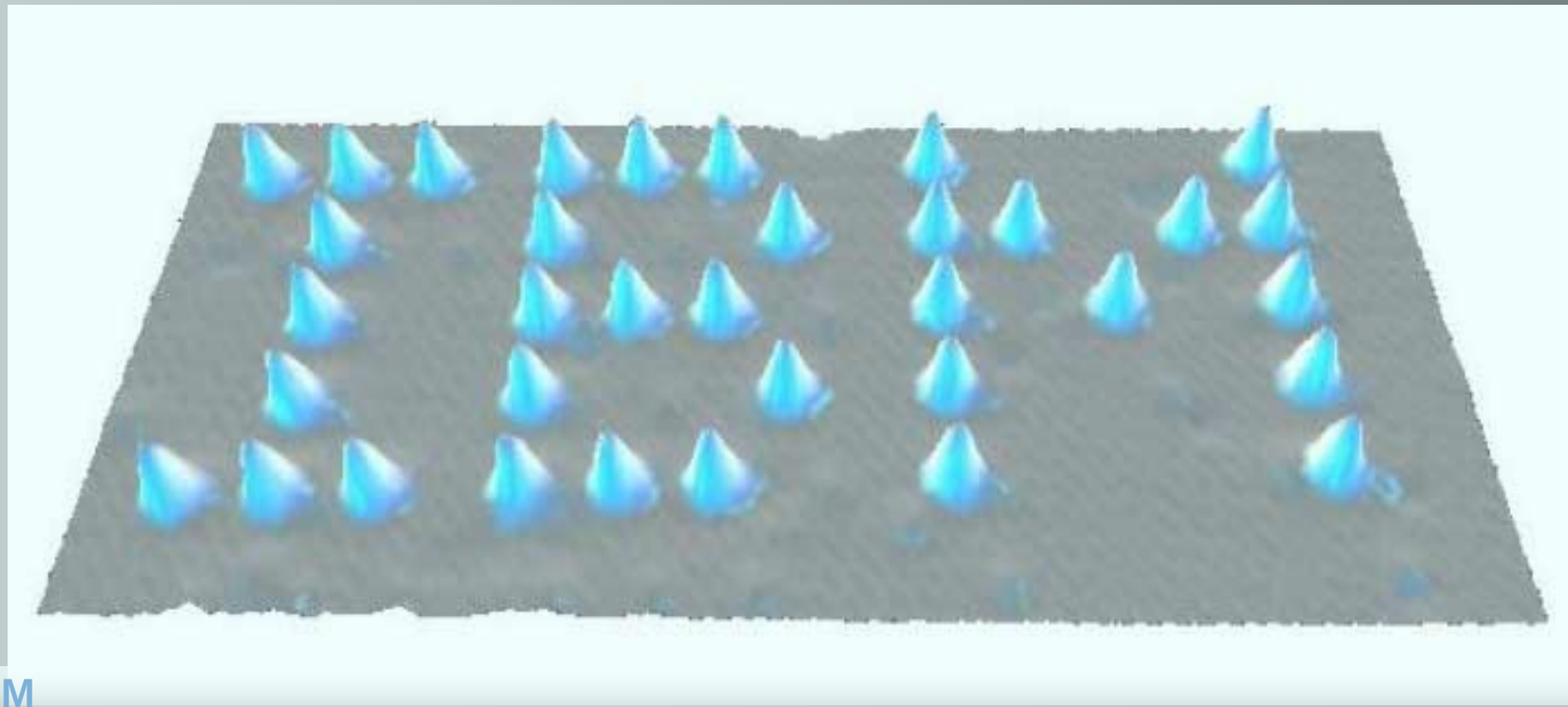
Nobel Prize Awards

1986

IBM - Binnig & Rohrer

1990

Eigler & Schweitzer



Credit: IBM

1996

Nobel Price in Chemistry

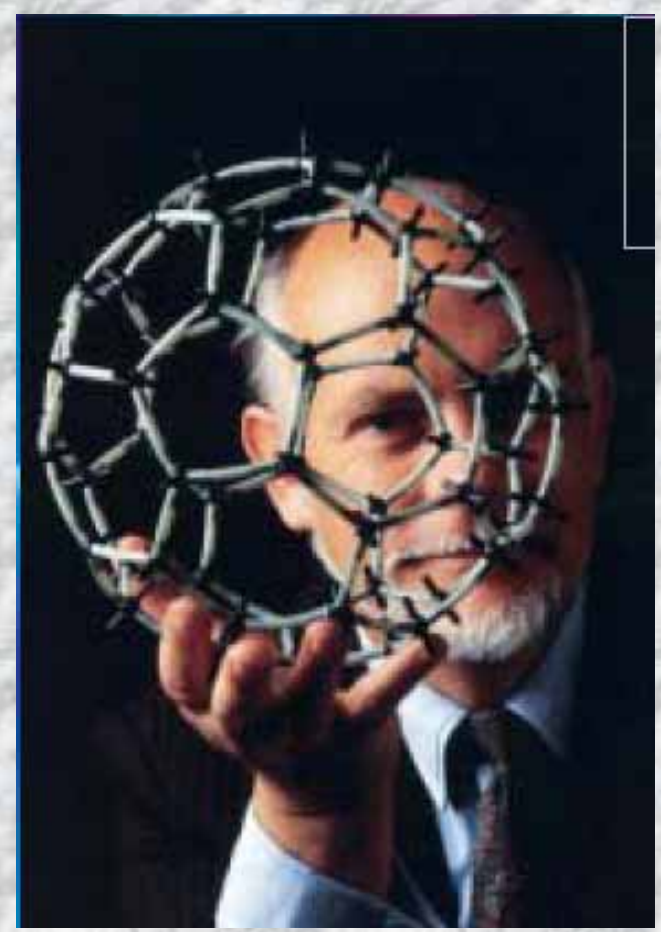
Robert F. Curl Jr. &

Richard E. Smalley

&

Harold W. Kroto

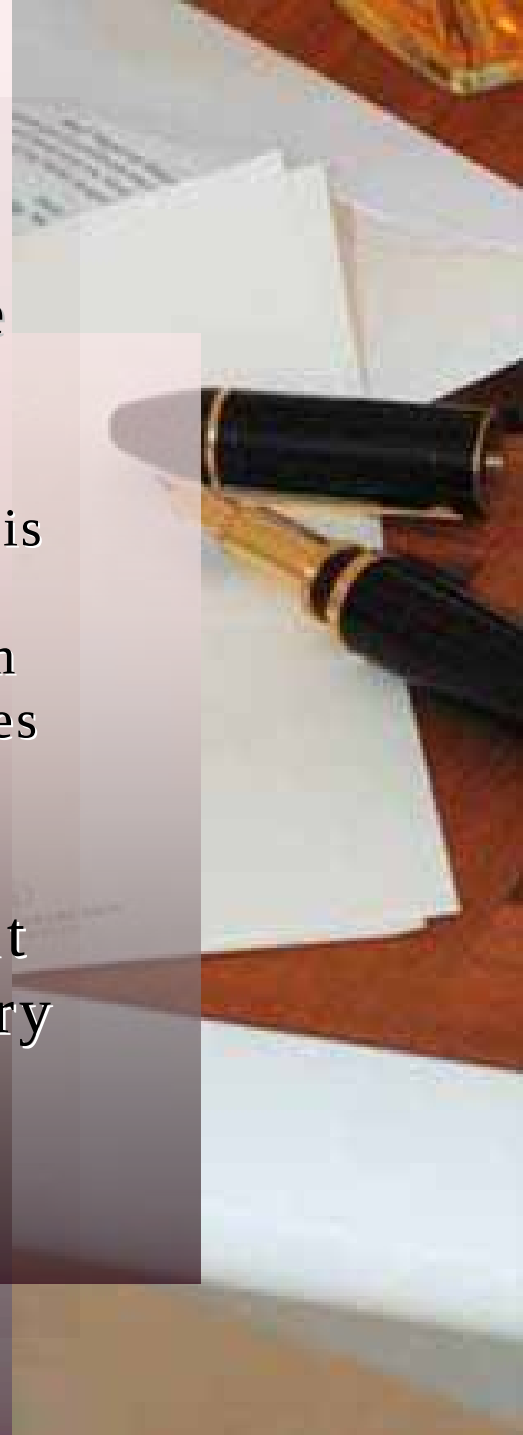
for their discovery of buckminsterfullerene, the scientific name for buckyballs



Realistic approach to the development of NT is characteristic for US government. Most scientist share similar reasonable responsive attitude.

As the US National Nanotechnology Initiative (NNI) is commencing, there is a rare opportunity to integrate the societal studies and dialogues from the very beginning and to include societal studies as a core part of the NNI investment strategy.

For the first time in the history happens that social scientists have such a participatory role in a nanotechnology development.



In the January 2000 President Clinton's program speech on establishing National Nanotechnology Initiative (NNI) at Caltech.

President George W. Bush signed into law the "21st Century Nanotechnology Research and Development Act" - 3rd of December, 2003

NANO-2010
23-24 March
1st Conference in Nanochemistry & Nanotechnologies
In the St. Andrew the First-Called Georgian University

For the first time in the history of the development of nanotechnologies Georgia is the first country in which Georgian Orthodox and Apostolic Church supports its development.

During conference **NANO-2010,** which was the 1st Nanochemistry & Nanotechnologies meeting organized by the Patriarchy of Georgia in 23-24 March in Tbilisi in the St. Andrew the First-Called Georgian University. www.sangu.ge.

Colleagues proposed to consolidate joint effort and intellectual resources of all scientists working in Nanotechnology sphere in Georgia. The idea of initiation of activities through establishment of the Initiative Group was announced and accepted during round table discussions. Short term goals were outlined, out of them most important to achieve governmental support.

Public perceptions concerning NT

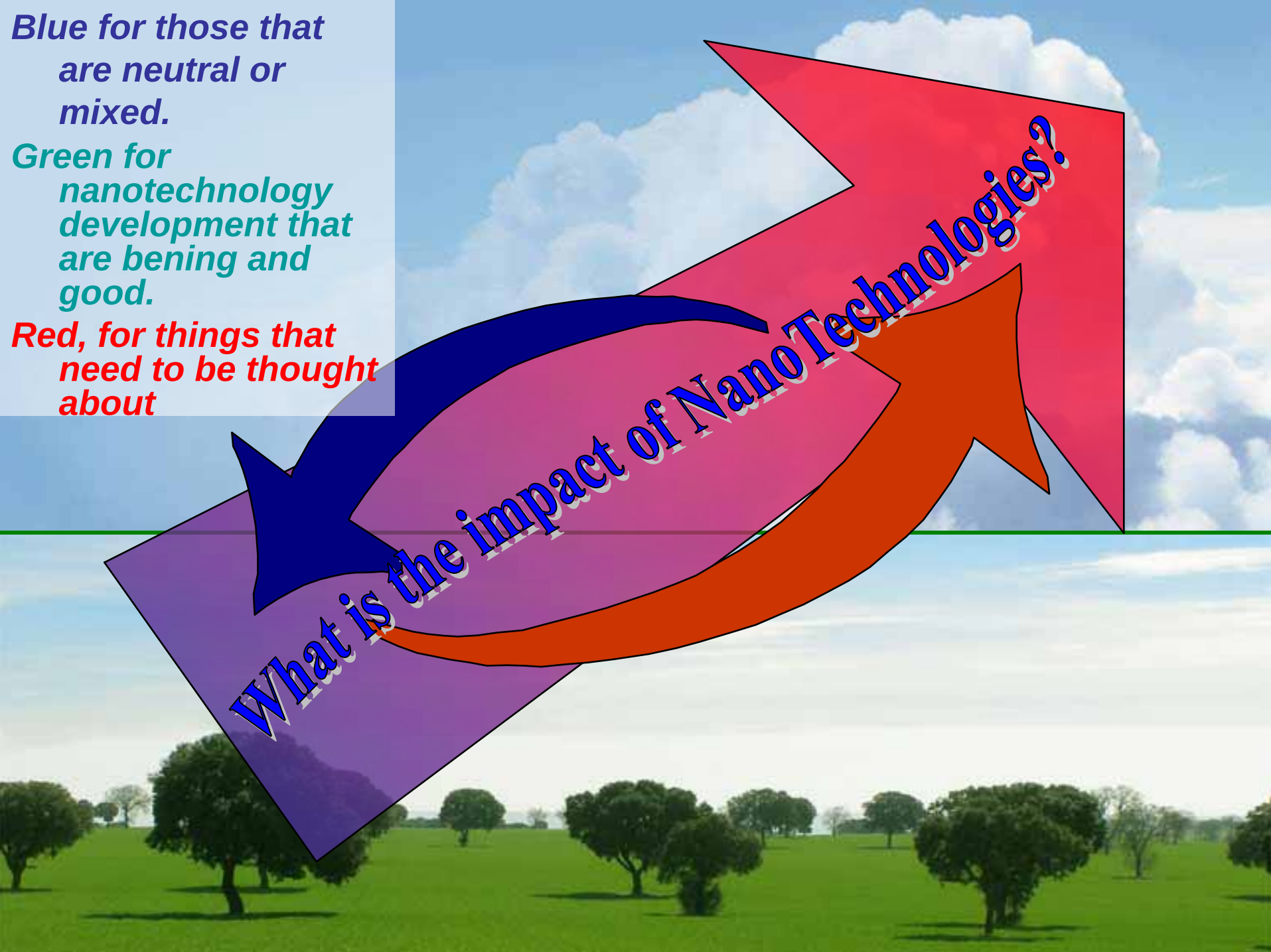
Nano Optimism, Realism & Pessimism

From the moment of its foundation nanotechnology was unequivocally considered from the multi dimensional perspective. General public, as well as scientists are split in distinctive successors, on the one hand, ***nano radicals***, with optimistic, almost futuristic beliefs in nanotechnology, on the other hand, ***nano skeptics***, with their prominent nanophobic precautions… and in fine, ***nano realists***, with clear materialistic attitude to this emerging technology like US government.

Nano Optimism, Realism & Pessimism

- **Eric Drexler**
- **Ray Kurzweil**
- **Michel Roco &**
- **W. Bainbridge**
- **Transhumanists**
- **Futurists**
- **Robert A. Freitas Jr.**

- Bill Joy
- Prince of Wales Charles
- Michael Crichton
- President's Council on Bioethics
- ETC Group
- Friends of the Earth


Blue for those that are neutral or mixed.
Green for nanotechnology development that are bening and good.
Red, for things that need to be thought about
What is the impact of NanoTechnologies?

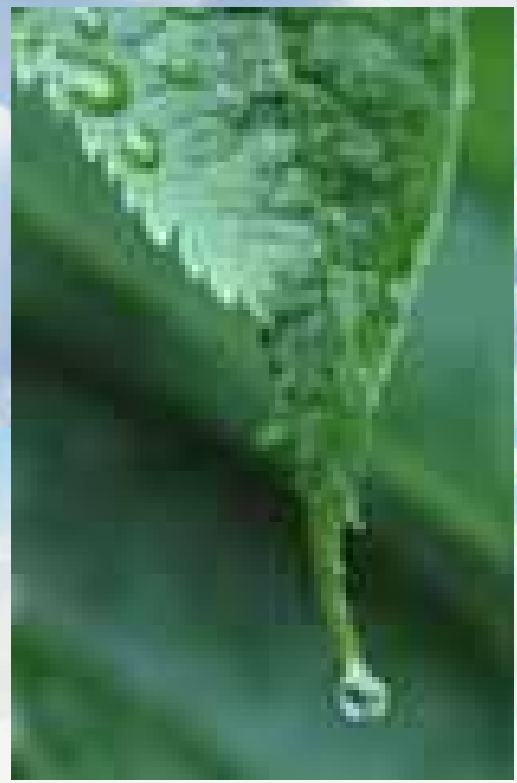
Green Nanotechnology

For the first time in the history of technology development NT is governed in most responsible way from the very beginning. Technology should be ever greener then could be imagined.

Nanotech: Rolling to Market

David Rejeski, Director
Project on Emerging Nanotechnologies
EPA Grantees Meeting
October 26, 2005

- Moreover David Rejeski envisioned development of green NT in 3 main directions.
- **Dark Green**: Nanotechnology is applied directly to solve environmental problems.
- **Light Green**: Nanotechnology provides environmental benefits for other applications.
- **Right Green**: Nano-based processes and products are designed to be environmentally low-impact (life-cycle analysis,design for environment, etc.).



Innovation

Why is crucial Innovation management in the period of technology revolution?

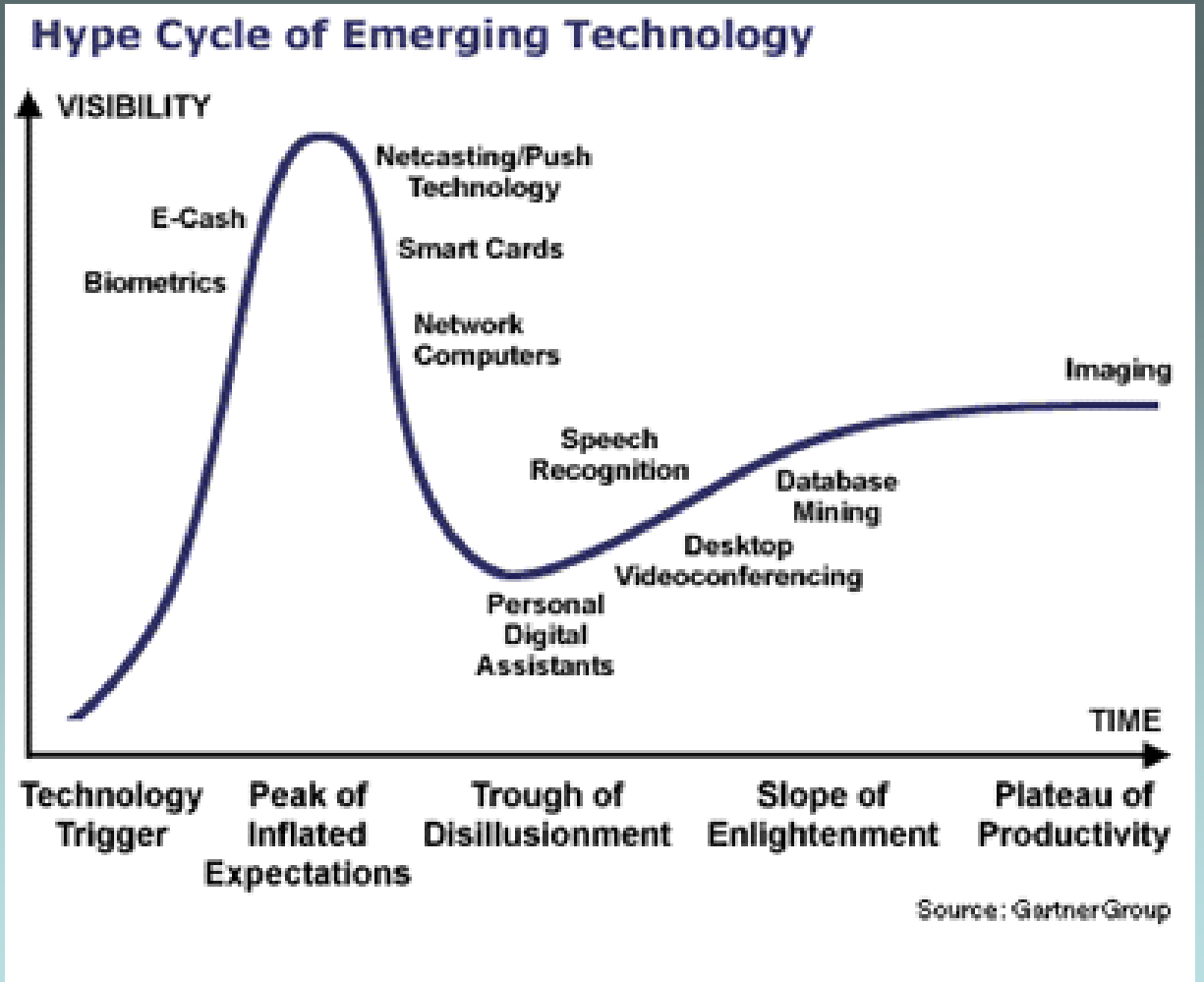
How to perform timely the Innovation?

Adoption of new technologies

Innovator - you are willing to try unproven results / be an initiator for R&D in the field;
Early adopter - you aim to be among the first to market products with new technologies;
Late adopter - you introduce new technologies only after they have been widely popularized;
Late follower - you introduce new technologies only when current solutions become obsolete.

We should know about steps of technology development

- Technology trigger.
- Peak of inflated expectations.
- Trough of disillusionment.
- Slope of enlightenment.
- Plateau of productivity.



Thank you for your time

Questions?