

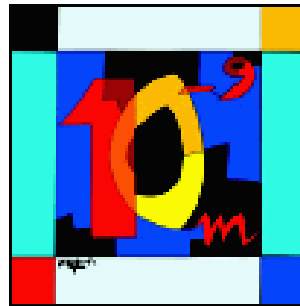
Report

Third
International Dialogue on
Responsible Research and
Development of
Nanotechnology

Brussels, March 11-12 2008

Edited by Renzo Tomellini and Julien Giordani.

The views expressed in this document are entirely those of the Authors
And do not engage or commit the European Commission in any way.



Ms Jacqueline MagallonVillarejo has been of great assistance in preparing this workshop.

This report is available on <http://cordis.europa.eu/nanotechnology/src/intldialogue.htm>

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FOREWORD

The European Commission is committed to promoting a safe and responsible development and use of nanotechnology. Within an approach of good governance, achieving this goal requires the common effort of many players, from individual researchers to the European Institutions and Member States, from local and regional levels to all concerned countries worldwide.

Starting in 2004, with its communication "Towards a European strategy for nanotechnology" and then in 2005 with "Nanosciences and nanotechnologies: An action plan for Europe 2005-2009", the European Commission highlighted the role of international cooperation within a common objective of a responsible development. The Council of the European Union has welcomed the Commission's intention to engage in a dialogue at international level, with a view to establishing a framework of shared principles for the safe, sustainable, responsible and socially acceptable development and use of nanotechnologies.

In recent years, the European Commission has become the largest funding body in the field of nanotechnology worldwide with 1.4 billion € allocated under the 6th Framework Programme for Research and Technologic Development. In its first year, the 7th Framework Programme has already granted almost 600 million €. Research on safety is also supported, where the Commission has a portfolio of grants for 28 million €, making the European total in this area some 80 million €.

The value of facing global challenges within a multinational approach has been accepted by several countries and in this way this international dialogue was initiated. This global dialogue is today the main and broadest space to analyse progress, share experience and benchmark initiatives, explore synergies between different stakeholders and foster cooperation to define what can be done better at international level.

The final aim of this dialogue is to facilitate good governance in nanotechnology, aiming at a development of nanotechnology that corresponds to the needs of society as a whole, without creating new economic or knowledge disequilibria, whether within or between countries in the world. In this respect this dialogue wants to be inclusive, involving all countries and stakeholders interested in the responsible and sustainable development of nanotechnology.

With this spirit and building on the momentum generated by the previous editions of 2004 in USA, and 2006 in Japan, the European Commission was pleased to organise the 3rd International Dialogue for Responsible Research and Development of Nanotechnology, which was held in Brussels on 11-12 March 2008 and gathered 97 participants representing 49 countries (one fourth of the nations of the world), as well as international organisations, multinational bodies, industries and universities.

I am now pleased to present the resulting report from the 3rd International Dialogue for Responsible Research and Development of Nanotechnology and I am confident that the cooperation and synergy initiated will produce in the coming years a fruitful outcome, ensuring in this way that nanotechnology will make a substantial contribution to improving the quality of life of our citizens and protecting the environment through a reliable sustainable development.

Zoran STANČIČ

Deputy Director General of DG RTD

EXECUTIVE SUMMARY

The 3rd International Dialogue on Responsible Nanotechnology took place in Brussels (Belgium, EU) on 11-12 March 2008. This Dialogue followed the previous two successful meetings in Alexandria (Virginia, USA) in 2004, and Tokyo (Japan) in 2006.

At this Dialogue there were 88 participants from 49 countries. Institutions, international organizations, major stakeholders and high level specialists participated in this two-day event.

This Dialogue represents a space for facilitating international sharing, bringing together stakeholders from public administrations who meet in their personal capacity to review progress, benchmark initiatives, identify differences and specificities, and explore synergies, with the ultimate aim of contributing to a responsible and sustainable development of nanotechnology.

This Dialogue is of informal nature and high level specialists can be invited, depending on the agenda of the meetings. Strict complementarity with other forums at global level is observed, never duplicating what is done competently and successfully elsewhere, but paving the way where appropriate for formal discussions in appropriate areas.

The aim of the Dialogue is to be inclusive with regard to all countries interested in a responsible and sustainable development of nanotechnology. In particular, this Dialogue has become a space where the societal impact of nanotechnology can be explored. It allows experiences to be discussed and possible synergies to be explored, aiming at the best possible standards, with regard to addressing peoples' expectations and concerns.

The ultimate aim of this Dialogue is to contribute to a development of nanotechnology that corresponds to the need of society as a whole, without disequilibria or "divides" within or between countries and regions. This process is expected to lead to positive worldwide developments, and eventually to good governance, as with several other historical parallels.

The 3rd International Dialogue has addressed:

- *Nanotechnology governance*, debating in more detail (i) the EU/USA call for proposals on the impact of nanoparticles on health and the environment as an example of international research on a topic of global interest; (ii) activities of leading international institutions and organisations; and (iii) the codes of conduct adopted or in preparation. How synergy can be improved between stakeholders was examined, and proposals have been made for the exchange of good practises (e.g. on conditions at the workplace), as well as for coordinated "observatory" activities, including indicators of responsible and sustainable innovation or the implementation of the codes of conduct.
- *Bridging the gap*, which has been a very informative session illustrating various initiatives, in particular the IBSA initiative (India, Brazil, South Africa), and exploring how to better achieve a meaningful access to knowledge by all countries, in the so-called North-South, North-North or South-South cooperations. Such initiatives deserve further attention in future meetings.

- *Enabling means*, debating the progress of the work carried out by the OECD working parties related to nanotechnology, as well as the challenges of metrology, standardisation, definitions and intellectual protection. The importance of launching coordinated activities on global challenges was highlighted, such as nanotechnology for water purification, environmental remediation or more generally in sustainable development. The importance was highlighted of joint projects whose immediate industrial or commercial interest is not apparent, but whose societal or environmental benefits are great. Organisational challenges were also addressed.
- *Societal engagement*, debating the experience acquired by a global networking of social scientists and hearing the lessons learnt from the dialogue with the public in different countries and by different stakeholders. The value of information, communication, dialogue and of a constant "listening mode" was consistently highlighted. Good practices have been presented and debated.

The main messages from the Dialogue included recommendations to public administrations such as:

- To continue promoting nanotechnology development within a systematic and responsible approach, taking into account long term challenges.
- To acknowledge that developing safe products and processes, protecting the environment and achieving a level playing field in the globalized market, is of interest to all countries in the world;
- To encourage adopting a global approach when global issues are at stake;
- To pursue an inclusive approach;
- To promote a number of joint actions, so that "going global" is not a goal *per se* but can help all stakeholders to perform better.

3rd International Dialogue on Responsible Research and Development of Nanotechnology

Brussels, 11-12 March 2008
European Parliament, Building "Altiero Spinelli"

Agenda

Opening, 11 March at 9 a.m

- 9:00 Welcome address by EC: Zoran STANČIČ, Dep. Director-general DG RTD
- 9:10 Introductory addresses by USA, chair of the first Dialogue: Mihail ROCO
- 9:20 Introductory addresses by Japan, chair of the second dialogue: Yujiro NARUSE
- 9:30 Special lecture: The new Russian programme in nanotechnology, Mihail KOVALCHUK (Russian Federation)

Discussion will be structured in four sequential plenary sessions animated by a chairman and a keynote speaker. Participants are invited to contribute their experience and inputs, so as to exchange views and allow benchmarking and define possible synergy.

10:00 Plenary session 1: Nanotechnology governance

Chairmanship: Mihail ROCO (USA)

- 10:10 Keynote lecture: Francoise ROURE (France)
- 10:30 Case study: EU/USA call for proposals on the impact of nanoparticles on health and the environment, Nora SAVAGE (EPA, USA)

10:50 Coffee break

- 11:20 Round Table with FAO, OECD, UNEP, UNIDO, WHO.
- 12:30 Debate: where synergy can be improved between stakeholders

13:00 Lunch

- 14:30 Round Table on proposed Codes of Conducts: Peteris ZILGALVIS (EC), Hilary SUTCLIFF (Responsible Nano Code), Carolin KRANZ (BASF).
- 15:00 Debate

15:30 Coffee Break

16:00 Plenary session 2: Bridging the gap

Chairmanship: Humberto TERRONES (Mexico)

- 16:10 Short communication: Ongoing projects and prospective in the nanotechnology field in Brazil: José d'Albuquerque e Castro (S&T Ministry, Brazil)
- 16:20 Keynote lecture: Graziano BERTOGLI (ICS, UNIDO)
- 16:40 Case study: South-South cooperation by a speaker from the IBSA initiative (India, Brazil, South Africa): Baldev RAJ, India's coordinator for the tri-nation programme in the field of nanotechnology, Director of IGCAR, (India)
- 17:00 Short communication: Ongoing projects and prospective in the nanotechnology field in Argentina: Alberto LAMAGNA (CNEA, Argentina)

17:10 Debate: How to achieve a meaningful participation by all countries?

17:45 Close of the session
Social event

12 March

9:00 Plenary session 3: Enabling means

Chairmanship: Masafumi ATA (J)

9:10 Keynote lectures: OECD Working Parties related to nanotechnologies, by Dirk PILAT (OECD)

9:50 Keynote lecture: Standardisation and progress done by the ISO TC 229 technical committee on nanotechnology by Peter HATTO (ISO)

10:10 Coffee break

10:40 Keynote lecture: IPR issues by Yves VERBANDT (EPO)

11:00 Debate

12:00 Lunch

13:30 Plenary session 4: Societal engagement

Chairmanship: Renzo TOMELLINI (EC)

13:40 Keynote lecture: Masahiro TAKEMURA (J)

14:00 Case study: Global networking of social scientists. Philippe LAREDO, coordinator of the PRIME network of excellence.

14:20 Special lecture: Progress achieved in China on responsible development of nanotechnology, Chen WANG (China)

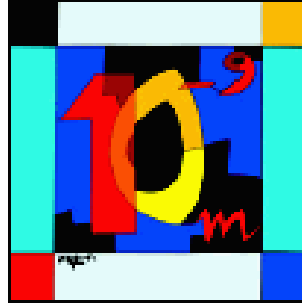
14:50 Coffee break

15:20 Round Table with Evonik, IRGC, L'Oréal, NIA

16:20 Debate: what we have learnt from the dialogue with the public

17:00 AOB

17:45 Closing remarks



INTRODUCTORY ADDRESSES

- Welcome address by EC: Zoran STANČIČ, Dep. Director-general DG RTD
- Introductory addresses by USA, chair of the first Dialogue: Mihail ROCO
- Introductory addresses by Japan, chair of the second dialogue: Yujiro NARUSE



Since the first International Dialogue

M.C. Roco

U.S. National Science Foundation and
National Nanotechnology Initiative

International Dialogue 3, Brussels, March 11, 2008

First International Dialogue on Responsible R&D of Nanotechnology, Virginia, 2004

26 countries and EC



Japan

Italy

Russia

E.U.

First International Dialogue on Responsible R&D of Nanotechnology, Virginia, 2004

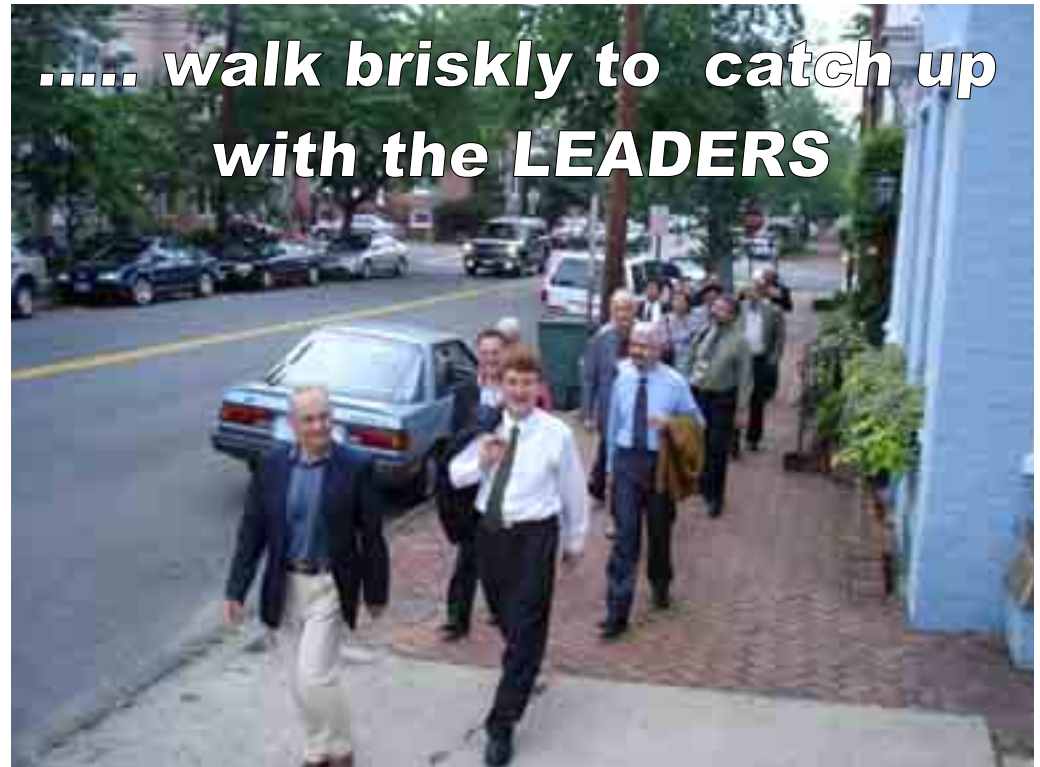
Nanotech = no easy Game.

YOU WILL HAVE TO



by Manfred Scriba (South Africa) et al.

**..... walk briskly to catch up
with the LEADERS**





.... wait for your Opportunity



the rewards will be there ...



... for EVERYONE ...



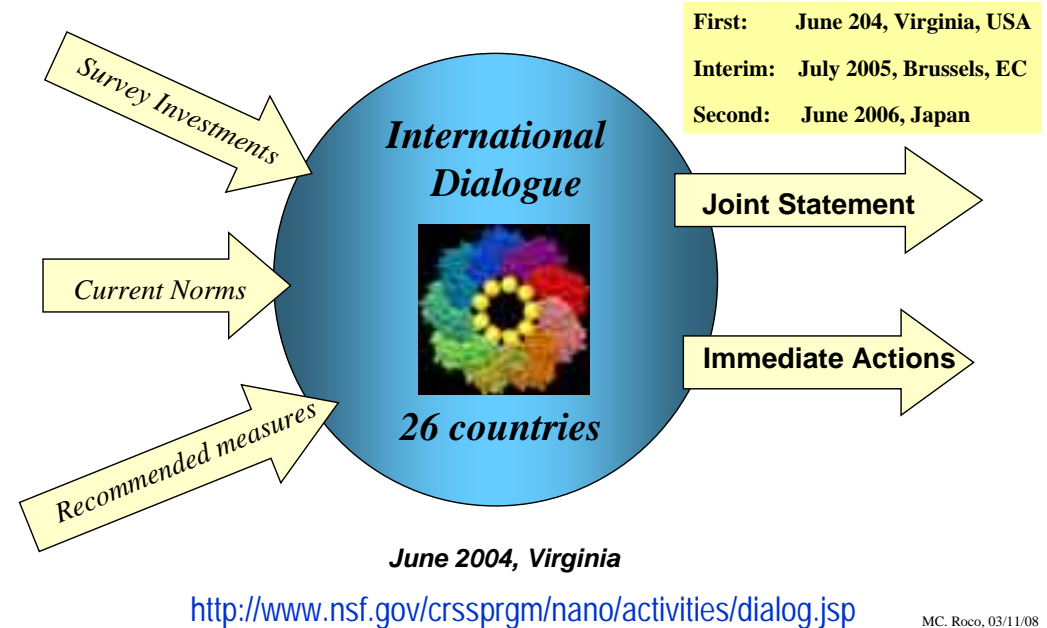
...late entrants included !

Nano Africa 1 (7 April 2004, Stellenbosch)

Our efforts will change lives!



First International Dialogue on Responsible Nanotechnology R&D (2004)



First International Dialogue on Responsible Nanotechnology R&D (2004)

- Recurring themes during the dialogue
 - Nanotechnology and regulatory responses
 - Governance: involving public, global
 - Nanotechnology applications and implications
 - Institutional mechanisms for ongoing dialogue
- Recommended future actions
 - Intention to coordinate activities
 - Expanding the dialogue to other stakeholders and countries

First International Dialogue on Responsible Nanotechnology R&D (2004)

Coordinated activities after the June 2004 International Dialogue

- October 2004 / October 2005 - Occupational Safety Group (UK, US,.)
- November 2004 - OECD / EHS group on nanotechnology begins
- December 2004 - Meridian study for developing countries
- December 2004 - Nomenclature and standards (ISO, ANSI)
- February 2005 - North-South Dialogue on Nanotechnology (UNIDO)
- May 2005 - International Risk Governance Council (IRGC)
- May 2005 - "Nano-world", MRS (Materials, Education)
- July 2005 - Interim International Dialogue (host: EC)
- June 2006 - 2nd International Dialogue (host: Japan)
- October 2005 - OECD Nanotechnology Party in CSTP
- 2006 Int. awareness for: EHS, public participation, education

Expanding nanotechnology domains since 2000

- *2000-2001*: nano expanding in almost all disciplines
- *2002-2003*: industry moves behind nano development
- *2003-2004*: medical field get involved with new goals
- *2004-2005*: media, NGOs, public, internat. organizations
- *2006-2007*: new focus on common Earth resources - water, food, environment, energy, materials
- *2007-2008*: increased political-military relevance

MC. Roco, 03/11/08

Changing international context since 2000

- ~ *2000*: Focus on fundamental research; wait & see
- > *2005*: Nano as a technological, economical and strategic advantage for nations and large business
Expanding open source, horizontal growth, open and fast communication, changing the governance environment

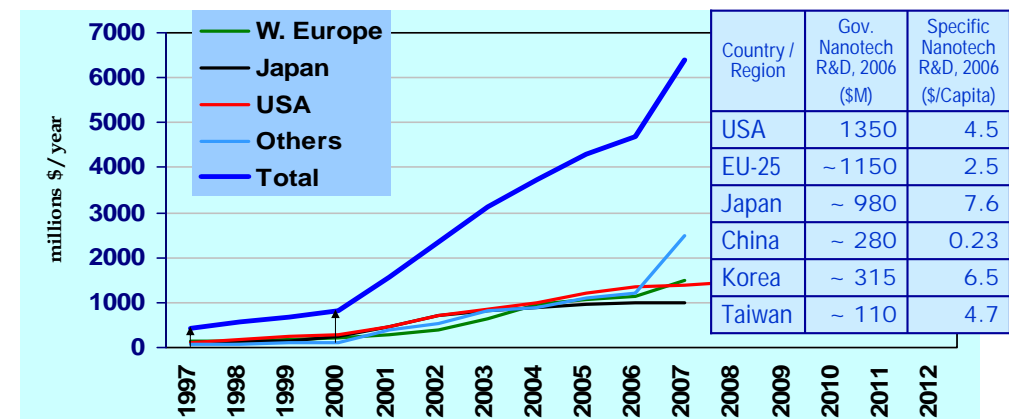
MC. Roco, 03/11/08

Changing public perception since 2000

- *Before 2000*:
Is anything special at nanoscale?
Is nanotechnology important?
When the first products?
- *2000-2003*: Are there self-duplicating nano-bots? www.irgc.org
- > *2003*: What are the risks of "long-term / catastrophic environmental and health events" of nanoparticles?
- > *2005*: Nanotechnology can help sustainable management of global resources (water, energy, ..)
Concern on using nanotechnology in food, x-products

MC. Roco, 03/11/08

Context – Nanotechnology in the World National government investments 1997-2007 (est. NSF)



Seed funding (1991 -) NNI Preparation (vision / benchmark) 1st Strategic Plan (passive nanostructures) 2nd Strategic Plan (active ns. & systems)

Industry R&D (\$6B) has exceeded national government R&D (\$4.6B) in 2006

J. Nanoparticle Research, 7(6), 2005, MC. Roco

The role of the International Dialogue

- Balancing multiple aspects of responsible development
 - Provide society with better means for manufacturing, medicine and environment in order to improve the quality of life and have a sustainable development;
 - Address possible negative effects of nanotechnology analyzed in the general context, and support nano-EHS R&D integrated with science, engineering and medicine.
 - Address ethical, legal and other societal implications
- Exploring broader issues, in longer term, for all stakeholders

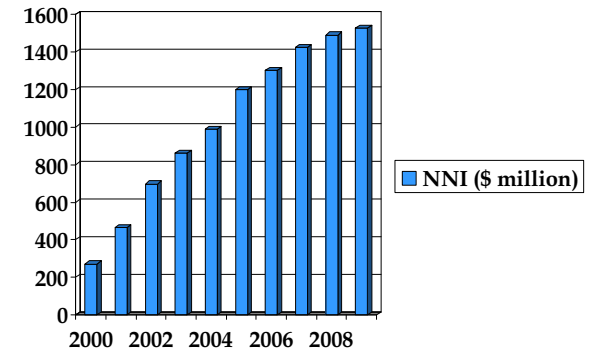
Other international organizations have initiated nanotechnology activities since the first Dialogue in 2004. Those organizations have more focused missions, for their stakeholders. We need to discuss how this role may evolve and what is needed, or what other alternatives may be available

MC. Roco, 03/11/08

FY 2009 NNI Budget Request \$1,527 million

MC Roco, 01/10/08

Fiscal Year	NNI
2000	\$270M
2001	\$464M
2002	\$697M
2003	\$862M
2004	\$989M
2005	\$1,200M
2006	\$1,303M
2007	\$1,425M
2008	\$1,491M
R 2009	\$1,527M



EHS 2006: \$38M (primary; \$68M total eff.)
 2007: \$48M (primary; \$86M total est.)
 2008: \$57M (primary; \$102 total est.)
 2009: \$76M (primary - planned)

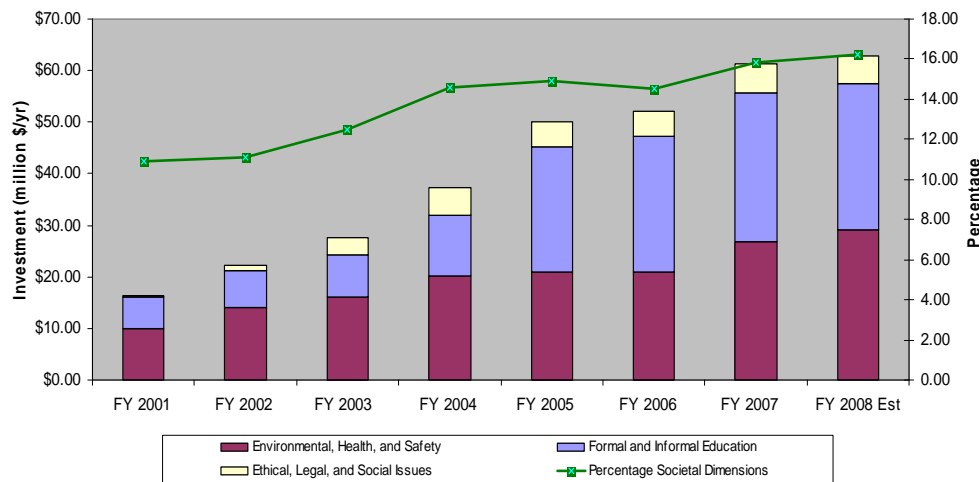
NNI / R&D ~ 1/4 of the world R&D
 NNI / EHS > 1/2 of the world EHS R&D



NSF Investment in Societal Dimensions of NT

Of FY 2008 NNI / NSF of \$390 M, \$63 M or 16.2% is for SI, and \$29.2 M (7.5%) for nano EHS

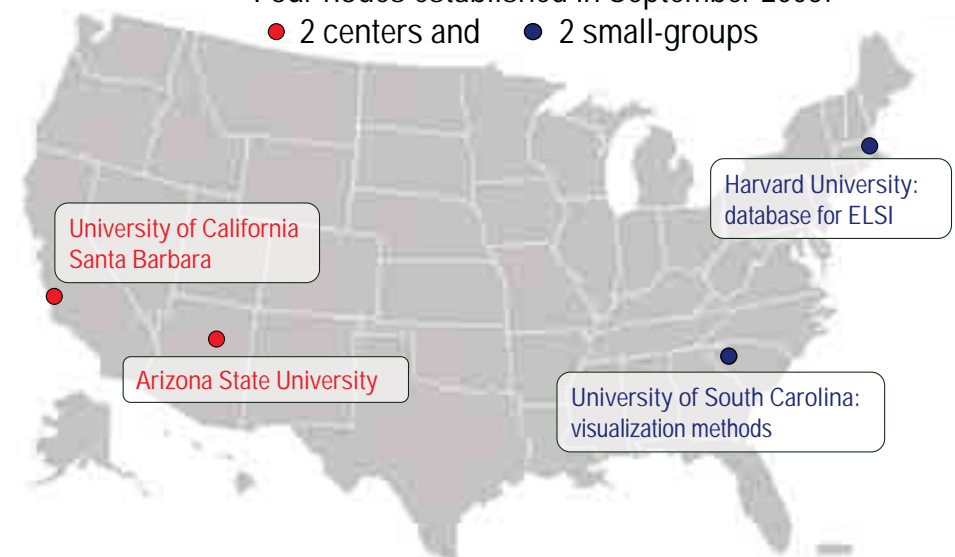
New NSEC in 2008: Environmental Implications of Nanotechnology (NSF, EPA)



MC. Roco, 03/11/08

NSEC: Nanotechnology in Society (one of 4 SI networks)

Four nodes established in September 2005:
 ● 2 centers and ● 2 small-groups



To address Ethical, Legal and other Social Issues related to Nanotechnology

11 March 2007

Good morning Ladies and Gentlemen

It is my great pleasure to be here and make a greeting on this international dialogue.

First of all, I would like to extend my gratitude to European Commission and staffs in Brussels for their efforts in preparing this meeting.

The last meeting, that is, the second International Dialogue on Responsible Research and Development of Nanotechnology was held in Tokyo about 2 years ago.

Based on the valuable outcomes of the first International Dialogue held in United States, many participants from 25 countries have discussed wide range of issues relating to nanotechnology.

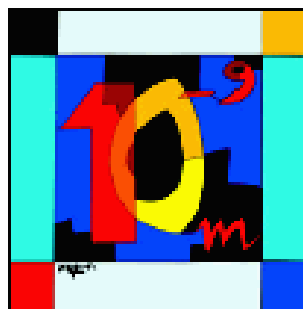
Since then R&D of nanotechnology is evolving steadily in various science and technology fields towards exploring discoveries and industrial applications. However, at the same time, we have to pay attention to the relationship between our sustainable world and nanotechnology. The reasons are as follows.

Firstly, it is expected that nanotechnology has potential to solve energy and environmental problems. Secondly, efforts are being made for standardization and technology assessment in nanotechnology, which will be beneficial for manufactures and consumers, at the same time. Thirdly, public engagement is always essential for every country in order to promote this key technology of 21st century.

Finally, I hope all the participants will get many possibilities to extend each goal through this international dialogue in Brussels.

Thank you very much for your kind attention.

(Yujiro Naruse)



SPECIAL LECTURE

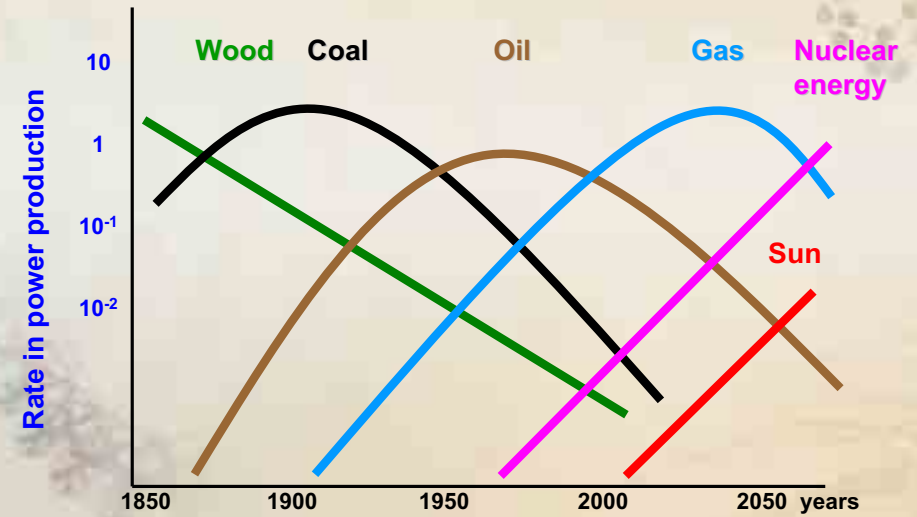
The new Russian programme in nanotechnology,
Mihail KOVALCHUK (Russian Federation)

NANOTECHNOLOGY IS THE BASIS FOR NEW POSTINDUSTRIAL ECONOMY

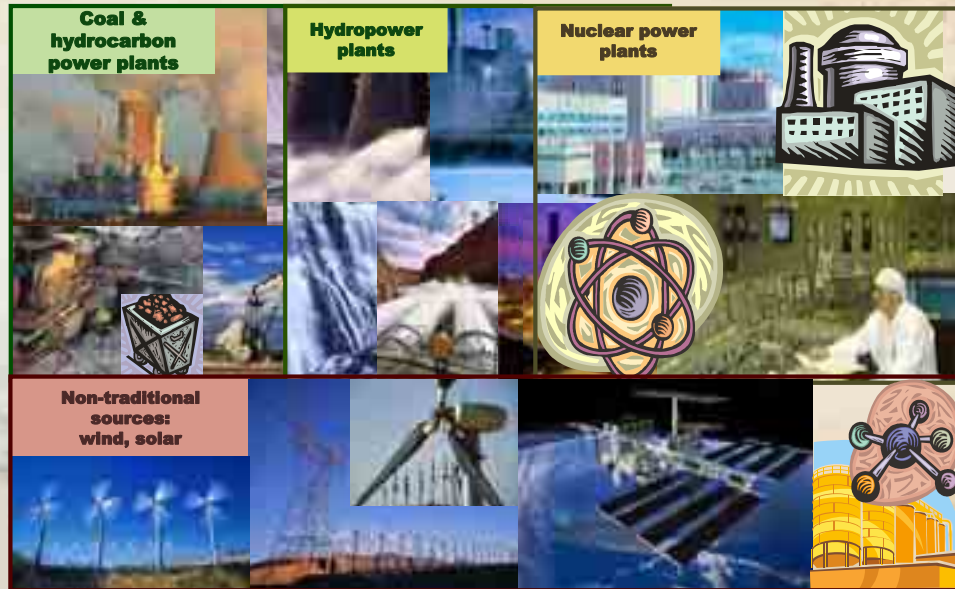
M.V.Kovalchuk

3rd International Dialogue on Responsible Research and Development of Nanotechnology, Brussels, 11 March 2008

ROLE OF THE MAIN ENERGY SOURCES



ENERGY PRODUCTION



FUTURE DEVELOPMENT



Energy

Production



Saving

Nanotechnology

- Dematerialization of manufacturing
- Decrease of resource and energy consumption



From bulb to LED



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SCIENTIFIC REVOLUTION OF THE XX CENTURY

- ♦ Discovery of the structure of atom and nucleus
- ♦ Transition from the classic to quantum model of the world
- ♦ Scientific revolution - «Atomic project»
from accelerator
→ to atomic bomb
→ to nuclear power plant
- ♦ New world model
science, technology, weapons,
power engineering, geopolitics ...



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UNDERSTANDING OF THE WORLD

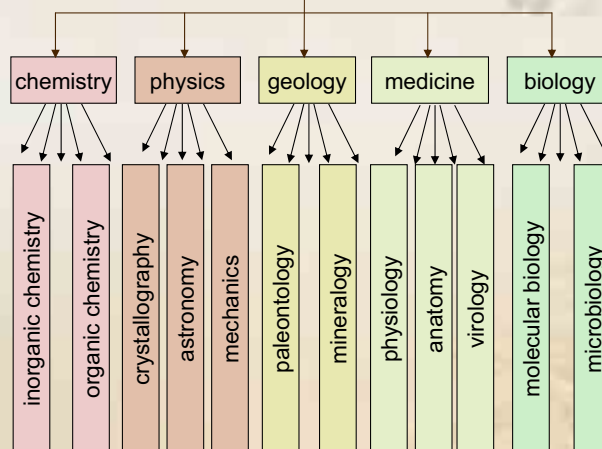
Nature as
the unique single world
(low level knowledge)

Segmentation of nature

Specialization of
science and education

Branch type economy

NATURAL SCIENCE



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INDUSTRIAL DEVELOPMENT

Branch technologies:

metallurgy, chemical industry, building materials, mining operations, etc

Integrated inter-branch technologies:

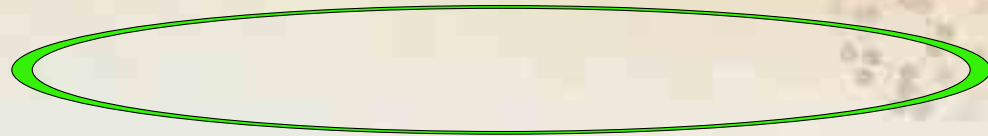
microelectronics, engineering industry, power engineering, etc

Over-branches technologies: Information technology



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Information Technology (IT)



- inorganic chemistry
- organic chemistry
- crystallography
- astronomy
- mechanics
- paleontology
- mineralogy
- physiology
- anatomy
- virology
- molecular biology
- microbiology

Information Technology

- inorganic chemistry
- organic chemistry
- crystallography
- astronomy
- mechanics
- paleontology
- mineralogy
- physiology
- anatomy
- virology
- molecular biology
- microbiology

Nanotechnology



- inorganic chemistry
- organic chemistry
- crystallography
- astronomy
- mechanics
- paleontology
- mineralogy
- physiology
- anatomy
- virology
- molecular biology
- microbiology

Information Technology

Nanotechnology

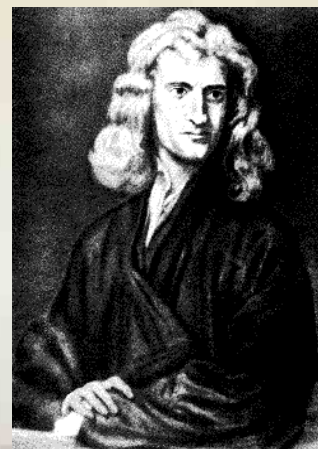
- inorganic chemistry
- organic chemistry
- crystallography
- astronomy
- mechanics
- paleontology
- mineralogy
- physiology
- anatomy
- virology
- molecular biology
- microbiology

Information Technology

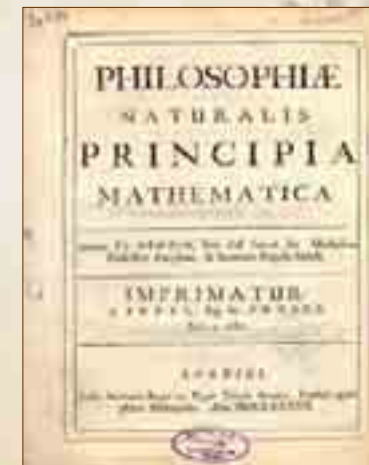
Nanotechnology

NATURAL SCIENCE

Nanotechnology – universal technological basis of postindustrial society

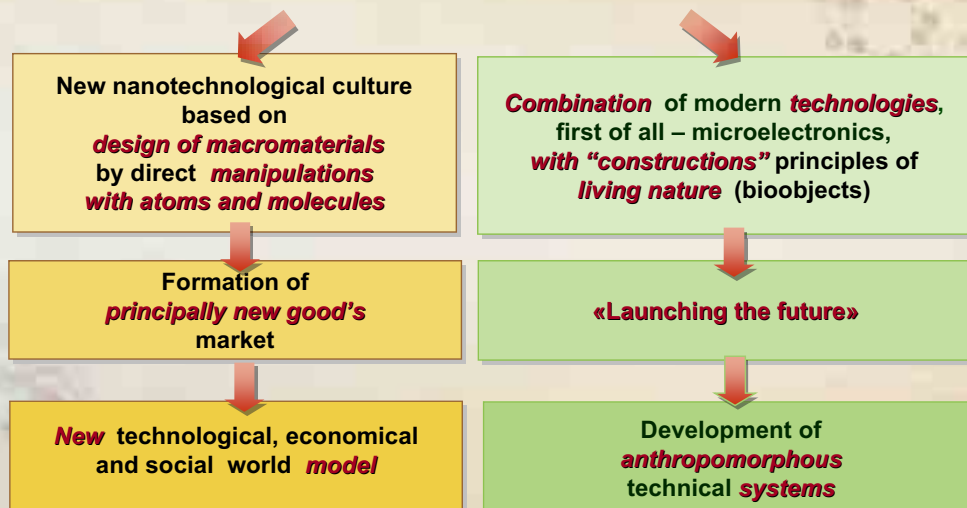


«*Philosophiae Naturalis Principia Mathematica*» (1687)



Isaac Newton
(1642...1727)

NANOTECHNOLOGY



MARKET OF NANOTECH PRODUCTS IN RUSSIA

Products	Products to be ready for market in 3-5 years	Products to be designed in 8-10 years
<ul style="list-style-type: none"> • Nanodispersed materials • Coatings • Composites • Ceramics • Polymers • Catalysts • Membranes • LEDs • Sensors 	<ul style="list-style-type: none"> • Carbon materials • Nanoelectronic devices • Drug delivery systems (nano capsules) • Microsystem devices • Medical diagnostic systems 	<ul style="list-style-type: none"> • Nanobiotechnological products • Hybrid devices and bionics products • Nanobioelectronic systems and devices

DEVELOPMENT and PRODUCTION the NEW TECHNOLOGICAL, METROLOGICAL and DIAGNOSTIC EQUIPMENT for NANOINDUSTRY (TOOLS)



MBE unit



Synchrotron



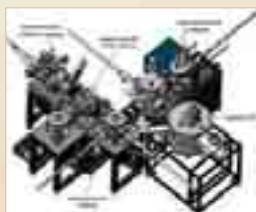
NANOFAB



"Clean room"



Neutron reactor



NANOFAB



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MATERIAL SCIENCE UNDER MICROGRAVITY

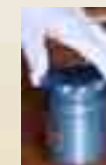
Protein Crystal Growth in Space



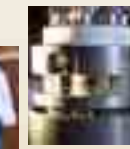
SAICAR synthase



Pyrophosphatase



Lysozyme crystal



Crystal growth cameras



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FORMING OF NANOTECH MARKET

- Integration into existing transnational technological platforms and networks.
- Forming of home market in compliance with the strategic goals for Russian Federation (National Projects).

National Projects – are the instruments for formation of home market for high-technology industry

Medicine

- Noninvasive and low-invasive diagnostics and surgery
- Biocompatible materials
- New drug delivery systems

Housing

- Intellectual living environment
- Water purification systems
- New energy-saving lighting
- Monitoring systems for checking the state of buildings and facilities



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ALGORITHM OF "LAUNCHING" OF THE NANOTECHNOLOGICAL MARKET

PRIVATE-GOVERNMENT PARTNERSHIP

- Creation and/or selection of companies, working in the main directions of R&D
- Intellectual property transfer
- Material and financial investment
- Forming of steady demand (state offers, changing of regulatory basis)

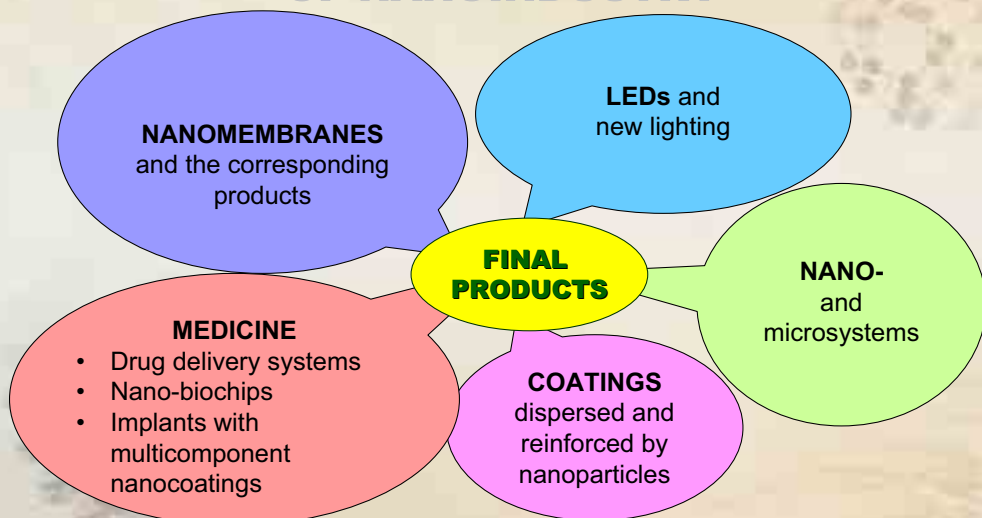
Similar programs in USA – SBIR, STTR, SBIC

Planned increasing of nanoindustrial activity by force of replacement of conventional industrial products by NANO-products (reorganization)



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EXAMPLES OF THE FINAL PRODUCTS OF NANOINDUSTRY



THE MAIN TARGET – SCALE UP THE PRODUCTION

EXAMPLES OF THE FINAL PRODUCTS OF NANOINDUSTRY



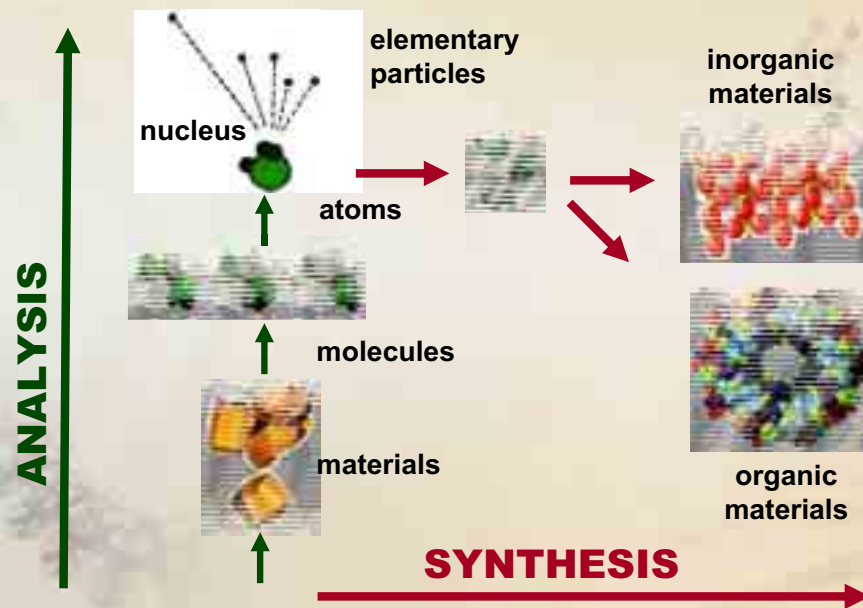
THE MAIN TARGET – SCALE UP THE PRODUCTION

SCIENCE TODAY: SPECIFIC FEATURES

- From **ANALYSIS** to **SYNTHESIS**
- From **MICRO** to **NANO**
- **ORGANICS** ↔ **INORGANICS**
- **MULTIDISCIPLINARITY:**
from “narrow specialization”
⇒ to the “single nature”

New materials is the main priority for scientific development

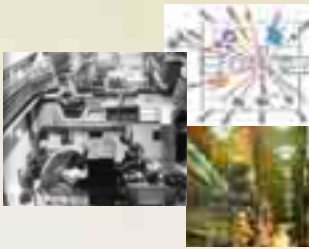
TRENDS IN SCIENCE DEVELOPMENT



LARGE-SCALE FACILITIES



Synchrotron Radiation Sources



Neutron Sources



International Space Station

Way of Analysis:

Large and expensive facilities for small number of scientists

Way of Synthesis:

Large facilities are converted for multidisciplinary application for a wide scientific community

Main Synchrotron Radiation and Neutron Facilities in Russia



Inorganic materials

Organic materials

ATOMIC and MOLECULAR DESIGN

MOLECULAR BEAM EPITAXY

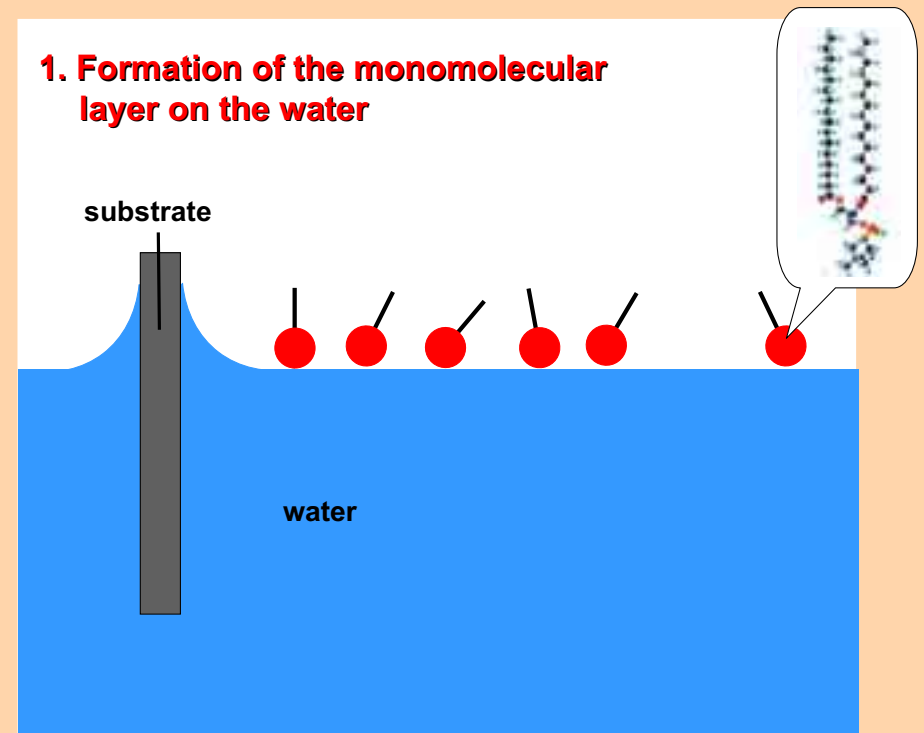
LANGMUIR-BLODGETT METHOD

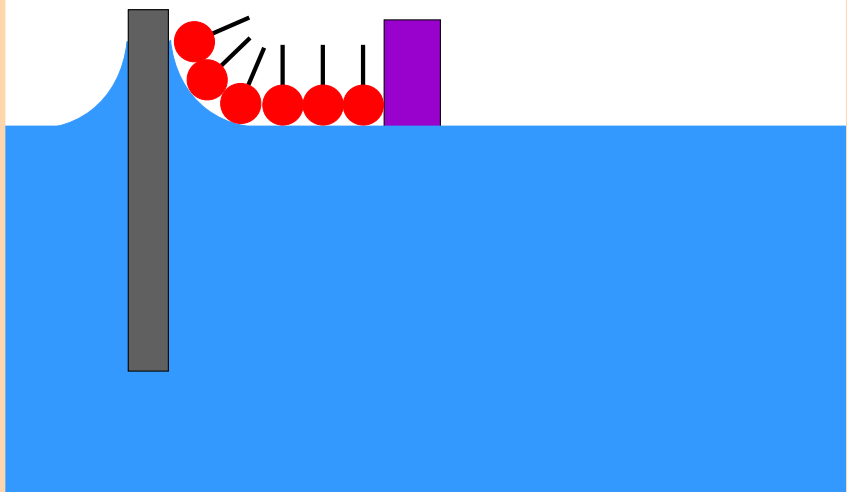
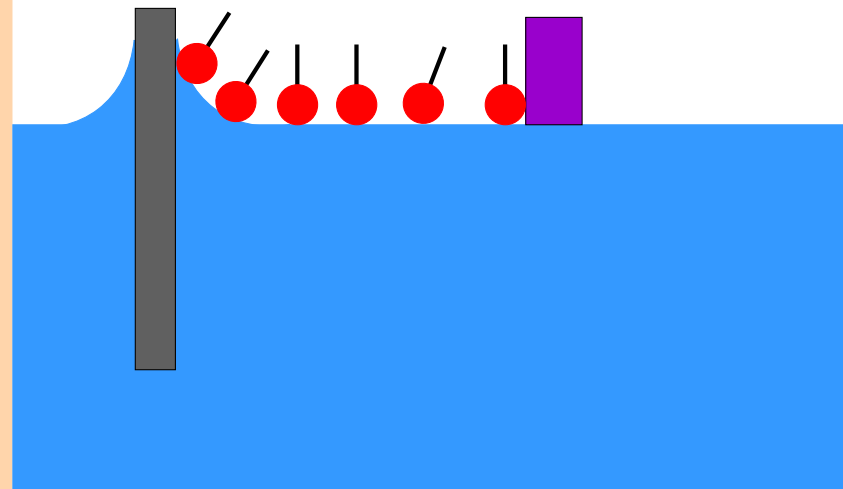
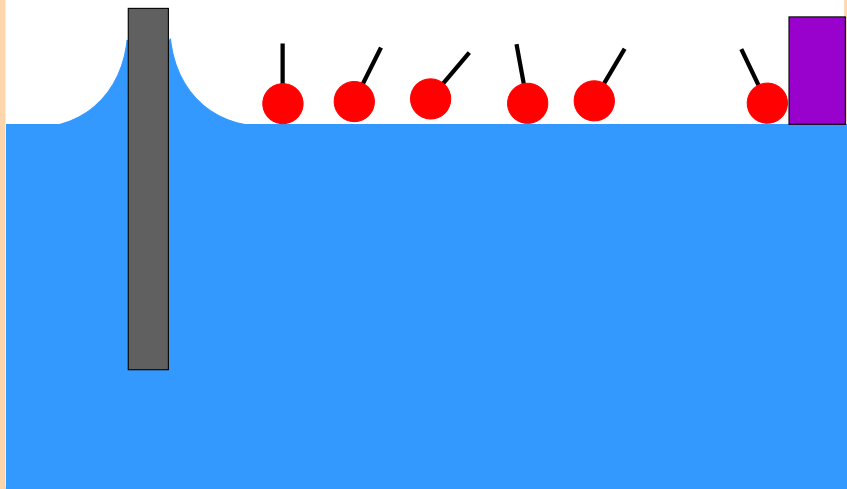
SELF-ORGANIZATION

STRUCTURES WITH QUANTUM DOTS

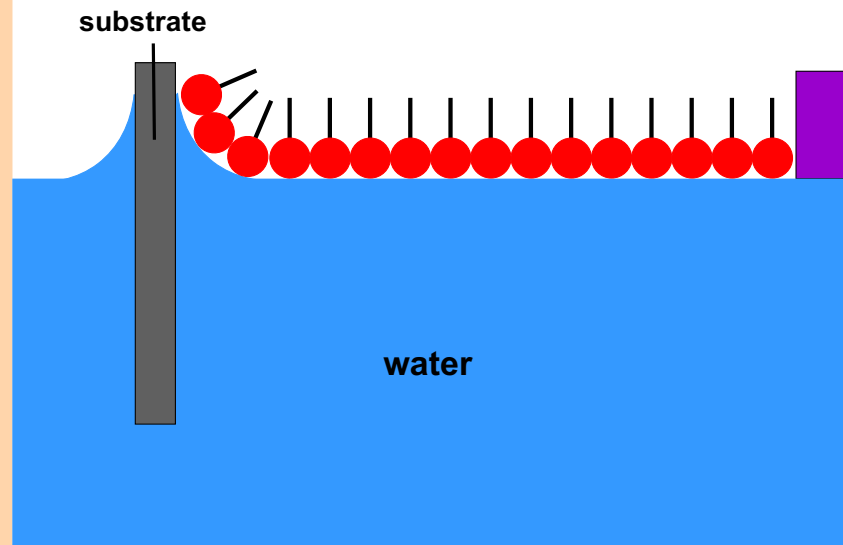
BIO-OBJECTS

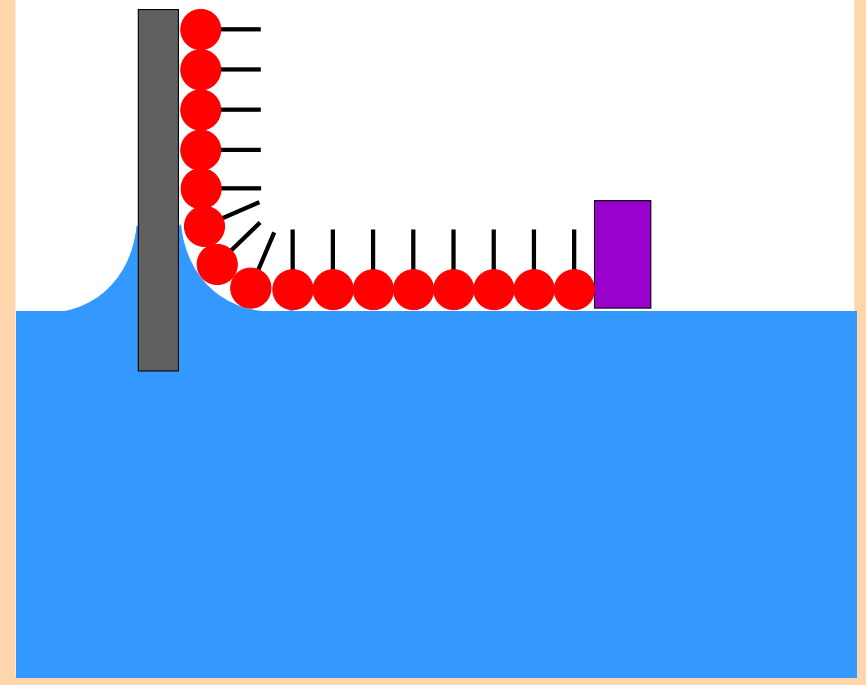
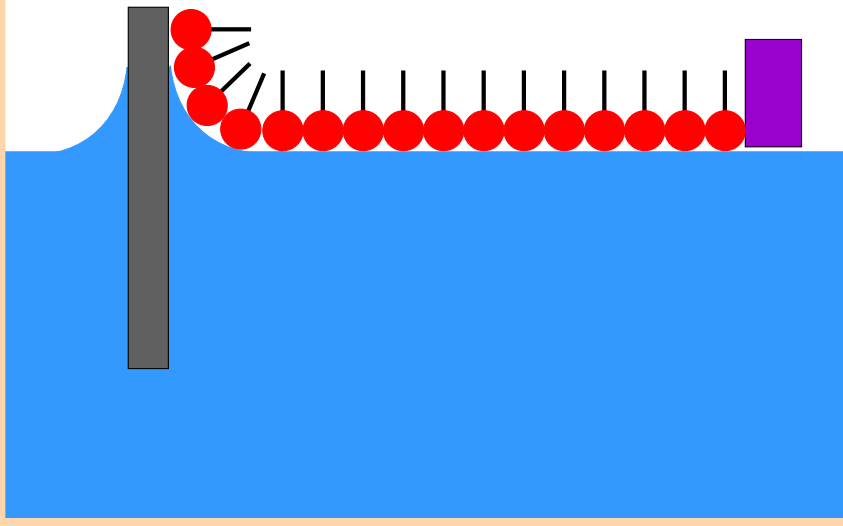
1. Formation of the monomolecular layer on the water



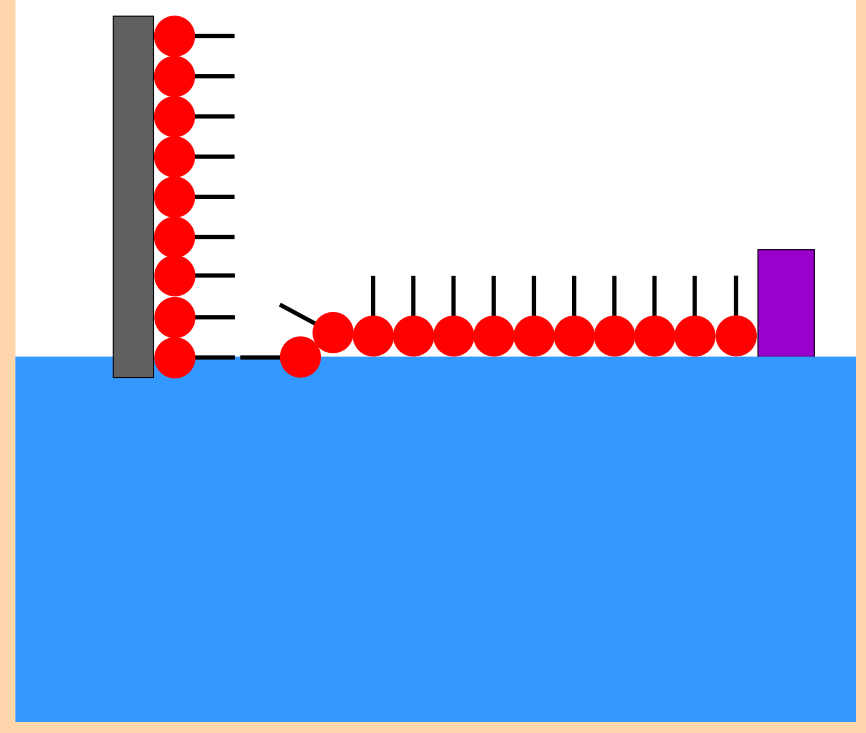
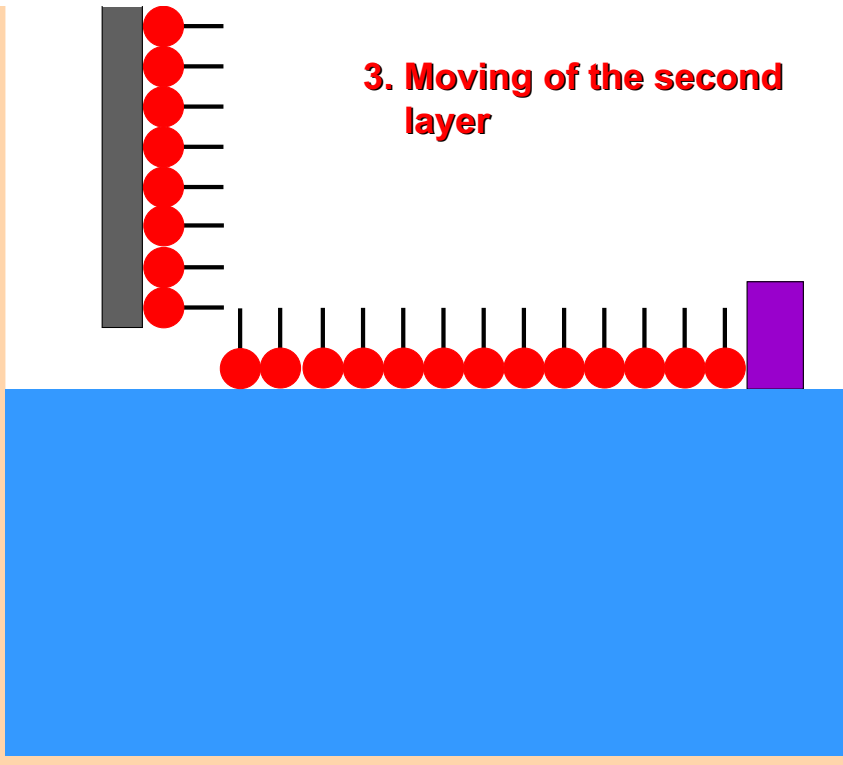


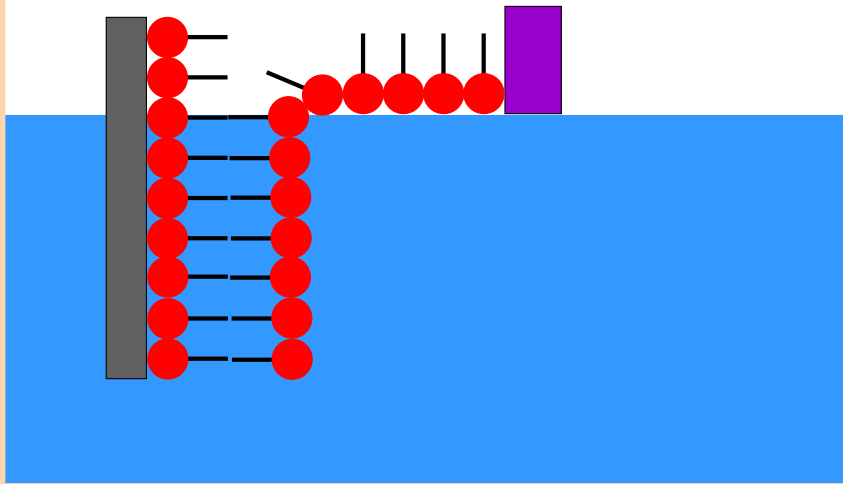
2. Moving of the monomolecular layer onto substrate



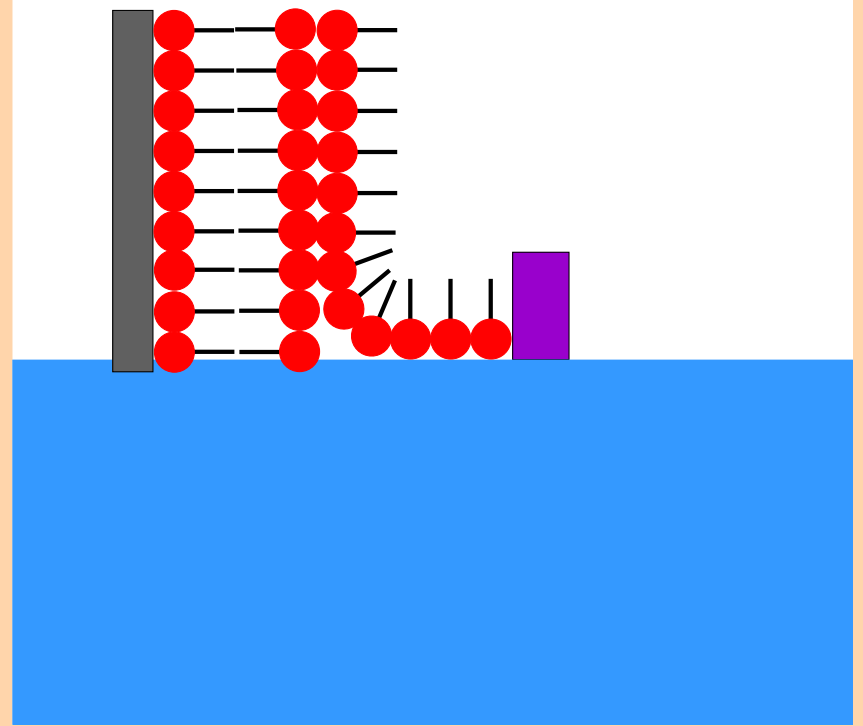
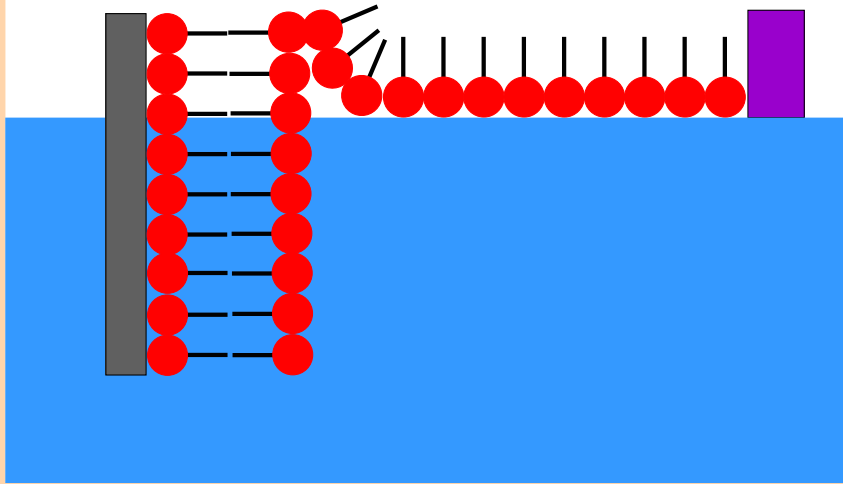
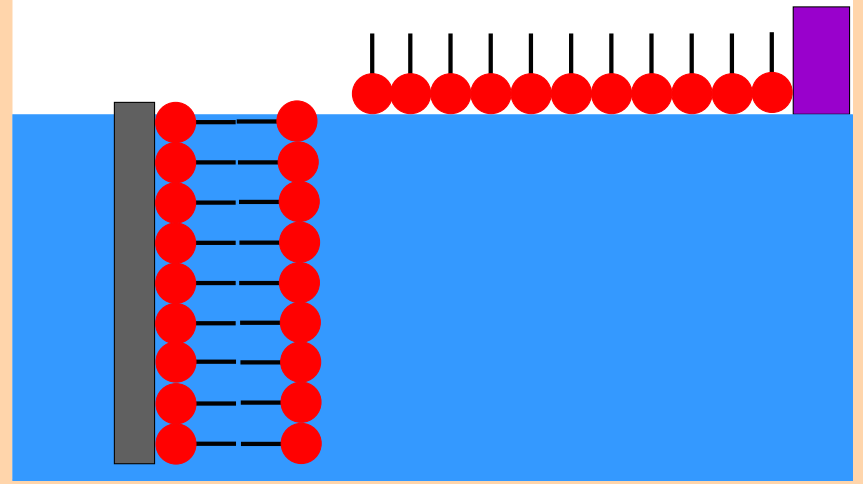


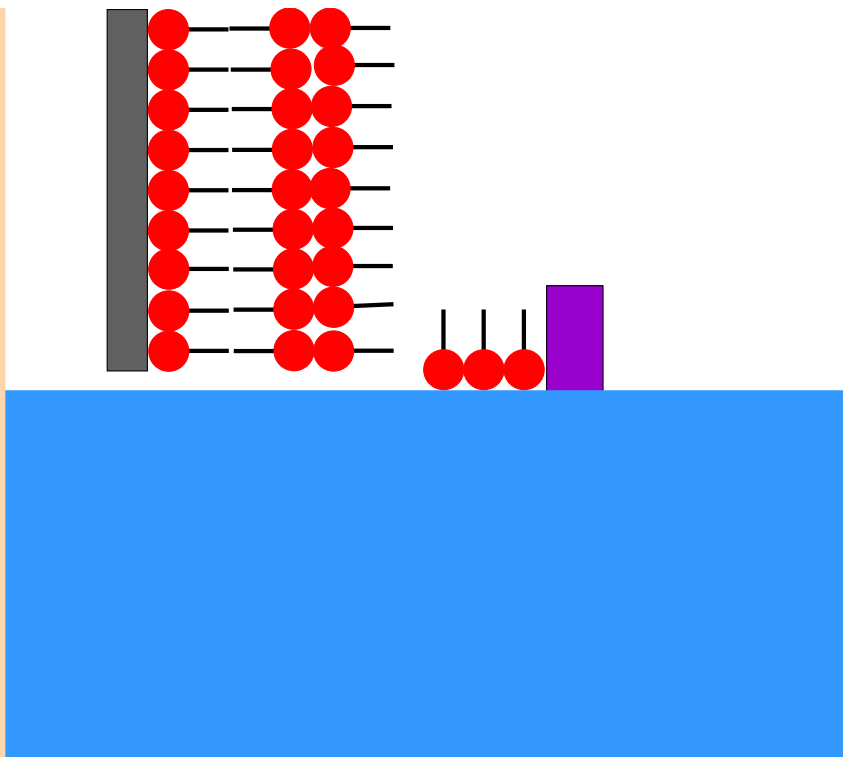
3. Moving of the second layer



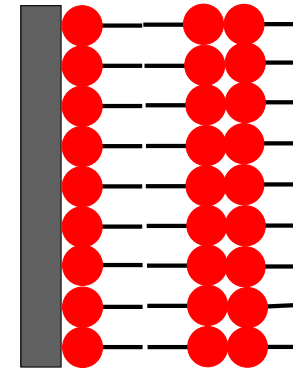


4. Moving of the next layers





Multilayer nanofilm



ARTIFICIAL EYE – THE UNIQUE DETECTOR OF ELECTROMAGNETIC RADIATION



protein of rhodopsin

Investigation of vision
(**physiologist**,
neuroophthalmologist)

Investigation of functions of
rhodopsin molecules (**biologist**)

Separation of proteins
(**biochemist**)

Crystallization of protein,
X-ray structural analysis
(**crystallographer**)

Design of a chip
(**engineer - system analyst**)

Creation of two-dimensional
protein films (**physicist, chemist**)

EXISTING WORLD SYSTEM OF SCIENCE-EDUCATION ORGANIZATION AND ITS FINANCING IS STRONGLY AGAINST INTERDISCIPLINARY APPROACH

Interdisciplinary national labs are the best places
to implement new type of science and education

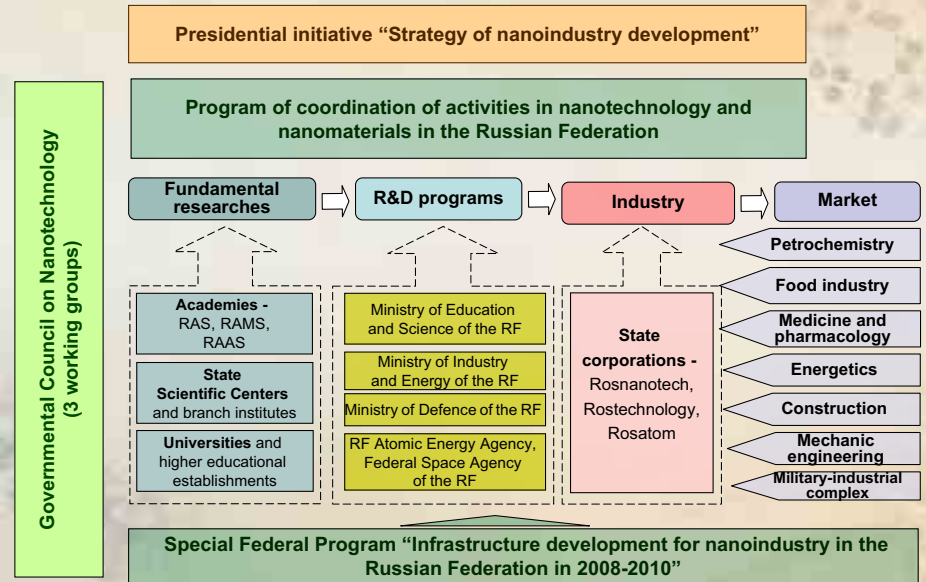
National labs in the globalizing world
are basis of global nanotechnology network

GLOBALIZING WORLD: FROM CLUSTERS TO NETWORKS



**Synchrotron Radiation Facilities:
European + Russian = Network of Excellence**

SCIENTIFIC AND TECHNICAL STATE POLICY IN THE SPHERE OF NANOTECHNOLOGY IN RUSSIA



NANOTECH PROJECT FRAMEWORK

Global character of the Project presumes **network structure**
(National Nanotechnology Network – **NNN RF**)

The key point of network – the leading scientific national institute,
with unique interdisciplinary scientific and technological capabilities -
Russian Research Center «Kurchatov Institute».

Structure of NNN RF

- Leading scientific institutes
 - a) by scientific fields
 - б) by regions (Federal districts)
- Science and education centers
- Technological platforms in all directions (basis of NNN)
- Global computing network (GRID-GLORIAD)



TECHNOLOGICAL PLATFORMS of NNN RF

RESEARCH - TECHNOLOGY

Support of R&D, metrology, basis for standardization and certification

RESEARCH - EDUCATION and HUMAN RESOURCES

Support of interdisciplinary education, high mobility,
quick response to labor-market trends, social infrastructure

INFORMATION TECHNOLOGIES and COMMUNICATIONS

IT integration of national nanoindustry, data bases, monitoring, foresight, GRID,
GLORIAD, remotely controlled experiments

ORGANIZATION and ECONOMY

Commercialization of NANO products, private-public partnership (SBIR)

ORGANIZATION and LEGISLATION

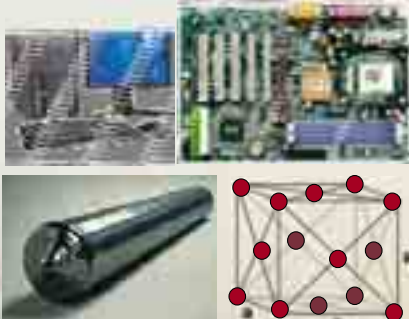
Legal base of innovations in NANO area, intellectual property, standards,
risk insurance

INTERNATIONAL COOPERATION

International scientific exchange, cooperation projects

THE MAIN AIM OF SCIENCE AND TECHNOLOGY DEVELOPMENT IN INDUSTRIAL SOCIETY – IS THE INVESTIGATION OF HUMAN «STRUCTURE» AND CAPABILITIES AND COPYING IN MODEL TECHNICAL SYSTEMS

Model approach of XX century



The main result – solid-state microelectronics technology, reproducible everywhere in the world

Nature



Bio-robotics systems

THE MAIN AIM OF SCIENCE AND TECHNOLOGY DEVELOPMENT IN POST-INDUSTRIAL SOCIETY – REPRODUCTION OF LIVING SYSTEMS

1-st STEP of NANOREVOLUTION:

combination of capabilities of modern microelectronics with progress in understanding of nature (nano-biotechnology)

AIM:

design of hybrid anthropomorphous technical systems of bionic type

RESULT:

platforms for creation of nanobiosensors – new hybrid systems of bionic type



THE MAIN AIM OF SCIENCE AND TECHNOLOGY DEVELOPMENT IN POST-INDUSTRIAL SOCIETY – REPRODUCTION OF LIVING SYSTEMS

2-nd STEP of NANOREVOLUTION:
integration and unification of nano-biosensor platforms, created on the 1-st step

AIM:

Atomic-molecular engineering and technologies, based on self-organization of atoms and bioorganic molecules

RESULTS:

bio-robotics systems



PERSPECTIVE TRENDS FOR R&D ACTIVITIES IN NANOTECHNOLOGY



AN UNIQUE EXPERIMENTAL BASE AND COMPLEX OF LARGE RESEARCH INSTALLATIONS (MEGA COMPLEXES) OF RRC «KURCHATOV INSTITUTE»

- 6 nuclear research reactors
- 14 critical nuclear assemblies
- The first dedicated synchrotron radiation facility in Russia
- TOKAMAK plasma system concept
- Set of “hot” chambers for material study
- Cluster processing line for microelectronics
- Units for isotope separation and complex of radiochemistry laboratories

SCIENTIFIC-EDUCATIONAL INFRASTRUCTURE OF RRC «KURCHATOV INSTITUTE»

Established system of targeted manpower training

SECONDARY SCHOOL

- I.V.Kurchatov School № 1189

FUNDAMENTAL INTERDISCIPLINARY EDUCATION

- M.V. Lomonosov Moscow State University
 - Basic departments:
 - Physics of Nanosystems
 - Neutronography
 - Medical Physics
 - General Physics and Molecular Electronics

- Moscow Institute of Physics and Technology

Basic department of nanotechnology and informatics

ENGINEERING EDUCATION

- Moscow State Technical University n.a. N.E. Bauman
 - Educational centre: «Nanotechnologies, Nano- and Microsystems Technique»*
- Moscow Power Engineering Institute
 - Moscow Institute of Steel and Alloys
 - Moscow Engineering Physics Institute

Total: 23 basic departments and affiliates

TRAINING OF HIGHER QUALIFICATION MANPOWER

- Postgraduate study on 16 specialties
- 6 dissertation councils

INTEGRATION INTO GLOBAL INTERNATIONAL PROJECTS

- **CERN**, (Switzerland, Geneva)
Large hadron collider LHC
- **ITER** (France, Kadarash)
International thermonuclear reactor
- **XFEL** (Germany, Hamburg)
X-ray Free Electron Laser for nano-biotechnology and material science
- **FAIR** (Germany, Darmstadt)
- **Joint Russian-Germany SR Lab**
(Berlin, Hamburg, Dresden, Moscow, St.-Petersburg)



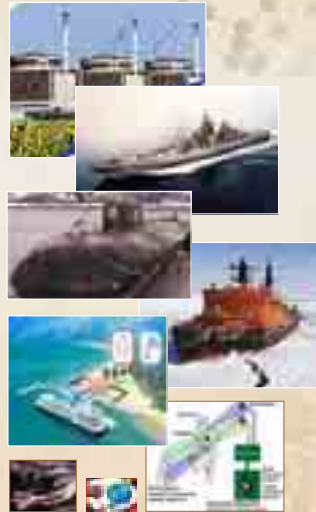
PROGRAM OF INFORMATION-COMMUNICATION INFRASTRUCTURE BASED ON THE BASE OF GRID – GLORIAD TECHNOLOGY

- Backbone nodes of global **GRID – GLORIAD** network
RRC - RAS - MSU
- Information-communication systems as a kernel of **National Nanotechnology Network**



SCIENTIFIC MANAGEMENT ON CREATION AND DEVELOPMENTS, MAINTAINING OF PRODUCTION AND EXPLOITATION IN THE FRAMES OF MAJOR NATIONAL PROJECTS

- **Nuclear power engineering**
 - project of APP-2006
 - perspective innovation projects
- **Ship and space nuclear reactor systems**
 - new generations of power units for atomic fleet and spacecrafts
- **Nuclear fusion**
- **Nanotechnologies and material study**
- **Nuclear technologies in medicine**
- **Decommissioning, territory remediation, non-proliferation of nuclear materials**



CHANGES IN PARADIGM OF SCIENTIFIC DEVELOPMENT

From **ANALYSIS** to **SYNTHESIS**

Main goal:
penetration into
the matter
*(physics of
nucleus and
elementary
particles)*

Main goal:
synthesis of
organic and
inorganic
materials with
given properties
*(material
science)*

THREE STAGES OF MATERIALS SCIENCE

• **Metals**

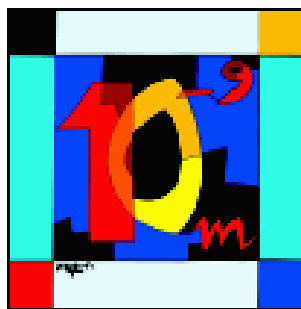


• **Semiconductors**



• **Bio-organics**





PLENARY SESSION 1

NANOTECHNOLOGY GOVERNANCE

Chairmanship: Mihail ROCO (USA)

Keynote lecture: Françoise ROURE (France)

Case study: EU/USA call for proposals on the impact of nanoparticles on health and the environment, Nora SAVAGE (EPA, USA)

Round Table with FAO, OECD, UNEP, UNIDO, WHO
Debate: where synergy can be improved between stakeholders

Round Table on proposed Codes of Conducts: European Commission, Responsible Nano Code, BASF

Nanotechnology Governance

- Plenary Session 1 -

Chair: M.C. Roco (USA)

Keynote lecture: Françoise Roure (France)

Case study: Nora Savage on EU-USA call for proposals

Two round tables

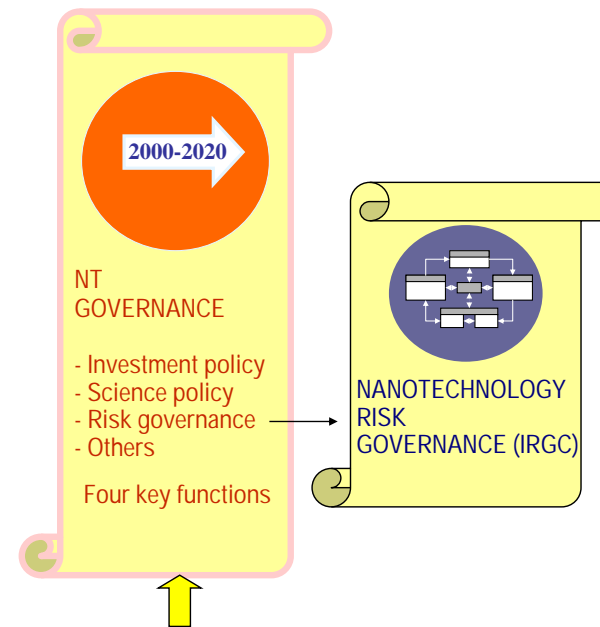
Third International Dialogue, Brussels, March 11, 2008

Governance of nanotechnology development: four roles

- **Transformative**
investment policy, S&T policy, support innovation, prepare pipeline in education, transformative tools
- **Responsible development**
EHS, ELSI+, methods for risk governance, communication and participation, oversight
- **Visionary**
Long-term and global view, human development/progress
- **Inclusive, collaborative**
Building national capacity, international capacity and leveraging

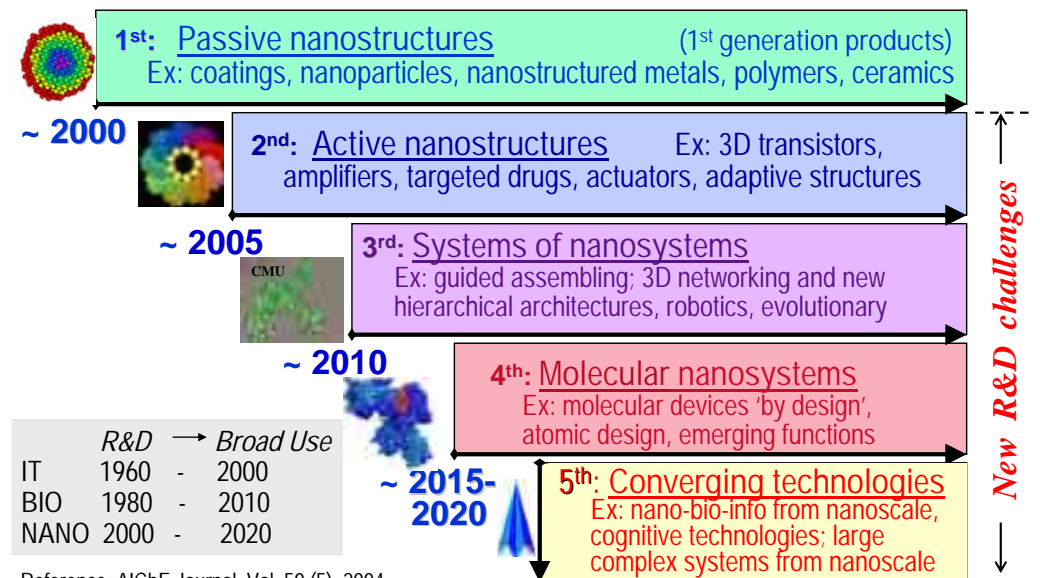
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NT Governance and Risk Governance

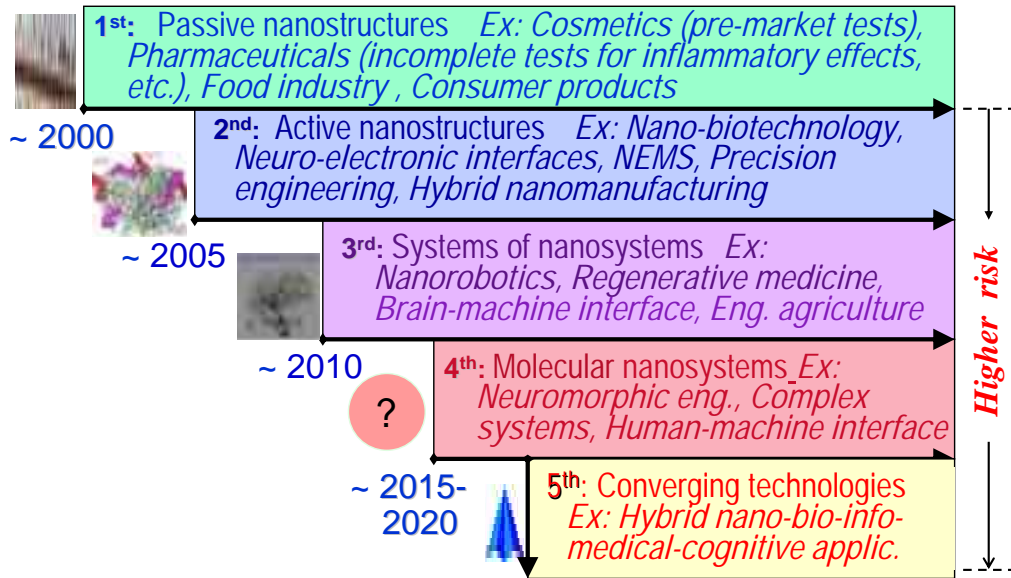


Five Generations of Products and Productive Processes

Timeline for beginning of industrial prototyping and nanotechnology commercialization (2000-2020; 2020-)

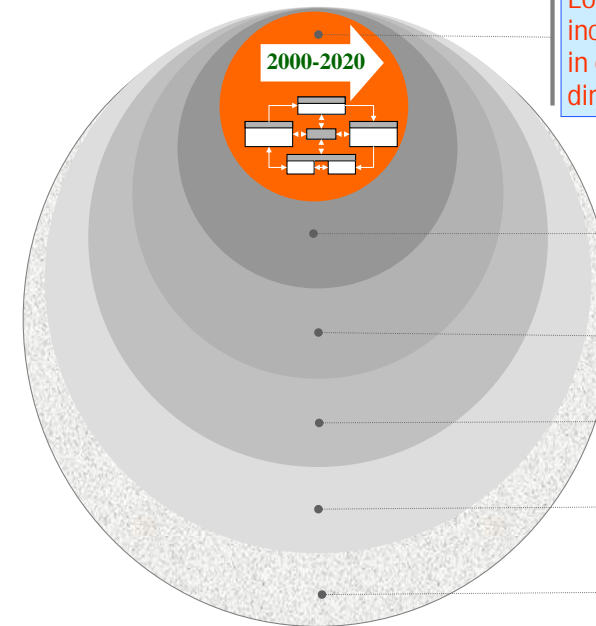


Perceived Higher Risks Areas (2000-2020; 2020-) as a function of the generation of products



M.C. Roco, 03/11/2008

Nanotechnology GOVERNANCE OVERVIEW



Core Governance Process:
Long-term view, transforming, inclusive, horizontal/vertical, priority in education, addressing societal dimensions, risk governance

Main Actors:

- R&D Organizations (Academe, industry, gov.)
- Implementation Network (Regulators, business, NGOs, media, public)
- Social Climate (Perceived authority of science, civil involvement)
- National Political Context
- International Interactions

M.C. Roco, 03/11/2008

Possibilities for a Global Governance of Nanotechnology

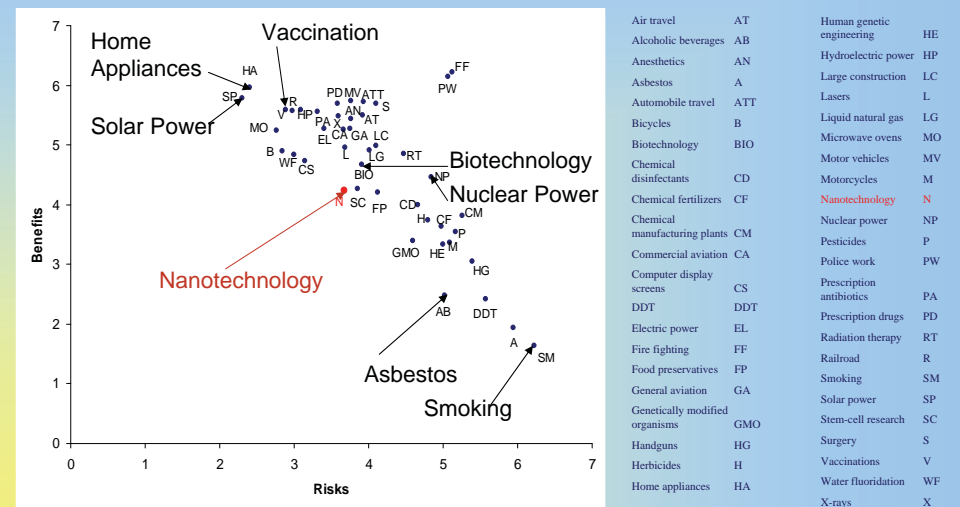
General approach

- Facilitate and provide reference models to the global self - regulating ecosystem (too complex for top-down):
 - open source models of NT development and its institutions, discovery, innovation, education, human resource, informatics
 - emerging and converging technology infrastructure;
 - use economical incentives for accelerating NT production;
 - foster suitable international organizations and agreements
- Focus on bottom-up and lateral interactions and less on top - down measures
 - using political leadership and democratic principles,
 - social consensus in knowledge based societies
- System of global communication and participation in all phases of governance, facilitated by international organizations

Reference: "Global Governance of Converging Technologies", MC Roco, J. Nanoparticle Research (2007)

M.C. Roco, 03/11/2008

Steven Currall et al. Survey on Public's Risk-Benefit Perceptions



Source: Nature Nanotechnology, Dec. 2006, 1:153-155.

NanoConnection to Society: Issues, Approaches, Findings

NANOTECHNOLOGY GLOBAL GOVERNANCE AT THE CROSSROADS :

Towards an structured dialogue on nanotechnology-induced change

Dr. Françoise D. ROURE

3rd International Dialogue on Responsible Research and Development of Nanotechnology. Brussels, 11-12 March 2008, European Parliament.

KEYNOTE LECTURE

Distinguished Colleagues, this is a great honor for me to be invited to address the question of the appropriate model of public governance for responsible research and development of nanotechnology, at a global scale, in a meeting hosted, what is more, by the European Parliament.

I know by experience that from the dialogue between cultures and from a mosaic of cultures can emerge the best fruits for humankind.

Distinguished Colleagues, nanotechnology global governance is at the crossroads. A shared culture of responsible innovation might be the unifying principle that will guide us towards a cooperative approach in our search of an appropriate model for nanotechnology governance.

Since the First dialogue took place, thanks to the cooperative vision and the personal courage of Mike ROCO, and thanks also to the conventional wisdom of our mediators from the Meridian Institute, who were supposed to drive the participants up to the expressions of a consensus where positions were not expected to converge spontaneously, since this First dialogue in Alexandria (Virginia), policy makers have entered a series of initiatives whose first results were perceptible at the Tokyo meeting of June 2006 where the 2nd dialogue took place at the invitation of our Japanese colleagues.

The preparatory meeting of the 3rd Dialogue, held in Cape Town at the invitation of our South

African colleagues, elaborated on an agenda directly issued from the consensus achieved at the Tokyo meeting.

Discussion points of the previous meetings were the following :

- Infrastructure,
- Industrial Property Rights,
- Fighting Against Nano-divide
- Impact on Health and Environment
- Responsible Development, Outreach Programs and Governance and, last but not least,
- Methodology and Assessment, taking into account the concept of **responsible innovation**, presented and discussed by a Dutch expert, Arie RIP.

The Tokyo meeting successfully concluded its works by reaching a consensus on the fact that the International dialogue on responsible research and development of nanotechnology was the only really inclusive place available to address topics of common interest at the level of governments and policy makers.

So, it allowed the process begun in Alexandria in 2004, to find its path to a third meeting, enabling a close shop of participants from all the continents to prepare this meeting. The participants at the 3rd Dialogue preparatory meeting were representatives of South Africa, Japan, the United States and the European Commission (represented by DG Research, assisted, at its requirement, by two experts from Member States, The Netherlands and France). They agreed to focusing the discussions of the 3rd Dialogue on four main topics. Those topics were

- **Governance:** the proposal should focus on the appropriate global governance model for responsible research and development of nanotechnology ;
- **societal engagement:** this item was identified as central to bridging the gap between the development of nanotechnology and the involvement of society;
- **bridging the nano-divide**, ensuring that developing countries are not left behind in the responsible research and development of nanotechnology and would benefit from it, as well as orientating its pervasive applications according to their own needs; this discussion point would be aimed at creating platforms for the meaningful participation

by all, including developing countries, and manpower cultivation for nanotechnology development.

- **and enabling means** (*infrastructure, standardization, intellectual property*), elaborating on the first feedbacks available from diverse existing working parties on nanosafety of manufactured nanoproducts and nanotechnology policy, when and where available (e.g. OECD WPMN and WPN).

It's over four years now since the first International Dialogue took place, and all of us have witnessed, if not promoted, diverse initiatives coming from all the continents. Those initiatives involve many institutions, including multilateral and intergovernmental ones like IBSA, UNESCO, OECD or ISO, as well as others, private, like those conducted by ICON and IRGC for instance. Many initiatives have already blossomed under the leadership of the European Commission, like the preparation of a codes of conduct and implementation of observatories, with a special mention to the efforts made to developing joint international research programs, as we shall see in the case study following this lecture.

Nanotechnology-induced change in the supply side is expected to stimulate innovation in many fields of applications and will have a fundamental impact leading to new products. Russia, Korea, Brazil and Argentina, South Africa, Malaysia, India, Turkey, China, almost all the European Union Member States and the European Commission, most of OECD country members and observers, indeed Japan, Taiwan and Israel, but also countries like Morocco for nanomaterials or Saudi Arabia, - please forgive me for the numerous ones not quoted in this list- , have adopted public policies supportive of research and innovation in the field of nanoscience and nanotechnology, some if not most of them including a precautionary approach as regards health, environment, legal and ethical issues as well as systemic risks in the long run.

This means that, already, and whether we like it or not, **an appropriate model for nanotechnology-induced change should not afford anymore letting a subset of countries left behind. An appropriate model for nanotechnology-induced change and the related global and dynamic frame it may design, should not be designed by a subset of countries** deciding in all the others' place, if not in their name, because it has too many potential impacts on the international specialization of nano-skills, production, added-value, as well as the conditions of trade and the incentives given to sustainable development.

I do believe that the International Dialogue has reached, right now, the capacity to unifying, under a integrated model and frame the constituent elements of a global nanotechnology governance, that until now have expanded separately. I do believe that this process has the power to shortening dramatically the time to delivering to all stakeholders, the low hanging fruits of nanotechnology, under a responsible, transparent, inclusive, structured governance, in particular in the long expected field of nano-medicine,

I shall address four challenges around the constituent elements **of an appropriate, integrated global nanotechnology public governance: those challenges for public policy makers are mainly:**

- **1. Designing a global frame for responsible development of nanotechnology**
- **2. Understanding the huge impacts of convergence at the nanoscale**
- **3. Relying on a commonly agreed, on going normative assessment methodology**
- **4. Being accountable for the visions, and eventually decisions and measures taken.**

The first challenge must, by nature, be addressed at a level of synthesis. In my view, the three other challenges deserve being addressed by relevant, specialized experts.

How to address properly those four constituent elements, is *the* real task of the International Dialogue if we want to improve the quality of public decision-making and meet the requirements of citizens, consumers and actors of the supply side.

The Alexandria process is leading us towards a **major initiative**, which might rely for its implementation on **an intergovernmental, inclusive panel of experts on nanotechnology-induced change (IPNiC), referred to hereinafter as « the Panel »**. The core mission of this Panel would be to providing vision and proposals related to the four building blocks of an integrated model of public global governance on nanotechnology. This Panel would report to the Intergovernmental, international Dialogue on responsible research and development of nanotechnology, and would rely on a set of subgroups led by geographically well-balanced and specialized steering groups.

The first challenge for an appropriate model of nanotechnology governance would be to **design a coherent, global frame, dedicated to preparing public policy** in the following fields:

- establishing a level playing field for international trade of nano-enabled goods and services;
- adapting the current regulatory frameworks to transformational technologies converging at the nanoscale, towards a predictable, innovation friendly, regulatory framework; *synchronizing, harmonizing and monitoring* “regional” implementation of the framework
- filling emerging gaps related to access to the benefits of nanosciences and nanotechnologies;
- strengthening informed trust of all stakeholders where concerns related to industrial safety, and the living, emerge.
- implementing the Millennium objectives for/by global governance of nanoscience and nanotechnology.

As the number and the complexity of international transactions and decisions grow in this field as a result of convergent and cross-disciplinary technologies, a framework for global legal authority, transjudicial cooperation is needed¹. An integrated model of nanotechnology governance, *inspired by the Panel*, would help ensuring the transition between a decision-making process made by a few, to decision-making process involving more stakeholders. Intellectual Property Rights, technology transfers and control, litigations and trials, and the economic models derived from the law, are at stake, as well as **responsible, pervasive innovation** induced by converging technologies at the nanoscale.

The Panel could aim at inspiring to the International Dialogue, an *operational* nanotechnology public global governance model, in a useful, practical way dedicated to public policy makers, who carry on their own, non transferable responsibilities.

The second challenge consists in understanding the huge impacts of nanotechnology and of convergence at the nanoscale.

With respect to networking and data/information sharing, the participants to the 2nd Dialogue stressed the need to share information and data for sustainable development and risk/impact

¹ MILLER Sonia E. « Confronting Tomorrow: U.S., E.U. Legal Frameworks Ill-equipped for Technology 's Future". “ New York Law Journal December 07, 2004 Vol. 232 109

assessment, and to rely on databases incorporating scientific data and basic knowledge. For the Panel, designing an *appropriate* global framework would require intelligence of the quickly evolving states of the arts. It necessitates:

- ensuring existing data *sharing*, to the greatest extent possible, following a reasonably and non discriminatory attitude (RAND);
- organizing data for data mining analysis and synthesis;
- giving incentives for data creation, if necessary (ex: reproducible, standardized test beds for nanoparticles...);
- defining relevant, commonly agreed, published indicators (science and technology indicators, publications indicators, patents indicators), including indicators coming from Social Sciences and Humanities, and in particular addressing opinions, and gaps between risks and perceived risks;
- helping relevant actors to networking (OECD, and non OECD for example). This might mean connecting observatories in an international network and, if no such observatories are available, promoting their creation. There is such a Nano-observatory now going on in the European Union, thanks to the 7th R&D Framework Program and thanks to the responsible vision developed by the Directorate General Research.

Numerous surveys realized and published in the fields of toxicity and eco toxicity indicate that there is a need for research to provide information of the behaviour and fate of the nanoparticles in the environment. The stakeholders' replies generally underline the need to undertake actions in this field. For instance, the societal implications, including dialogue and discussions on regulation were highly represented in a survey conducted by the European Commission in 2006, even if no specific mention of such implications had been explicitly proposed in the consultation.

The Panel could act as a catalyst for a new kind of network or virtual body, to be demonstrated as a first, accessible and modest step, to be undertaken separately but simultaneously on “regional” basis. In particular, multilingualism should be actively promoted in order to allow and boost appropriation and education.

The 3rd challenge consists in designing and setting up a commonly agreed, ongoing assessment methodology of nanotechnology-induced change.

In order to translate intelligence of the state of the art into observation for *monitoring* the responsible development of nanotechnology, the Panel could elaborate and propose a common, dynamic methodology of risks and benefits assessment dedicated nanotechnology-induced change. The Panel could focus on this methodology, aiming at improving the quality of public policies and private decisions, and rely on multidisciplinary scientists as well as experts. Action could begin with simple, basic objectives, and be open to on-going improvements. *Voluntary peers reviews*, in particular in the field of decision process, have already been stressed as relevant. (by IRGC and Transatlantic dialogue PST conference, at least...)

The International Dialogue could rely on the proposals made by the Panel to prepare a structured international, institutional (inter-governmental) agreement on this methodology, to be implemented at the global scale and tested on a *voluntary* basis.

This dynamic assessment should rely, as already mentioned, on the relevant public and private initiatives undertaken and would benefit from the following characteristics:

- multistakeholders support, at least public **funding** and involvement, including major international institutions like WHO and UNEP;
- multi criteria approach (Science and Tech, ELSA+, Educational gap, Public security and defence,...which are of critical importance for the appropriation of the results by all the stakeholders. “Science and technology indicators as well as other indicators mentioned, “can give insights, for instance, into the stage of maturity of a given technology, and may be used to depict scenarios for future evolution and for decision makers to design an appropriate strategy”.²
- Inclusion of demand side and users concerns and requirements (citizen/customer/gender/special interest /handicapped and ill...), upstream participation.
- short term as well as **systemic, long term approaches** of nanotechnology-induced change.

² COMPANO R, HULLMANN A. “Forecasting the development of nanotechnology with the help of science and technology indicators”. European Commission. 2002 IPO Publishing, 26 April 2002

Giving this panel the responsibility to design an early warning/ early listening process in specific fields, could be an issue of common interest in the short run. This proposal could be extended to a broader scope. It echoes a recommendation made by a German study related to Industrial applications of nanomaterials : “ A proactive approach should be taken to advance scientific knowledge, develop appropriate monitoring and warning systems, and, if necessary- adjust existing legislation and regulation.”³

The 4th challenge is to ensure that the International Dialogue is fully accountable for its own, specific responsibility and added-value.

The International Dialogue should be **accountable** for its actions and make them visible and legible. The 2nd Dialogue has already made this recommendation. in Tokyo.

Participants to the 2nd Dialogue required that the proceedings of the meeting would be published on the Internet. Many thanks to our Japanese colleagues for the very good report they published in 2006, and their wish to promote it.

This report stressed that: “*The IDR of N&N should be accountable of its action, fully transparent, in order to strengthen both legitimacy and efficiency.* Global support, “soft law” improvement, best practices selection, sharing and dissemination will be inspired by the adequate positioning of the public policy makers, in particular their action in favour of a global framework, provided that the process remains clear, readable, predictable and inclusive. In particular, the benefits of nanosciences and nanotechnologies as enablers deserve being promoted actively, because this part of the assessment is below the medias short-term interest. So the IDR should adopt a balanced approach of risks and benefits and be “results oriented».

The first step for being accountable begins with transparency on outputs.

Our distinguished Irish Colleague from FORFAS, Seamus BANNON, inspired us by a recommendation he made for the preparatory meeting of the 3rd Dialogue, to ensure that the publications proposed would be put together in a Global publication on the best papers on “responsible R&D”, with a geographic balance in terms of papers included, and promoted as a Dialogue output. He wished this publication had a wide readership. I should be tempted to add

³ VDI Technologiezentrum. August 2004. www.zukuenftegetechnoogien.de

to his recommendation that, for a better impact, the International Dialogue should adopt multilingualism for its publications.

Distinguished colleagues, there are others steps ahead of us. Those are how we do structure our action to addressing the four challenges addressed.. Now, market actors as well as citizens urge policy-makers to provide a clear, integrated frame for an appropriate global governance. Despite the remaining divisions, global, informal cooperation only is no more an acceptable option. But entering a structured cooperation among public policy-makers is going to take courage.

Yes, deciding to design a global nanotechnology governance frame is going to take courage.

This is going to take imagination.

This going to take creativity.

This is going to take full commitment from public policy-makers and International institutions like WHO and UNEP.

This is going to take the related, time-consuming investments.

But this deserves being done for the greatest and widely shared welfare of all of us and of the following generations.

Many private stakeholders, national or global players, and the financial and insurance sector, have conducted for themselves extensive works and discussions to establish the global frame that would be the most relevant according to their own needs. They are now in a good position to bring an important added-value to the public decision-makers, as the public nanotechnology governance model is at stake. I presume that a constructive, on going dialogue among public and private decision makers must be promoted, in particular in the field of applied research and information sharing related to toxicology and ecotoxicology.

In conclusion, the Alexandria process has led us towards considering a major initiative, which might consist in **structuring the Dialogue with an intergovernmental panel on nanotechnology-induced change (IPNiC)**, whose mission would be to providing vision and proposals to the next Dialogues, in our common search of an appropriate model for global governance on nanotechnology.

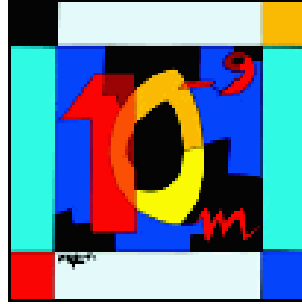
Dear colleagues, most of you have made a long trip to come here in Brussels, and this 3rd Dialogue should not be a meeting for nothing as the future of nanotechnology governance is concerned, notwithstanding the great interest of the presentations. So,

- either we take the opportunity of this 3rd Dialogue on responsible research and development of nanotechnology to structuring it by an Intergovernmental Panel, - the Panel would be given the mandate to prepare the terms of references to be proposed in order to secure the relations between the Dialogue and the relevant international institutions identified as having legitimacy to carry on this task, at least the World Health Organisation (WHO/ OMS) and the United Nations Environment Program (UNEP/PNUE),
- or we shall face political and societal unrest with a loss of trust in the ability of public institutions to provide appropriate nanotechnology governance, as well as legal uncertainty , both with deep, long lasting and, unfortunately, predictable consequences on the market side.

Personally, I should be tempted to bet on the first, positive side of the alternative, and I am quite confident that a consensus will be reached, the sooner the better.

Thank you for your attention.

Dr. Françoise D. ROURE
Economist, Inspector general



ROUND TABLE 1

WHERE SYNERGY CAN BE IMPROVED BETWEEN STAKEHOLDERS ?

FAO, OECD, UNEP, UNIDO, WHO.

FAO/WHO Expert Consultation: Food Safety Implications of Nanotechnology Applications in the Food and Agriculture Sectors

Deon Mahoney
FAO, Rome



Background

- Huge potential for nanotechnology in food and agriculture, however our knowledge of the human health effects of engineered nanomaterials or nanoparticles and their implications for food safety and food regulation is incomplete:
 - FAO/WHO seek to provide Member States with advice on identifying and understanding the potential risks
- Joint FAO/WHO Expert Committee on Food Additives (67th Report):
 - Affirmed that neither the specifications nor the acceptable daily intakes for food additives that have been evaluated in other forms are intended to apply to nanoparticulate materials

3rd International Dialogue on Responsible Research and development of Nanotechnology [11-12 March 2008]

2

Expert Consultation – Objectives (Draft)

- To develop a common view of actual and anticipated nanotechnology applications in the food and agriculture sectors and of their implications for food safety;
- To share lessons learned by those countries that have already initiated programmes to assess and manage food safety concerns associated with nanotechnology applications in the food and agriculture sectors;
- To agree on priority actions that are needed to identify and control potential food safety hazards associated with nanotechnology applications in food and agriculture; and
- To develop guidance on the possible roles of FAO and WHO in promoting sound governance of food safety issues linked to nanotechnology applications

3rd International Dialogue on Responsible Research and development of Nanotechnology [11-12 March 2008]

3

Next Steps

- Core Group Meeting (May 2008) - Purpose is to progress the planning and preparation for the Expert Consultation (scheduled for late 2008)
- Expert Consultation
 - 3-4 day session
 - ~15 Experts plus Authors of Review Papers
 - FAO/WHO Secretariat
- Identified priority actions

3rd International Dialogue on Responsible Research and development of Nanotechnology [11-12 March 2008]

4



Intergovernmental Forum on Chemical Safety
Global Partnerships for Chemical Safety

5 INF

Contributing to the 2020 Goal

IFCS/FORUM-VI/5 INF
Original: English
7 February 2008

FORUM VI
SIXTH SESSION
OF THE
INTERGOVERNMENTAL FORUM ON CHEMICAL SAFETY

Dakar, Senegal
15 – 19 September 2008

Activities on Nanotechnologies in the IOMC Organizations

Prepared by: OECD Secretariat at the request of the IOMC

ACTIVITIES ON NANOTECHNOLOGIES IN THE IOMC ORGANIZATIONS

This paper has been prepared by the OECD Secretariat at the request of all IOMC organisations. It has been prepared for Forum VI of the Intergovernmental Forum on Chemical Safety (IFCS). It summarises the activities related to nanotechnologies of the IOMC organizations based on input from each.

A BRIEF INTRODUCTION TO THE IOMC

The Inter-Organization Programme for the Sound Management of Chemicals (IOMC) was established in 1995 to strengthen cooperation and increase coordination in the field of chemical safety. The seven Participating Organizations (POs) of the IOMC are:

- the Food and Agriculture Organization of the United Nations (FAO);
- the International Labour Organization (ILO);
- the Organisation for Economic Co-operation and Development (OECD);
- the United Nations Environment Programme (UNEP);
- the United Nations Industrial Development Organization (UNIDO);
- the United Nations Institute for Training and Research (UNITAR); and
- the World Health Organization (WHO);

In addition, two observer organizations also participates in the IOMC:

- the United Nations Development Programme (UNDP); and
- the World Bank

The IOMC organizations hold regular meetings together to ensure co-ordination. The status of activities related to nanotechnology has been discussed at these meetings.

IOMC: CURRENT ACTIVITIES ON NANOTECHNOLOGIES

FAO/WHO

International Meeting on Food Safety Implications of Nanotechnology Applications in the Food and agriculture Sectors

International harmonisation of food safety measures is recognised as a crucial element in the facilitation of food trade. It is essential therefore that there be international input into the discussion of concerns and possible approaches for ensuring good governance. The reviews and consultations carried out at national and sub-regional levels have been fruitful and guarantee a substantial basis for deliberation at international level.

The international leadership provided by the Joint FAO/WHO Food Standards Programme is widely recognized. It provides a truly international and neutral forum for consideration of the food safety issues raised by nanotechnology and for agreement on coherent and collaborative approach for addressing them.

Meeting Objectives

The major aims of this meeting are:

- to develop a common view of what the main food safety concerns associated with actual and anticipated nanotechnology applications in the food and agriculture sectors;
- to share lessons learned by those countries that have already initiated programmes to address concerns;
- to agree on priority actions that are needed to control possible food safety hazards associated with nanotechnology applications in food and agriculture; and
- to develop guidance on the possible roles of FAO and WHO in promoting sound governance of food safety issues linked to nanotechnology applications.

ILO

At the recent ILO Meeting of Experts to Examine Instruments, Knowledge, Advocacy, Technical Cooperation and International Collaboration as Tools with a view to Developing a Policy Framework for Hazardous Substances (Dec 2007), it was decided that the ILO should continue monitoring national and international activities related to safety in the use of new technologies, such as nanotechnologies and possibly contributing to them through ILO participation in relevant intergovernmental groups.

OECD

The OECD has two activities related to nanotechnologies: i) the activities of the Working Party on Manufactured Nanomaterials; and ii) the Working Party on Nanotechnology.

These co-ordinated and mutually supporting efforts are intended to provide the conditions for optimal development of this range of new technologies.

OECD's Working Party on Manufactured Nanomaterials (WPMN)

The Working Party on Manufactured Nanomaterials (WPMN) was established in 2006 by OECD's Chemicals Committee. The objective of the WPMN is to promote international co-operation in human health and environmental safety related aspects of manufactured nanomaterials (MN), in order to assist in the development of rigorous safety evaluation of nanomaterials. The work is being implemented through eight projects listed below:

- Development of a Database on Human Health and Environmental Safety Research;
- Research Strategies on Manufactured Nanomaterials;
- Safety Testing of a Representative Set of Manufactured Nanomaterials;
- Manufactured Nanomaterials and Test Guidelines;
- Co-operation on Voluntary Schemes and Regulatory Programmes;
- Co-operation on Risk Assessment;
- The role of Alternative Methods in Nanotoxicology
- Exposure Measurement and Exposure Mitigation

Detailed information can be found at: <http://www.oecd.org/env/nanosafety/>

OECD's Working Party on Nanotechnology (WPN)

The Working Party on Nanotechnology (WPN) was established by OECD's Committee for Science and Technology Policy in 2007. The objective of the WPN is to advise on emerging policy-relevant issues in science, technology, and innovation related to the responsible development of nanotechnology. The WPN seeks to promote international co-operation that facilitates research, development, and the responsible commercialization and utilisation of nanotechnology.

Currently, the WPN has six projects in its programme of work:

- Statistics and Measurement;
- Impacts and the Business Environment
- International R&D collaboration
- Communication and public engagement
- Policy Dialogue -
- Global Challenges: Nano and Water

Detailed information can be found at: <http://www.oecd.org/sti/nano>

Note: OECD's work is covered in more detail in the document IFCS/Forum-VI/04 INF.

UNEP

Within the United Nations Environment Programme (UNEP), Chemicals Branch of the Division of Technology, Industry and Economics (DTIE) promotes sustainable development by catalyzing global actions for the sound management of chemicals worldwide. The main priorities include activities related to specific chemicals such as mercury, lead and cadmium as well as persistent organic pollutants together with support to developing countries and

countries with economies in transition in the sound management of chemicals by providing sound scientific and technical basis through training and capacity building on existing chemicals and emerging chemicals. So far, UNEP has not taken an active role with respect to nanotechnologies. However, since nanoparticles are being recognized an emerging environmental issue UNEP will continue to address the complex implications related to the possible broad dissemination of this technology with a view to optimize its benefits and to minimize the environmental risks in support of sustainable development,

A first output has been published in the UNEP GEO 2007 Yearbook with the chapter entitled “Emerging Challenges: Nanotechnology and the Environment” [for download see http://www.unep.org/geo/yearbook/yb2007/PDF/7_Emerging_Challenges72dpi.pdf]. The pros and cons from innovative medical techniques to savings on materials and energy as well as advances in detection and remediation of pollution are highlighted. However, according to UNEP, the environment impacts are largely unknown and controls typically absent. Therefore, UNEP concludes that nanotechnology issues have to be taken up through more systematic research and sector-specific policies. Besides cooperation with international partners and stakeholders, the SAICM approach may provide a useful platform for such an undertaking.

For further information on SAICM, please visit: <http://www.chem.unep.ch/saicm/>

UNITAR

At the current, time UNITAR does not have any activities which are specifically related to nanotechnology. However, it is following developments carefully including those of the other IOMC Participating Organizations. If it becomes clear that there is a need, it may initiate activities related to nanotechnology in the future. In line with UNITAR’s usual activities, such work would be related to awareness raising and capacity building for developing countries and countries in transition.

WHO

The WHO Collaborating Centres for Occupational Health discussed the work on occupational health and safety risks of nanotechnology at a meeting on 2 November 2007 in Helsinki. The main conclusions are that the lessons learned from the first five years of studying occupational health and safety risks and developing national reports need to be shared with other countries. The collaborating centres agreed to summarize these lessons learned in the United States, United Kingdom, Finland, Japan, Singapore, Italy, and the Netherlands in a report to be developed under the leadership of WHO. The report would also help countries with emerging and transitional economies to incorporate occupational health and safety issues into their national strategies for the development of nanotechnologies.

ADDITIONAL INFORMATION

Detailed information on the IOMC can be found through the following website:
<http://www.who.int/iomc/en>

CONTACT INFORMATION

IOMC can be contacted at: infoIOMC@who.int



Intergovernmental Forum on Chemical Safety
Global Partnerships for Chemical Safety

4 INF

Contributing to the 2020 Goal

IFCS/Forum-VI/04 INF
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5 February 2008

FORUM VI
SIXTH SESSION
OF THE
INTERGOVERNMENTAL FORUM ON CHEMICAL SAFETY

Dakar, Senegal
15 – 19 September 2008

Nanotechnologies at the OECD

Prepared by: OECD

NANOTECHNOLOGIES AT THE OECD

This paper has been prepared by the OECD Secretariat, on request, for Forum VI of the Intergovernmental Forum on Chemical Safety (IFCS).

A BRIEF INTRODUCTION TO THE OECD

The Organisation for Economic Co-operation and Development (OECD) was founded in 1961. Today the OECD has 30 member countries.* Its principal aim is to promote policies for sustainable economic growth and employment, a rising standard of living and trade liberalisation. By “sustainable economic growth”, the OECD means growth that balances economic, social and environmental considerations.

The OECD brings together its member countries to discuss and develop both domestic and international policies. It analyses issues, recommends actions, and provides a forum in which countries can compare their experiences, seek answers to common problems, and work to co-ordinate policies.

The OECD’s work is overseen by several governing bodies. At the highest level is the OECD Council, made up of Ambassadors from all member countries. The Council’s main role is to review and approve the OECD budget and programme of work. It can also adopt Council Decisions (which legally bind all member countries to a particular course of action) and Council Recommendations (which strongly encourage action within governments). The Council and all other OECD bodies work on many issues by consensus.

Under the Council, work in the OECD is directed by specialised committees, and under these, there are subsidiary bodies (working parties and working groups), which are composed of experts representing member countries. The Chemicals Programme, for example, is directed by the Chemicals Committee. Similarly, the Committee for Science and Technology Policy oversees work related to science and technology.

The daily work of the OECD is co-ordinated and supported by its Secretariat in Paris, which has approximately 1,800 employees.

* OECD member countries are: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The European Commission also takes part in the work of the OECD.

ACTIVITIES ON NANOTECHNOLOGY AND NANOMATERIALS AT THE OECD

This paper describes the two activities of OECD related to nanotechnologies: i) the activities of the Working Party on Manufactured Nanomaterials; and ii) the Working Party on Nanotechnology.

THE WORKING PARTY ON MANUFACTURED NANOMATERIALS (WPMN)

The Working Party on Manufactured Nanomaterials (WPMN) was established in 2006 by the Chemicals Committee. The objective of the WPMN is to promote international co-operation in human health and environmental safety related aspects of manufactured nanomaterials (MN), in order to assist in the development of rigorous safety evaluation of nanomaterials. The work is being implemented through eight projects listed below:

- Development of a Database on Human Health and Environmental Safety Research;
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- Manufactured Nanomaterials and Test Guidelines;
- Co-operation on Voluntary Schemes and Regulatory Programmes;
- Co-operation on Risk Assessment;
- The role of Alternative Methods in Nanotoxicology
- Exposure Measurement and Exposure Mitigation

These eight projects are being managed by eight steering groups which are implementing their “operational plans”, each with their specific objectives and timelines. For the most part, these steering groups (which average around 20 participants) are being led/chaired by members of the WPMN, with support from the Secretariat. Much of the work has been (and is being) undertaken through teleconferences and electronic means. At the same time, there are close linkages amongst the projects, and for this reason, “face-to-face” meetings of steering groups are organised as the need arise. Results of each project are then evaluated and endorsed by the entire WPMN.

The WPMN brings together more than 100 experts from governments and other stakeholders from: **a)** OECD Countries; **b)** non-member economies such as Brazil, China, the Russian Federation, and Thailand; and **c)** observers and invited experts from ISO, WHO, UNEP, BIAC¹, environmental NGOs, and TUAC².

¹ The Business and Industry Advisory Committee to the OECD

² Trade Union Advisory Committee to OECD.

WPMN PROJECTS: OUTCOMES, PROGRESS AND NEXT STEPS

Project 1: An OECD Database on Human Health and Environmental Safety Research

The WPMN is developing a *Database of Research into the Safety of Manufactured Nanomaterials*. This database is intended to hold details of completed, current and planned research projects on safety, which are to be updated (electronically) by delegations. Although this database is still a prototype, it already includes over 200 records which have been migrated from the database of the Woodrow Wilson Center. The database will be accessible online for editing and/or adding new records. This database is intended to be a resource for (amongst other things) each of the other projects of the WPMN. The public launch will be in 2008.

Project 2: Research Strategy(ies) on Human Health and Environmental Safety Research

The WPMN is developing a research strategy. This work is based on the knowledge that large sums of money are being devoted to R&D for future applications of nanotechnology. By contrast, it appears that relatively small sums are being made available for human health and environmental safety research. The objective of this project is to strengthen the international cooperation on safety research related to manufactured nanomaterial through: i) identifying priority research areas; ii) considering mechanisms for co-operative international research; and iii) to draw recommendations on research priorities for the short, medium and longer term.

With this in mind, the WPMN has developed a comprehensive list of research themes on environment and human health safety. An analysis (based on the research priorities provided by delegations) on gaps in research currently being undertaken, from which it will draw a set of preliminary recommendations on priorities or needs for research for consideration during 2008.

Project 3: Testing a Representative Set of Nanomaterials

This project is built around the concept that much valuable information on the safety of manufactured nanomaterials (MNs), as well as the methods to assess safety, can be derived by testing certain nanomaterials for human health and environmental safety effects. The objective of this project is to develop a programme to create an understanding of the kind of information on intrinsic properties that may be relevant for exposure and effects assessment of nanomaterials through testing.

As a result of the background work undertaken so far, the WPMN has selected a priority list of MNs for testing (based on materials which are in commerce or close to commercialisation). The WPMN also agreed a minimal base set of endpoints or effects for which these NMs should be tested. As a follow-up, the WPMN launched a “**sponsorship programme**” at the end of 2007 for the testing of specific MNs. The sponsorship programme is an international effort to share the testing of those manufactured nanomaterials selected by the WPMN. The first phase of the programme will test each nanomaterial for a minimal base set of endpoints (phase 1 of the project). This will produce Dossier Developments Plans for each nanomaterial tested. This work is being supported by the development of a *guidance manual* for sponsors of the testing programme. In addition, it is expected that this will identify those cross-cutting issues or tests, that will need further consideration (phase 2).

Project 4: Manufactured Nanomaterials and Test Guidelines

It is important to know whether existing test guidelines (used for “traditional chemicals”) can be successfully applied to MNs. Some information on this question will be derived from the work on testing MNs implemented by sponsors as a part of Project 3. In parallel, this project is reviewing existing test guidelines [especially the OECD Test Guidelines (TGs)] with view to establishing whether they are suitable for MNs. A preliminary review of Test Guidelines related to physical chemical properties has been finalised and work is planned to review non-OECD testing methods including international and national standards. This project is also reviewing Test Guidelines related to: effects on biotic systems; degradation and accumulation; and health effects.

The WPMN may also begin work on the preparation of guidance documents for testing MNs to address specific issues such as how to prepare and administer materials in appropriate doses for *in vivo* and *in vitro* studies.

Project 5: Co-operation on Voluntary Schemes and Regulatory Programmes

A number of countries have put “voluntary schemes” or “stewardship programmes” in place to assess the safety of MNs. This project is analysing these programmes with the aim of: i) identifying common elements, which encourage industry and other entities to submit existing information and data and/or generate new data on risk assessment and risk management of nanomaterials; ii) preparing recommendations to countries on approaches and elements to consider for information gathering initiatives; iii) to identify current and proposed regulatory regimes and how they address information requirements, hazard identification, risk assessment and exposure mitigation/ risk management of MNs; and iv) to share information on existing or proposed guidance documents on practices to reduce occupational or environmental exposure to MNs.

Accordingly, an *Analysis of Information Gathering Initiatives* has been completed. Amongst other things, it addresses the similarities and differences identified in these national initiatives. This analysis also includes a number of considerations and recommendations on approaches and elements for consideration by those countries wishing to launch similar initiatives.

In addition, a *Comparison of Regulatory Regimes for Manufactured Nanomaterials* has been completed. This exercise identified how current and proposed regulatory regimes address the risk assessment of MNs. In addition, a “template” form has been suggested to identify the various components of regulatory regimes which are or may be applicable to NMs.

As a result of this project, the WPMN has decided to undertake an additional activity on “*International Sharing and Comparison of Data on Manufactured Nanomaterials*”. The concept behind this proposal is to share, amongst member countries, information on MNs, reported through national information gathering initiatives, including voluntary programmes. A centralised list with summary level data is being prepared. This list will be held on the WPMN password-protected site, and it will include contact information in the relevant countries to enable delegations to exchange information on a bilateral basis.

Project 6: Co-operation on Risk Assessment

This project aims at identifying existing risk assessment schemes and is currently reviewing them to establish if they are suitable for the assessment of MNs. This project aims

to: i) compile information on risk assessment approaches for chemicals that may be applied to MNs; ii) analyse current risk assessment approaches as these apply to MNs; iii) prepare recommendations for addressing and filling identified gaps.

Accordingly, this project is currently compiling existing risk assessment strategies and methodologies for chemicals that are being currently used for - or may be extended to include - MNs. At the same time, supporting tools will be identified that are currently available which offer the potential to strengthen and enhance risk assessment.

Project 7: The Role of Alternative Methods in Nanotoxicology

This project has been established to: i) assess available *in vitro* methods and evaluate how they might be used in an overall assessment plan for hazard testing of MNs; ii) prepare an analysis by comparing *in vivo* and *in vitro* studies through testing MNs (human and ecotoxicity endpoints); and iii) to produce a guidance document for the longer term and for more general use on the use of alternative approaches, including *in vitro* methods, for the hazard evaluation of MNs.

As a first step, a report is being prepared including: i) a list of *in vitro* endpoints on human health and ecotoxicity; ii) the kind of information that the *in vitro* tests will provide; iii) a list of validated *in vitro* tests that might be used for testing NMs; and iv) a background document on the feasibility for validating further *in vitro* methods and to consider the development of further *in vitro* tests.

Project 8: Exposure Measurement and Exposure Mitigation

The objective of this project is to exchange information on guidance documents for exposure measurement and exposure mitigation and to develop recommendations on future work that needs to be undertaken. Specifically, the project aims to address: 1) exposure in occupational settings; 2) exposure to humans resulting from contact with consumer products and environmental releases of MNs; 3) exposure to environmental species resulting from environmental releases of MNs including releases from consumer products containing MNs. The WPMN recognizes that exposure measurement and exposure mitigation information developed for incidental nanoscale particles is highly relevant to this project and thus it will be considered.

Recommendations for specific work needed on exposure measurement and exposure mitigation in occupational settings has been prepared. The WPMN is currently analysing the recommendations in order to prioritise them.

ADDITIONAL OUTPUTS/ ACTIVITIES OF THE WPMN

Communication Strategy

The WPMN is developing a plan, which is intended to disseminate information on its work as widely as possible. The OECD website is updated on a regular basis with documents and announcements related to the work of the WPMN.

For example, the WPMN publishes periodically a document entitled, *Current Developments in Delegations on the Safety of Manufactured Nanomaterials – Tour de Table*. This contains information (provided by delegations) on recent activities in their countries/organisations. Publications are available electronically, at no charge, on the OECD's Web site: <http://www.oecd.org/env/nanosafety> .

Co-ordination with other activities of the Chemicals Committee

The work of the WPMN is closely related to other activities within the Chemicals Committee. Accordingly, close communication is underway with the Working Group of Test Guidelines Co-ordinators (WNT). This is important to the WPMN to ensure close collaboration in respect to project 4: *Manufactured Nanomaterials and Test Guidelines*.

Finally, it is worth noting that a number of other subsidiary bodies of the Chemicals Committee have taken an interest in the work of the WPMN including: the Working Group on Pesticides; the Working Group on Chemical Accidents; the Task Force on Biocides; and the Task Force on Pollutant Release and Transfer Registers.

Co-ordination with other organizations

The WPMN has been co-ordinating closely with a committee of the International Standards Organisation (ISO) ISO/TC229 (Nanotechnologies). The Chair of ISO/TC229 and its convenor for its Working Group 3 (Health, Safety and Environmental Aspects of Nanotechnologies) have participated in the WPMN since its first meeting. The OECD Secretariat to the WPMN also participates in the meetings of ISO/TC 229 to facilitate co-ordination.

The OECD Secretariat also co-ordinates with other intergovernmental organisations through the Inter-Organization Programme for the Sound Management of Chemicals (IOMC). The IOMC includes FAO, ILO, UNEP, UNIDO, UNITAR, OECD and WHO. UNDP and the World Bank are observers. In addition, collaboration is being ensured with the Intergovernmental Forum on Chemical Safety (IFCS).

THE WORKING PARTY ON NANOTECHNOLOGY (WPN)

The Working Party on Nanotechnology (WPN) was established by OECD's Committee for Science and Technology Policy in 2007. The objective of the WPN is to advise on emerging policy-relevant issues in science, technology and innovation related to the responsible development of nanotechnology. The WPN seeks to promote international co-operation that facilitates research, development, and the responsible commercialization and utilisation of nanotechnology.

Currently, the WPN has six projects in its programme of work:

- Statistics and Measurement;
- Impacts on Companies and the Business Environment
- International R&D collaboration
- Communication and public engagement
- Policy Dialogue
- Global Challenges: Nanotechnology and Water

These projects are being managed by six steering groups which are implementing their “operational plans”, each with their specific objectives and timelines. These steering groups are being led by members of the WPN, with support from the secretariat. Much of the work has been (and is being) undertaken through teleconferences and electronic means.

Project A: Statistics and Measurement

The objectives of this project are twofold. The first objective is to overview of the current status, importance and development of nanotechnology using currently scantily available and internationally comparable science, technology and innovation indicators and statistics. This overview will draw on available national and international sources, including member government reports. It will also draw on private sources, where relevant, and assess the quality and comparability of such indicators and statistics. This overview will be published as an OECD report entitled “Nanotechnology at a Glance”. The report will be a building block for further efforts in developing internationally comparable statistics and indicators.

The second objective of this project is to develop a framework for internationally comparable and validated statistics, according to agreed definitions and classifications, supported by possible firm-level model surveys. This objective will be undertaken in conjunction and subsequent to the first objective and will involve cooperative work with OECD’s Working Party on National Experts in Science and Technology Indicators (NESTI).

Project B: Nanotechnology Impacts on Companies and the Business Environment

The overall objective of this project is to contribute to an improved understanding of the current and potential specific implications of nanotechnology for innovation and economic growth and for policymaking in these areas. The project foremost uses qualitative case study approaches for achieving its objectives. The primary source of information about the impacts of nanotechnology on companies and business environments will be face-to-face interviews with the relevant company representatives using a pre-designed questionnaire. In addition to the qualitative company case studies will also be complemented with a questionnaire on broader characteristics and developments of science, technology and innovation policies across countries. This questionnaire will highlight challenges and opportunities of policymaking in this field and is also intended to facilitate a policy dialogue. The results of the project will be presented in a final report to the WPN. Project outcomes may also be discussed at a Workshop to be held in 2008 to which business leaders, policymakers, and other experts will be invited.

Project C: International R&D collaboration

This objective of this project is to map research infrastructures, science and technology agreements across countries in order to increase the awareness of countries about opportunities for international R&D collaboration and thereby facilitate this cross-country activity. The information collected in this project can also provide insights about the development of nanosciences and technologies, and assess whether new types and patterns of R&D collaboration at the global level are emerging due to the specificities of this field.

Project D: Communication and public engagement

The objective of this project is to gather experiences from member countries on communication and outreach activities related to nanotechnology in order to support public engagement and foster a dialogue among stakeholder communities

(including industry, researchers, policy makers, and the public). The OECD secretariat is currently developing, together with this project steering group, a questionnaire which will be sent to countries delegates and specialists in the area of emerging technologies agencies, to know more about actual and foreseen activities in communicating around nanotechnology and engage the general public in the debates. Combined with other available material and a dedicated workshops this questionnaire will be used for identifying and supporting further good practices in this area..

Project E: Policy Dialogue

The first objective of this project is to develop an inventory of current S&T policies covering OECD member countries and some non-member countries that can form the basis of a synthesising report on the nature, organization, objectives and recent changes in S&T policies related to nanotechnology across countries. The inventory will be based on information that has been identified from public sources and on a dedicated questionnaire which has been sent out to the WPN delegates. The synthesising report will contribute to highlighting common challenges and opportunities of S&T policies in nanotechnology across countries and constitute one basis for a policy dialogue.

The second objective of this project is to facilitate a policy dialogue. As suggested above the synthesising report could form a basis for the dialogue. The other facilitating activity will take the form of one or two workshops in summer or autumn 2008. This workshop will involve OECD member and non-member delegates, as well as invited S&T policy experts and a number of other key stakeholders.

Project F: Global Challenges: Nano and Water

The objective of this project is to examine nanotechnology developments, opportunities and diffusion barriers in the area of water purification. The access to affordable and clean water is a major global challenge, especially for developing countries. Nanotechnology offers a range of interesting technologies such as enhanced membranes, filters, catalysts, sensors etc. that can provide concrete solutions in this context. Nonetheless the further development and diffusion of these technologies are still in an early phase, and might face various barriers to adoption. This project will undertake expert interviews and focused analyses in this field to help address some of the key challenges in delivering policies that can unlock the potential that nanotechnology can have.

This project has recently received additional funding and is presently in an intensive design and start-up phase with scheduled expert panel interviews in February as well as preparations for a workshop session at the Nanotechnology in Northern Europe 2008 conference to be held in September 23-25 in Copenhagen. This project also hopes to contribute to the fifth World Water Forum conference to be held in March 2009 in Istanbul.

Co-ordination with other directorates and organizations

The WPN is co-ordinating especially it's work on statistics and measurement with a committee of the International Standards Organisation (ISO) ISO/TC229 (Nanotechnologies).

It is also actively collaborating with Business and industry Advisory Committee to the OECD (BIAC) in order to ensure that the work has relevancy to the business community, while benefiting from real-time business insights on nanotechnology developments. Discussions are also under way to coordinate the work on nanotechnology and water with United Nations Secretariat of the Convention to Combat Desertification.

At the OECD the WPN also seeks to collaborate with the OECD Environment Directorate in the area of nanotechnology and water, and is already coordinating activities with the Working Party on Manufactured Nanomaterials (WPMN) under the OECD Chemicals Committee.

FURTHER READING

Additional information to OECD programmes is available at the following web sites:

OECD main page: <http://www.oecd.org>

Safety of Manufactured Nanomaterials (WPMN):
<http://www.oecd.org/env/nanosafety/>

The Chemicals Programme: <http://www.oecd.org/ehs/>

Science and Technology Policy: <http://www.oecd.org/sti/>

Working Party on Nanotechnology: <http://www.oecd.org/sti/nano>

CONTACTS

Working Party on Manufactured Nanomaterials: Peter Kearns (OECD ENV/EHS) peter.kearns@oecd.org

Working Party on Nanotechnology: Christopher Palmberg (OECD STI/STP) christopher.palmberg@oecd.org

ROUND TABLE “WHERE SYNERGY CAN BE IMPROVED BETWEEN STAKEHOLDERS”

Contribution from United Nations Environment Programme (UNEP)

Within the United Nations Environment Programme (UNEP), Chemicals Branch of the Division of Technology, Industry and Economics (DTIE) promotes sustainable development by catalyzing global actions for the sound management of chemicals worldwide. The main priorities include activities related to specific chemicals such as mercury, lead and cadmium as well as persistent organic pollutants together with support to developing countries and countries with economies in transition in sound management of chemicals by providing sound scientific and technical basis through training and capacity building on existing chemicals and emerging chemicals.

UNEP is one of the members of IOMC (Inter-Organization Programme for the Sound Management of Chemicals), which coordinates in the field of chemical safety. Nanotechnology has been taken up recently on the chemicals' agenda (see contribution by OECD).

So far, UNEP has not taken an active role with respect to nanotechnologies. However, since nanoparticles is being recognized an emerging environmental issue UNEP will continue to address the complex implications related to the possible broad dissemination of this technology with a view to optimize its benefits and to minimize the environmental risks in support of sustainable development,

A first output has been published in the UNEP GEO 2007 Yearbook with the chapter entitled “Emerging Challenges: Nanotechnology and the Environment” [for download see http://www.unep.org/geo/yearbook/yb2007/PDF/7_Emerging_Challenges72dpi.pdf]. The pros and cons from innovative medical techniques to savings on materials and energy as well as advances in detection and remediation of pollution are highlighted. However, according to UNEP, the environment impacts are largely unknown and controls typically absent. Therefore, UNEP concludes that nanotechnology issues have to be taken up through more systematic research and sector-specific policies.

It is highlighted that life-cycle analysis (LCA) may be an appropriate tool to approach the complex question how nanoparticles might affect the environment. It involves mapping fate and transport at every step, from production through use phase until final disposal. There may be a need to adopt LCA to specifics of nanomaterials but in general the established methods for risk assessment should be applied.

Besides cooperation with international partners and stakeholders, the SAICM approach (Strategic Approach for Chemicals Management) may provide a useful platform for such undertaking. For further information on SAICM, please visit: <http://www.chem.unep.ch/saicm/>

Finally, nanotechnology may be taken up under the UNEP Medium-term strategy (MTS) under the “harmful substances and hazardous waste” priority.

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Dialogue on Responsible Research and Development of Nanotechnology

Bridging the gap

The contribution of the High Technology and New Materials Area of International Centre for Science and High Technology of UNIDO

Brussels - March 11-12, 2008-03-09

Graziano Bertogli

Introduction

The International Centre for Science and High Technology (ICS), located in Trieste, Italy, operates under the aegis of the United Nation Industrial Development Organization (UNIDO). The mandate of ICS is to promote the transfer of knowledge in applied science and high technology to Developing Countries in order to contribute to their economically, environmentally and socially sustainable industrial development. This mandate is based on the strong belief that a modern competitive industrial sector can be built-up only with an adequate scientific knowledge and technological capability, which imply an active participation in the development and utilization of new advanced technologies, achieved through an effective and efficient "transfer of know-how".

The ICS is composed by three Areas: Chemistry, Environment and High Technology and New Materials

Since 2004 the ICS High Technology and New Materials Area recognizes the enormous potentiality that the nanotechnologies could represent for developing countries and their growth,

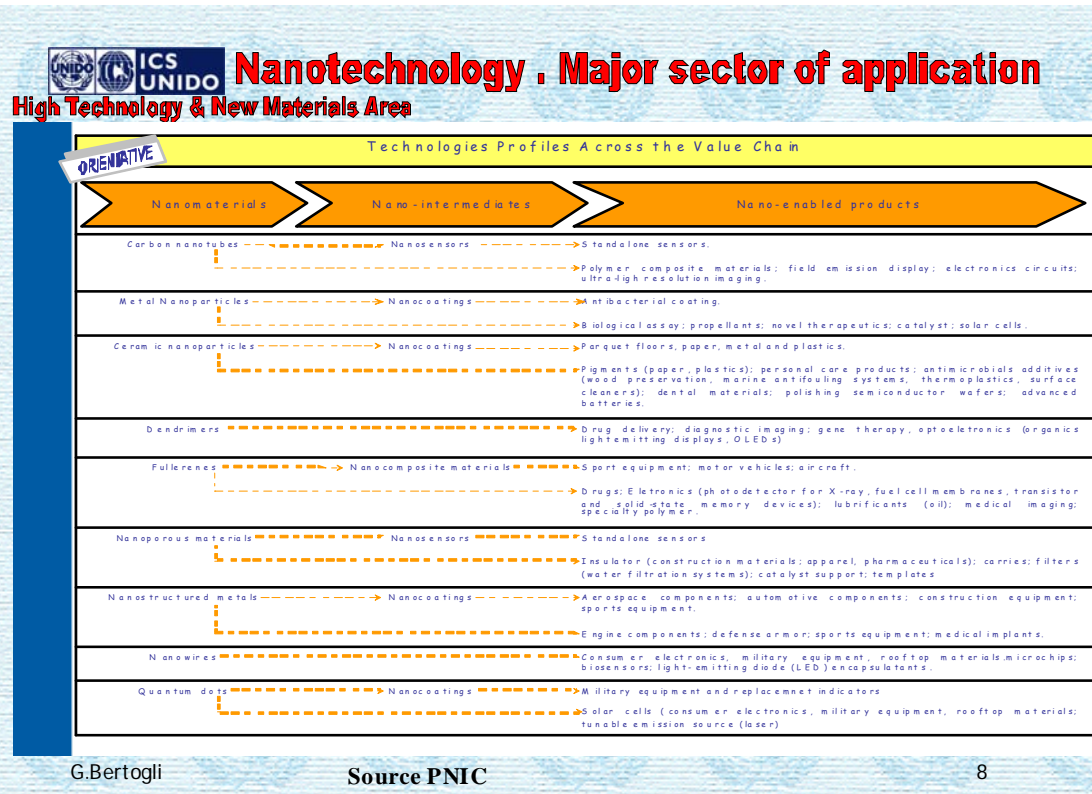
In fact, nanosciences and its derivative technologies have the potential to improve the countries of the developing world if the applications are designed and tailored to best fit the needs of their people. Nanotechnology, unlike other technologies, offers a unique chance to bridge the technological gap between the industrialized and developing countries. However a favourable terrain for their growth needs to be prepared. Furthermore, in the medium and long term, nanotechnologies could generate benefits to the global society such as cheap and sustainable energy and better methods for disease diagnosis and treatment. But, there is the possibility that different capabilities to develop and exploit new technologies will increase the divide between rich and poor nations in the more immediate term. Indeed, the high cost of developing new procedures and skilled workforces would put several developing countries at a definitive disadvantage.

At the same time, it is worth to underline that there are also several risks in connection with this technology. For instance, the risks of today's nano-scale technologies (nano-particle toxicity, etc.) cannot be treated similarly to the risk of longer term molecular manufacturing (economic disruption, unstable arms race, etc).

In its advance form nanotechnology will have significant impact on almost all industries¹ and all areas of society it will offer better built, longer lasting, cleaner safer, and smarter products for home, communication, medicine, transportation, agriculture and industry in general.

The follow A indicates the three main sectors of applications, (electronics and IT, manufacture and materials, healthcare and life science), versus the value chain (nano-materials, nano-intermediary goods, finished goods).

¹ A key feature of nanotechnology is that it offers not just better products but a vast number of improved manufacturing processes.



Last but not least, it is necessary to promote the commitment of regional and international financial institutions in actively encouraging innovation by sharing the financial risk through grants or soft loans. Particularly participating in the early stage risk of capital for technologies from developing countries with potential for international markets or addressing major social needs

Preliminary activities

The HTNM Area launched a preliminary activities on this field with the organization of a High Level Conference on “North-South Dialogue on Nanotechnologies: Challenges and Opportunities” that was held in Trieste in February 2005. The main objectives were

- To explore appropriate areas where to promote nano-science and nanotechnology for DCs,
- To survey the state-of-the-art in the area in developing countries
- To promote a better understanding of the needs and opportunities in DCs in this area.
- To define the role of ICS with the support of the Trieste System in promoting and catalyzing the implementation of nanotechnology in DCs
- To discuss the role of education in promoting nanotechnology: the model of the USA and Europe and to propose training activities in developing countries

Among the most important recommendations resulting from the conference the representatives of different working groups indicated the need to promote and strengthen the partnerships between academia and industry to advance and implement nanotechnology for economic development, to support and promote the cooperation and networking between scientific and technological research centres and industry through the establishment of appropriate structures and links with international technology centres as well as to extensive use of *ad hoc* financial support and incentives.

The conference also stressed the need to strengthen the efforts to enable researchers and industrialists from developing countries to access knowledge and technology produced elsewhere in the world, thought: creating databases, portals, training initiatives in the form of fellowship programmes for young researchers and junior scientists and technicians, training events directly in the South, and international *fora* for an effective exchange of information.

The same results and recommendations were reached during to recent similar events: Nano2Business Workshop (Warsaw February 7-8, 2007) and UNIDO Expert Group Meeting Nanotechnology, Sustainability and Developing Economies in the 21st Century (Vienna December 2007).

Bridging the gap – The ICS High technology and New Materials Area immediate actions

Generally speaking knowledge is an increasingly decisive factor in the process of socio-economic growth and growing competition and cooperation. The capacity to generate and utilize knowledge, the accessibility of information and the ability to be creative serve to give a country or a group of countries, a significant comparative advantage in terms of economic competitiveness and advance on social progress. An effective system of technological and scientific education and knowledge acquisition is needed to develop human resources capable of dealing with new high technologies such as nanotechnologies. Furthermore, in the specific case of nanotechnologies, more than other technical and scientific fields, the knowledge acquisition issue represents an important and sensitive challenge due to the fact that nanotechnology represents a convergence of several different sciences and topics (i.e. physics, engineering, mathematics, chemistry, biology, etc.).

In this aspect, the issue of international exchange of students and researchers is crucial to the sharing of experiences and improving of knowledge and skills in the field of nanotechnologies. However, the classic problem with labour force mobility across borders is that this is often long-term and can give rise to a brain drain, in the process being potentially negative for home country interest and benefit. Such problems do not arise if the movement is temporary, and the researchers, scientists, trainers, technicians apply new skills and knowledge in the local economy, but this depends heavily on the investment climate. However, expanding the pool of people that have foreign professional experience could generate pressure to implement necessary improvements. The problem becomes crucial in the case of nanotechnology (and in Developing Countries), when the critical mass of information is well defined but needs to be exploited at industrial level, then to be transformed into products able to meet market requirements.

Based on the above, in 2007 the HTNM Area decided to respond to the request from Developing Countries to be active part of the benefits originated by these new technologies and their application with a specific programme

The HT&NM Area, in addition to the typical instrument and tools utilized by ICS² to reach the planned objectives, is equipped with methodologies and tools to study, design and support the setting up of structures dealing with technology acquisition and transfer with particular attention on the sustainability of the operation as well as to develop a framework for promoting academia/industry partnerships in Developing Countries.

The possibility to study and implement non-traditional financial schemes (venture capital for instance) dedicated to set up pilot plant, industrialization of projects ideas; spin-offs, adaptation of existing technology to the local conditions, etc. as well as to fund the *disembodied* technology and knowledge transfer is also part of the so called in house expertise.

As pilot case, a project to provide the Authority of State of Guanajuato (Mexico) with studies and business plans to create following structures instrumental to the implementation of the Guanajuato economic and industrial strategic plan:

- Innovation Centre in Nanotechnology

A sort of hub among the Technology Centres of the region avoiding duplication with of exiting institutions can operate in synergy with them offering manly complementary high level services, for instance, start up and spin off, through the direct linkage with the Venture Capital Fund, high level training, patenting and licensing as well as maintain and strengthen operative connections with the most important high-technology International institutions.

- Venture Capital Fund for High Technology and Nanotechnology.

Such a fund could be a strategic tool to technology transfer in the field of Nanotechnology for the Guanajuato economy. Therefore, a portfolio of R&D projects shall be identified by the Innovation centre. The Fund will be financed by the Government of Guanajuato, Mexican banks, *Corporacion Andina de Fomento* (CAF) and private investors for a total capital of US\$ 20.0 million.

² EGMS, workshops, training courses, publication, DSSs, Fellowship programme, etc

In March 27, 2008 the complete set of document were discussed and agreed with the Guanajuato Authorities

The above represents one of the applications of the HTNM strategy to reach the ICS mandate that is base on the use of the following instruments:

- *Territorial* Innovation Centres strategy to create and strengthen the networking with other similar structures as a fundamental instrument to respond to the request from Developing Countries
- Portfolio of Research Projects, Training Activities and Fellowship Programmes
- Portal
- Master's programme as a sort of *umbrella programme* in which the Fellowship programme can be positioned.

In the HTNM 2008 work programme 2008 an *ad hoc* multiyear programme was included with the objective of

- promoting and implementing joint research projects and training of scientists, trainers and researchers in applied nanotechnologies,
- promoting partnerships between academia and industry to advance and implement nanotechnology for economic development,
- supporting and promotion of cooperation between scientific and technological research centres and industry through the establishment/upgrading of innovation centres and their linkages with international network as well as the extensive use of *ad hoc* funds and financial incentives
- assessing nanotechnology and the concerned potential risks associate with their development and use
- North-South and South-South networking to share and promote technologies/methodologies.
- promoting the conduction of surveys to assess potential regional pooling of existing resources and capabilities, establishing regional *fora* and identifying research institutions, foundations, and companies that have the interest and capacity to jointly develop new nanotech products and services;

The following table shows the activities planned to reach the 2008 output as ICS HTNM contribution to the reduce the gap for Developing Countries

Project	Output	Activities
<i>Nanotechnology for developing countries</i>	a. Strategic Plan to be implemented by ICS in favour of Developing Countries (three year plan)	• Conference on Nanotechnology in Developing Countries: opportunity and possibility
	b. Publication the State-of-the - Art on Nanotechnology and opportunity for DCs on medium and long term	• Workshop on the State-of the -Art of the technology
	c. Publication on possible risks and safety regulation for Developing Countries with regard to the development and utilization of nanotechnologies	• Workshop on safety regulation
<i>Nanotechnology regional networking</i>	Model of Regional nanofora to exchange information and pursuing common goals	• Design of model for regional <i>fora</i> • Workshop on model regional <i>fora</i> validation

<i>Establishment of ICS research and training network</i>	Creation of network including scientists, researchers and technicians from local academy, industry and R&D sectors as well as identifying institutions and or firms for carrying out training within the research/training activities	<ul style="list-style-type: none"> • Identification and selection of partner institutions for the programme (training and research) • Design and selection of research/training projects in connection with the interest shown by Developing Countries policy and programmes • Research projects implementation • Monitoring of the research projects
<i>Nano Project Award</i>	Portfolio of projects' proposal with complete scientific, technical, financial information, including business plan ready to be presented to funding institutions and/or donors	<ul style="list-style-type: none"> • Promotion of the programme among researchers and institution in developing countries • Selection of research and/or development projects

Bridging the gap – Medium term strategy

Talented/Capable researchers are available in the South, but there is a shortage of financial resources for project funding and infrastructure. Although aid from the North reaches the South for short-term needs, the collective view is that there is significantly less assistance for developing countries to build long-term capabilities on science and technology.

The issue of financing is essential for providing access to nanotechnologies in developing countries. The costs for R&D (and commercialization) of new nano-products may require large investments and so the role of national, regional and international financial institutions is to actively encourage innovation by sharing the financial risk through grants or soft loans.

Financial institutions are reluctant to carry out evaluations of innovative projects due to the high level of costs involved. In fact, both the financial return on investment (e.g. added-value nanotech for existing industries) and social return on investment (e.g. nano-based diagnostics, prevention and cure of diseases, water purification, rural energy, environmental monitoring and remediation) have to be taken into account. Likewise occurs with the Development Aid Agencies and local Governments.

To avoid the above, promoting and implementing activities at local/territorial level and promoting networking among territorial structures should increase the percentage of success in bridging this gap.

Consequently, the ICS 2008 activities are instrumental to prepare the environment^[1] where nanotechnologies could be studied, developed and applied, linking industry, clusters, academia, research centres, financiers, and in general the local economy. In other words, the ICS HTNM Area would like to replicate the exercise carried out in Mexico in other countries.

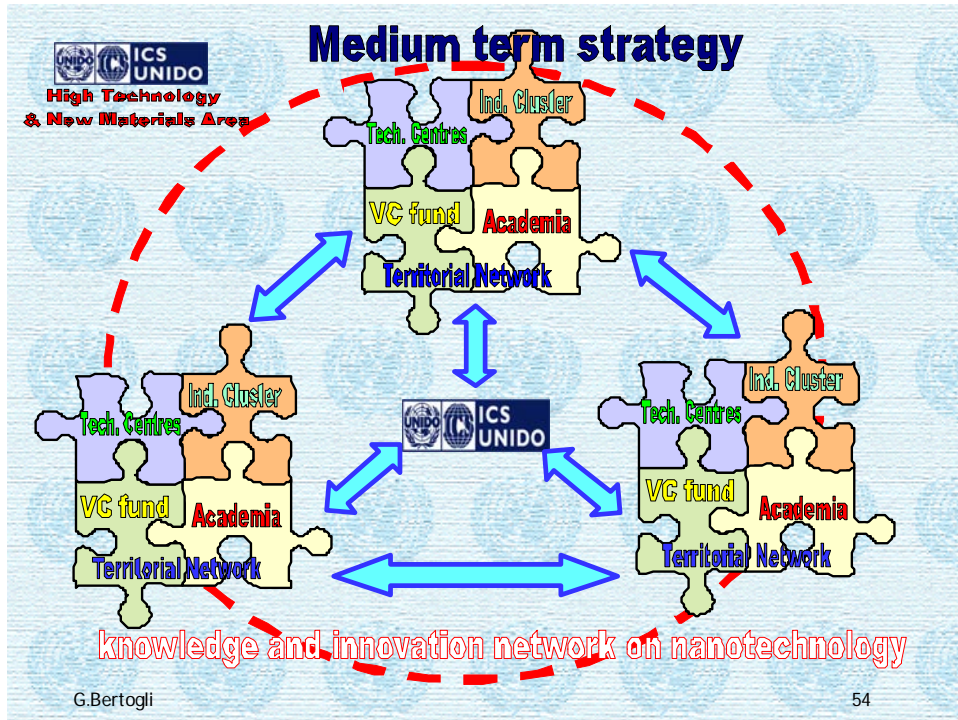
Such *Territorial Structures* should operate in a more integrated way, within a network where ICS and UNIDO could act as a sort of hub facilitating access to knowledge and technology as well as to a portfolio of research projects that are continuously being updated and ready to be implemented within research centres, laboratories, universities, industries with the active participation of researchers and technicians from developing countries.

Instead of promoting networking among academia or research centres, the basic idea is to promote and implement networking among *Territorial Structures* and to create with the joint cooperation of local academia, industry, technology and research centres, venture capital and investment funds as in the case of Guanajuato.

In this framework, the active collaboration of the international community is fundamental to secure good results in favour of social and economic growth for developing countries, to exploit the enormous potentiality

^[1] In selected countries/regions of developing countries

that nanotechnologies could encompass for the growth of developing countries, always taking into account the risks in connection with this technology (i.e. toxicity, economic disruption, and increased divide between rich and poor nations).



WHO-EU Project on “ENHANCED POLICY ADVICE ON ENVIRONMENT AND HEALTH IN EUROPE”

Health effects of several environmental risk factors are a frequent cause of concern and controversy. When faced with crises generated by such controversies, the response of European institutions is not always prompt and univocal. In line with its mandate, WHO has been offering institutions scientific and policy advice.

The project proposes that this service is refined further in order to:

- address more promptly,
- effectively
- in a consistent manner concerns and controversies in environment and health in Europe

through the development and piloting a systematic policy advice service, based on standardized procedures.

Specific objectives are:

- to identify suitable mechanisms,
- to identify criteria,
- to design standard procedures,
- to pilot criteria and procedures for policy advice function,
- to prepare guidelines for management of cases of concern on environment and health in Europe.

Four case studies have been chosen to test the criteria and procedures developed in the methodology. These are:

- EMF,
- climate change,
- nanotechnologies,
- urban planning.

Nanotechnologies

Purpose :

To formulate conclusions for policy making regarding nanotechnologies which will be based on existing reviews, research and studies concerning potential environmental health risks of nanotechnologies.

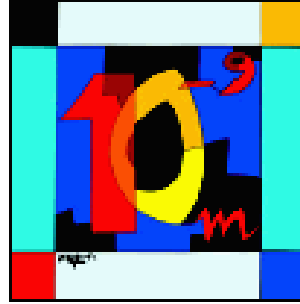
Although governments are investing substantially in nanotechnologies, scientific evidence on their potential negative health and environmental impacts is limited and controversial. At the same time, there are substantial expectation of positive aspects of these technologies including health and environmental applications. Novelty of technology entails a high degree of uncertainty on virtually all aspects of the possible health implications.

The case study(nanotechnologies) work package will bring together existing research, reviews, reflection and discussions and develop a WHO approach to the issue. Position statement and guidelines will be developed, information material including fact sheets on health implications will be prepared.

The project is at an initial stage and a Working Group is being established including academia, industrial scientists, policy makers to identify gaps in knowledge and setting priorities for research on health effects.

Results to be achieved:

It is expected that an agreement on the policy approach to the nanotechnologies considering current understanding of their health aspects will be reached.



ROUND TABLE 2 CODES OF CONDUCTS

European Commission, Responsible Nano Code, BASF

3rd International dialogue, 11 March 2008
Brussels

“Recommendation to the Member States on a Code of Conduct for Responsible Nanosciences and Nanotechnologies Research”



European Commission
Research DG
RTD-L3 “Governance and Ethics”
Head of Unit, Pēteris ZILGALVIS



1- Nanosciences and Nanotechnologies Citizens ask:

Is it **safe**?

Is it **ethical**?

Are citizens fundamental rights guaranteed?

Will it remain so in the future?



Recommendation to the Member States on a Code of Conduct for Responsible Nanosciences and Nanotechnologies Research

1. Nanosciences and Nanotechnologies
2. Why a Code of Conduct?
3. The Code of Conduct



3- Why a Code of Conduct for Responsible Nanosciences and Nanotechnologies Research?

A Recommendation from the Commission to the Member States in the field of N&N research constitutes a **strong political signal** in line with its previous commitments.

The harmonisation of laws of the Member States being excluded from research policy, the Community can use **non-binding instruments**, such as recommendations (Art. 211 of the EC Treaty), to fulfil the tasks and obligations enshrined in the Treaty.



3- Why a Code of Conduct for Responsible Nanosciences and Nanotechnologies Research? (V)

The Recommendation, through the Member States, addresses **all stakeholders** in N&N Research,

Proposes the **adoption and promotion of a Code of Conduct** for Responsible N&N Research,

Invites them to **apply the Precautionary Principle** and other above political commitments to N&N Research.



4- The Code of Conduct (I)

GENERAL PRINCIPLES

- (1) Meaning
- (2) Sustainability
- (3) Precaution
- (4) Inclusiveness
- (5) Excellence
- (6) Innovation
- (7) Responsibility



4- The Code of Conduct (II)

ACTIONS TO BE TAKEN (27)

- Good governance of the N&N research (17)
 - Stakeholders awareness, (7)
 - Favouring an inclusive approach (3)
 - Key priorities (4)
 - Prohibition, restrictions or limitations (3)
- Due respect of precaution (7)
 - Protection of people (4)
 - Reduction of uncertainty (3)
- Wide dissemination and monitoring (3)



4- The Code of Conduct (III)

ACTIONS TO BE TAKEN (27)

- Stakeholders awareness, (7)
 - Open and pluralistic forum for discussion
 - Make information accessible and understandable
 - Share best practices in N&N research
 - Scientific peer-review
 - Scientific integrity
 - Application of existing laws and regulations
 - Applying ethical review requirements



Applying ethical review requirements

How to approach proposals involving Nanosciences and Nanotechnologies (N&N) in Ethical Review?

The Ethical Review Panel should report in the ERR:

- Any violation of **fundamental rights or fundamental ethical principles**, at either the research or development stages;
- Fundamental rights implications of any possible restrictions on **informed consent** and on **publication of research results** related to human health;
- Particularly relevant for ethical review of **dual-use** linked to N&N research.



Applying ethical review requirements

Nanosciences and Nanotechnologies (N&N) and Ethical Review

- Specific research activities aiming to gain a better **understanding** of ethical, legal and societal impacts of the new fields opened by N&N;
- Degree of **awareness** of researchers of the Code of Conduct for Responsible N&N Research itself and of the opinion of the EGE on the ethical aspects of nanomedicine;
- The extent to which the future implications have been taken into account, notably through participatory **foresight** processes involving ethical committees;



4- The Code of Conduct (IV)

ACTIONS TO BE TAKEN (27)

- Favouring an inclusive approach (3)
 - Inclusive discussions
 - Participatory foresight exercises
 - Open N&N research



4- The Code of Conduct (V)

ACTIONS TO BE TAKEN (27)

- Key priorities (4)
 - N&N standards (terminology, measurement, reference)
 - Risk assessment, metrology and standardisation
 - Priority to protection
 - Balanced assessments



4- The Code of Conduct (VI)

ACTIONS TO BE TAKEN (27)

- Prohibition, restrictions or limitations (3)
 - Violation of fundamental rights or fundamental ethical principles
 - Non-therapeutic enhancement of human beings leading to addiction or if illicit (cheating in sports etc.)
 - As long as risk assessment on long-term safety not available, deliberate intrusion of nano-objects into the human body



4- The Code of Conduct (VII)

ACTIONS TO BE TAKEN (27)

- Protection of people (4)
 - Specific health, safety and environmental measures
 - Apply existing good practice in classification and labelling
 - Risk assessment and funding
 - Monitoring potential social, environmental and human health impacts



4- The Code of Conduct (VIII)

ACTIONS TO BE TAKEN (27)

- Reduction of uncertainty (3)
 - Understanding the potential risks
 - Understanding fundamental biological processes
 - Understanding ethical, legal and societal impacts



4- The Code of Conduct (IX)

ACTIONS TO BE TAKEN (27)

- Wide dissemination and monitoring (3)
 - Wide dissemination of the Code of Conduct
 - Awareness of all relevant legislation
 - Monitoring at national level and synergies





COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 07/02/2008
C(2008) 424 final

COMMISSION RECOMMENDATION

of 07/02/2008

on a code of conduct for responsible nanosciences and nanotechnologies research

COMMISSION RECOMMENDATION

of 07/02/2008

on a code of conduct for responsible nanosciences and nanotechnologies research

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community, and in particular Article 211 thereof,

Whereas:

(1) In its Communication to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions "Towards a European research area" the Commission proposed in January 2000 the creation of a European Research Area¹ with a view to consolidating and structuring European research policy. In May 2007, in the Green Paper "The European Research Area: New Perspectives", the Commission re-launched a broad institutional and public debate on what should be done to create a unified and attractive European Research Area that would fulfil the needs and expectations of the scientific community, business and citizens².

(2) The Commission adopted in February 2000 a Communication on the precautionary principle³, aiming to build a common understanding of how to assess, appraise, manage and communicate risks that science is not yet able to evaluate fully.

(3) In March 2000 the Lisbon European Council set for the Community the objective of becoming in the next decade the most competitive and dynamic knowledge economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion.

(4) In 2004, with its Communication "Towards a European strategy for nanotechnology"⁴, the Commission identified actions aimed at creating the Community added value necessary to remain competitive in this sector while ensuring its responsible development. In its conclusions of 24 September 2004⁵, the Council (Competitiveness) welcomed the proposed integrated, safe and responsible approach and the Commission's intention to draw up an Action Plan for nanotechnology.

(5) Taking into account the results of a public consultation, the Commission drew up in 2005 a Nanotechnologies Action Plan⁶ which sets out coherent and interconnected actions for the immediate implementation of an integrated, safe and responsible strategy for nanosciences and nanotechnologies based on the priority areas identified in the Communication "Towards a European strategy for nanotechnology". Both Communications explicitly acknowledged that

¹ COM(2000) 6, 18.1.2000.

² COM(2007) 161, 4.4.2007.

³ COM(2000) 1, 2.2.2000.

⁴ COM(2004) 338, 12.5.2004.

⁵ Doc. 12487/04

⁶ COM(2005) 243, 7.6.2005.

environmental, human health and safety aspects need to be integrated in all nanosciences and nanotechnologies research.

(6) Following the Nanosciences and nanotechnologies Action Plan, in January 2007 the European Group on Ethics in Science and New Technologies presented an Opinion on the ethical aspects of nanomedicine⁷.

(7) Following comments made during a public consultation on a previous opinion, the Scientific Committee on Emerging and Newly Identified Health Risks adopted in March 2006 a Modified Opinion on the appropriateness of existing methodologies to assess the potential risks associated with engineered and adventitious products of nanotechnologies⁸.

(8) In June 2006 the European Council adopted a revised sustainable development strategy fine-tuning the Community sustainable development strategy launched at the Gothenburg Summit in June 2001 that centred on objectives of environment and health protection and poverty eradication.

(9) In its conclusions⁹ of 23 November 2007, the Council (Competitiveness) recognised the need to foster synergies and cooperation between all nanosciences and nanotechnologies stakeholders, including the Member States, the Commission, academia, research centres, industry, financial bodies, non-governmental organisations and society at large.

(10) A first report on the implementation of the Nanotechnologies Action Plan for Europe was presented by the Commission in 2007¹⁰. In this report the Commission announced its intention to adopt a voluntary Code of Conduct for Responsible Nanosciences and Nanotechnologies Research.

(11) This Recommendation includes the Code of Conduct, aiming to promote integrated, safe and responsible nanosciences and nanotechnologies research in Europe for the benefit of society as a whole.

(12) The general principles and guidelines on actions to be taken outlined in this Recommendation benefited from a public consultation.

(13) This Recommendation provides Member States with an instrument to undertake further initiatives to ensure safe, ethical and sustainable nanosciences and nanotechnologies research in the European Union.

(14) This Recommendation also aims at contributing to proper coordination between Member States with a view to optimise synergies between all nanosciences and nanotechnologies research stakeholders at European and international levels,

HEREBY RECOMMENDS:

1. That Member States be guided by the general principles and guidelines for actions to be taken, set out in the Code of Conduct for Responsible Nanosciences and Nanotechnologies Research, in the Annex, as they formulate, adopt and implement their strategies for developing sustainable nanosciences and nanotechnologies (hereinafter N&N) research, in line with the Commission Nanotechnologies Strategy and Action Plan.

⁷ EGE Opinion No 21, 17 January 2007.

⁸ SCENIHR/002/05, 10 March 2006.

⁹ Doc. 14865/07

¹⁰ COM(2007) 505, 6.9.2007.

2. That Member States endeavour to follow these general principles and guidelines when implementing their national regulatory research and development strategies or developing sectoral and institutional research and development standards, taking into account pre-existing applicable N&N guidelines, good practices or regulations.

3. That Member States consider such general principles and guidelines on research to be an integral part of institutional quality assurance mechanisms by regarding them as a means for establishing funding criteria for national/regional funding schemes, as well as adopting them for the auditing, monitoring and evaluation processes of public bodies.

4. That Member States encourage the voluntary adoption of the Code of Conduct by relevant national and regional authorities, employers and research funding bodies, researchers, and any individual or civil society organisation involved or interested in N&N research and endeavour to undertake the necessary steps to ensure that they contribute to developing and maintaining a supportive research environment, conducive to the safe, ethical and effective development of the N&N potential.

5. That Member States cooperate with the Commission in order to review this recommendation every two years, as well as to monitor the extent to which relevant stakeholders have adopted and applied the Code of Conduct.

6. That the criteria for measuring such adherence to and application of the Code of Conduct be established and agreed with the Member States in relation to similar work undertaken at Community level.

7. That Member States, in their bilateral agreements on research strategies and activities with third countries and in their role as members of international organisations, take due account of this Recommendation when proposing research strategies and taking decisions, and duly coordinate with other Member States and the Commission.

8. That this Recommendation also be used as an instrument to encourage dialogue at all governance levels among policy makers, researchers, industry, ethics committees, civil society organisations and society at large with a view to increasing understanding and involvement by the general public in the development of new technologies.

9. That the Member States inform the Commission by 30 June 2008 and annually thereafter of any measures they have taken further to this Recommendation, inform it of the first results of its application and provide good practices.

Done at Brussels, 07/02/2008.

For the Commission
Janez POTOČNIK
Member of the Commission

ANNEX

CODE OF CONDUCT FOR RESPONSIBLE NANOSCIENCES AND NANOTECHNOLOGIES RESEARCH

This Code of Conduct provides Member States, employers, research funders, researchers and more generally all individuals and civil society organisations involved or interested in nanosciences and nanotechnologies (N&N) research (“all stakeholders”) with guidelines favouring a responsible and open approach to N&N research in the Community.

The Code of Conduct is complementary to existing regulations. It does not limit or otherwise affect the possibilities of Member States to grant a wider measure of protection with regard to N&N research than is stipulated in this Code of Conduct.

Stakeholders who adhere to this Code of Conduct should also be inspired, where applicable, by the principles set out in the Charter of Fundamental Rights of the European Union.

The Code of Conduct will be regularly monitored and revised every two years by the Commission in order to take into account developments in N&N worldwide and their integration in European society.

1. SCOPE AND AIM

The Code of Conduct invites all stakeholders to act responsibly and cooperate with each other, in line with the N&N Strategy and Action Plan of the Commission, in order to ensure that N&N research is undertaken in the Community in a safe, ethical and effective framework, supporting sustainable economic, social and environmental development.

The Code of Conduct covers all N&N research activities undertaken in the European Research Area.

The Code of Conduct is voluntary. It offers a set of general principles and guidelines for actions to be taken by all N&N stakeholders. It should facilitate and underpin the regulatory and non-regulatory approaches outlined in the 2005-2009 N&N Action Plan for Europe, improving the implementation of current regulation and coping with scientific uncertainties.

The Code of Conduct should also be a European basis for dialogue with third countries and international organisations.

2. DEFINITIONS

For the purpose of the Code of Conduct, the following definitions apply:

- a) Nano-objects: In the absence of recognised international terminology the generic term of 'nano-object' is used all throughout the Code of Conduct to designate products resulting from N&N research. It includes nanoparticles and their aggregation at nanoscale, nano-systems, nano-materials, nano-structured materials and nano-products.
- b) N&N research: In the broadest sense understood here, N&N research encompasses all research activities dealing with matter at the nanometric scale (1 to 100 nm). It includes all man-made nano-objects be they engineered or involuntarily generated.

Naturally occurring nano-objects are excluded from the scope of the Code of Conduct. N&N research encompasses research activities from the most fundamental research to applied research, technology development and pre and co-normative research underpinning scientific advice, standards and regulations.

- c) N&N stakeholders: Member States, employers, research funders, researchers and more generally all individuals and civil society organisations engaged, involved or interested in N&N research.
- d) Civil society organisations: In the context of the Code of Conduct, civil society organisations are considered to be any legal entity that is non governmental, not-for-profit, not representing commercial interests, and pursuing a common purpose in the public interest.

3. GENERAL PRINCIPLES

This Code of Conduct is based on a set of general principles which call for actions aimed at guaranteeing their respect by all stakeholders.

3.1 Meaning

N&N research activities should be comprehensible to the public. They should respect fundamental rights and be conducted in the interest of the well-being of individuals and society in their design, implementation, dissemination and use.

3.2 Sustainability

N&N research activities should be safe, ethical and contribute to sustainable development serving the sustainability objectives of the Community as well as contributing to the United Nations' Millennium Development Goals¹¹. They should not harm or create a biological, physical or moral threat to people, animals, plants or the environment, at present or in the future.

3.3 Precaution

N&N research activities should be conducted in accordance with the precautionary principle, anticipating potential environmental, health and safety impacts of N&N outcomes and taking due precautions, proportional to the level of protection, while encouraging progress for the benefit of society and the environment.

3.4 Inclusiveness

Governance of N&N research activities should be guided by the principles of openness to all stakeholders, transparency and respect for the legitimate right of access to information. It should allow the participation in decision-making processes of all stakeholders involved in or concerned by N&N research activities.

3.5 Excellence

¹¹ The United Nations Millennium Declaration, General Assembly resolution 55/2, 8.9.2000

N&N research activities should meet the best scientific standards, including standards underpinning the integrity of research and standards relating to Good Laboratory Practices¹².

3.6 Innovation

Governance of N&N research activities should encourage maximum creativity, flexibility and planning ability for innovation and growth.

3.7 Accountability

Researchers and research organisations should remain accountable for the social, environmental and human health impacts that their N&N research may impose on present and future generations.

4. GUIDELINES ON ACTIONS TO BE TAKEN

The guidelines set out in this point are based on the set of general principles described in point 3. They are meant to give guidance on how to achieve good governance, due respect for precaution, as well as wide dissemination and good monitoring of the Code of Conduct. The main responsibilities for action are indicated below, but all N&N stakeholders should contribute to their implementation as much as possible within the scope of their own remit.

4.1 Good governance of N&N research

Good governance of N&N research should take into account the need and desire of all stakeholders to be aware of the specific challenges and opportunities raised by N&N. A general culture of responsibility should be created in view of challenges and opportunities that may be raised in the future and that we cannot at present foresee.

4.1.1 Member States should cooperate with the Commission in order to maintain an open and pluralistic forum for discussion on N&N research at Community level as a means to stimulate the societal debate about N&N research, encouraging the identification and discussion of concerns and hopes and facilitating the emergence of possible initiatives and solutions. Accordingly, Member States should enhance communication on benefits, risks and uncertainties related to N&N research. Specific attention should be paid to the younger and older members of the population.

4.1.2 With due respect for intellectual property rights, Member States, N&N research funding bodies, research organisations and researchers are encouraged to make easily accessible and understandable by lay people as well as by the scientific community all N&N scientific knowledge as well as related information such as relevant standards, references, labels, research on impacts, regulations and laws.

4.1.3 Member States should encourage private and public sector laboratories to share best practices in N&N research, with due respect for the protection of intellectual property.

4.1.4 N&N research organisations and researchers should ensure that scientific data and results are duly peer-reviewed before being widely disseminated outside the scientific community in order to ensure their clarity and balanced presentation.

¹² Directive 2004/9/EC and Directive 2004/10/EC

4.1.5 Given its potential, Member States and N&N research organisations should ensure that N&N research is conducted at the highest level of scientific integrity. Questionable N&N research practices (not limited to plagiarism, falsification and fabrication of data) should be fought as they may entail risks for health, safety and the environment, raise public distrust and slow down the dissemination of benefits from research. Individuals signalling impropriety in research should be protected by their employers and national or regional laws.

4.1.6 Member States should ensure that appropriate human and financial resources are dedicated to the application of existing laws and regulations applicable to N&N research. Organisations performing N&N research activities should demonstrate transparently that they comply with relevant regulations.

4.1.7 National and local ethics committees and competent authorities should evaluate the manner of applying ethical review requirements to dual-use nanotechnology research. They should notably address the fundamental rights implications of any possible restrictions on informed consent and on publication of research results related to human health.

Favouring an inclusive approach

4.1.8 The broad directions of N&N research should be decided in an inclusive manner, allowing all stakeholders to enrich the preliminary discussions on these directions.

4.1.9 Member States, N&N research funding bodies, research organisations and researchers are encouraged to consider, at the earliest stages and through participatory foresight exercises, the future implications of technologies or objects being researched. This could allow the development of solutions to meet potential negative impacts caused by the use of a new object or technology at a later stage. Consultations with relevant ethics committees should be part of such foresight exercises as appropriate.

4.1.10 N&N research itself should be open to contributions from all stakeholders who should be informed and supported so that they can take an active part in the research activities, within the scope of their mission and mandate.

Key priorities

4.1.11 Research authorities and standardisation bodies should endeavour to adopt N&N standard terminology to facilitate the communication of scientific evidence. They should encourage standard measurement procedures as well as the use of appropriate reference materials in order to improve comparability of scientific data.

4.1.12 N&N research funding bodies should devote an appropriate part of N&N research to the development of methods and tools for risk assessment, the refinement of metrology at nano-scale and standardisation activities. In this context, particular attention should be paid to developing methods to assess the risk of second-generation, active nano-structures.

4.1.13 Member States, N&N research funding bodies and organisations should encourage fields of N&N research with the broadest possible positive impact. A priority should be given to research aiming to protect the public and the environment, consumers or workers and aiming to reduce, refine or replace animal experimentation.

4.1.14 N&N research funding bodies should carry out and publish balanced assessments, based on best available scientific data, of the potential costs, risks, and benefits of research areas eligible for funding.

Prohibition, restrictions or limitations

4.1.15 N&N research funding bodies should not fund research in areas which could involve the violation of fundamental rights or fundamental ethical principles, at either the research or development stages (e.g. artificial viruses with pathogenic potentials).

4.1.16 N&N research organisations should not undertake research aiming for non-therapeutic enhancement of human beings leading to addiction or solely for the illicit enhancement of the performance of the human body.

4.1.17 As long as risk assessment studies on long-term safety is not available, research involving deliberate intrusion of nano-objects into the human body, their inclusion in food (especially in food for babies), feed, toys, cosmetics and other products that may lead to exposure to humans and the environment, should be avoided.

4.2 Due respect for precaution

Given the deficit of knowledge of the environmental and health impacts of nano-objects, Member States should apply the precautionary principle in order to protect not only researchers, who will be the first to be in contact with nano-objects, but also professionals, consumers, citizens and the environment in the course of N&N research activities.

4.2.1 Students, researchers and research organisations involved in N&N research should take specific health, safety and environmental measures adapted to the particularities of the nano-objects manipulated. Specific guidelines on the prevention of pathologies induced by nano-objects should be developed in line with the Community Strategy 2007-2014 on Health and Safety at Work¹³.

4.2.2 N&N research organisations should apply existing good practices in terms of classification and labelling. In addition, as nano-objects might present specific properties due to their size, they should undertake research on systems (including e.g. the development of specific pictograms) aiming to inform researchers and more generally people likely to come into contact with nano-objects in research premises (e.g. security and emergency staff) so that they may take the necessary and appropriate protection measures in the course of their duties.

4.2.3 Public and private N&N research funding bodies should request that a risk assessment be presented along with each submission of a proposal for funding for N&N research.

4.2.4 N&N research funding bodies' programmes should include monitoring of the potential social, environmental and human health impacts of N&N over a relevant period of time.

¹³ COM(2007) 62, 21.2.2007.

Application of the precautionary principle should include reducing the gaps in scientific knowledge, and therefore undertaking further actions in research and development such as the following:

4.2.5 Research funding bodies should devote an appropriate part of N&N research to understanding the potential risks, notably to the environment and human health, induced by nano-objects, encompassing their whole life-cycle, from their creation up to their end of life, including recycling.

4.2.6 N&N research organisations and researchers should launch and coordinate specific N&N research activities in order to gain a better understanding of fundamental biological processes involved in the toxicology and ecotoxicology of nano-objects man-made or naturally occurring. They should widely publicise, when duly validated, data and findings on their biological effects, be they positive, negative or null.

4.2.7 N&N research funding bodies should launch and coordinate specific research activities in order to gain a better understanding of ethical, legal and societal impacts of the new fields opened by N&N. Information and communication technologies and biotechnology should receive particular attention as well as the convergence between these fields and cognitive sciences and N&N.

4.3 Wide dissemination and monitoring of the Code of Conduct

4.3.1 Member States should support the wide dissemination of this Code of Conduct, notably through national and regional public research funding bodies.

4.3.2 In addition to the existence of this Code of Conduct, N&N research funding bodies should make sure that N&N researchers are aware of all relevant legislation, as well as ethical and social frameworks.

4.3.3 As the application of the Code of Conduct should be monitored across the Community, Member States should cooperate with the Commission in order to devise adequate measures to carry out such monitoring at national level and guarantee synergies with other Member States.

The Responsible Nano Code

Hilary Sutcliffe
Secretariat
Responsible Nano Code

ResponsibleNanoCode

How it all started...

- 2004
 - Royal Society/Royal Academy of Engineering joint report on *'Nanoscience and Nanotechnologies: Opportunities and Uncertainties'*
- 2006
 - Royal Society felt there was a gap – business was not engaged
 - Insight Investment had identified potential investment issues and risks
 - They approached the Nanotechnologies Industries Association which also saw the need to engage more widely
 - A Business Workshop was held to explore uncertainties and solutions
- 2007
 - The Responsible Nano Code Initiative set up
- 2008
 - The Responsible Nano Code launch planned

ResponsibleNanoCode

The initiative aims to:

- Establish what is good practice for companies and other organisations involved in nanotechnologies
- Develop a code which is:
 - ✓ International in scope
 - ✓ For adoption by companies and other organisations, large and small...
 - ✓ ...involved in developing, manufacturing, retailing, disposal and recycling of products using nanotechnologies

ResponsibleNanoCode

The Code is not intended to:

- X ...supplant or delay effective or appropriate regulation
- X ...be an auditable set of standards
- X ...offer detailed guidance on performance expectations
- X ...provide any new definitions, characterisation or measurement of nanotechnologies

ResponsibleNanoCode

Who is involved?

- 'Founding partners' – *Royal Society, Insight Investment, Nanotechnology Industries Association and Nanotechnology Knowledge Transfer Network*
- Funders – *Royal Society, Insight Investment, KTN*
i.e. not business-funded.
- Chair – *Lord Selborne*
- Secretariat – *Responsible Futures*

ResponsibleNanoCode

The Working Group

Companies

- BASF
- Johnson & Johnson
- Johnson Matthey
- Oxonica
- Smith & Nephew
- Tesco
- Thomas Swan
- Unilever

Academics / scientists

- Institute of Occupational Medicine
- Napier University
- University of Sheffield
- University of Cardiff

Unions / NGOs

- Amicus
- Practical Action
- Which?

Founding Partners

- Royal Society
- Insight Investment
- Nano KTN
- NIA

ResponsibleNanoCode

Consultation activity

Activity undertaken	Audience reached
Mailings from us & consultation partner initiative Eg: NanoCap, NGO coalition, NIA etc	600+
Consultation partner initiatives Attendees at consultation partner events	5 155?
Meetings or in-depth telephone calls	17
Sources of input received (incl feedback from one-to-one meetings, events, submissions)	44

ResponsibleNanoCode

Consultation Partners

Partner	Activity
EU Commission	Consultation event held December 5 th 2007 – 46 attendees
Woodrow Wilson Centre - USA	Consultation event held 9 October 2007 – 25 attendees
ForumNano, Germany (Responsible Nano SME Group)	<ul style="list-style-type: none"> • Code Presentations and Promotion at NanoSolutions conference • Discussion of Code with its 7 Members • Formal Submission
European Social Investment Forum	Consultation event held by conference call held 26 November - 14 participants
Australian Nano Business Forum	<ul style="list-style-type: none"> • Consultation event 26th November – 40 attendees • Online survey conducted

ResponsibleNanoCode

The Responsible Nano Code: Seven Principles

NB: Draft Principles – not yet approved

The Code also features examples of how organisations can demonstrate compliance

ResponsibleNanoCode

Principle One: Board Accountability

Each Organisation should ensure that accountability for guiding and managing its involvement with nanotechnologies resides with the Board or with an appropriate senior executive or committee

ResponsibleNanoCode

Principle Two: Stakeholder Involvement

Each Organisation should identify its nanotechnology stakeholders, proactively engage with them and be responsive to their views.

ResponsibleNanoCode

Principle Three: Worker Health and Safety

Each Organisation should ensure high standards of occupational health and safety for its workers handling nano-materials and nano-enabled products. It should also consider occupational health and safety issues for workers at other stages of the product lifecycle

ResponsibleNanoCode

Principle Four – Public Health, Safety & Environmental Risks

Each Organisation should carry out thorough risk assessments and minimise any potential public health, safety or environmental risks relating to its products using nanotechnologies. It should also consider the public health, safety and environmental risks throughout the product lifecycle

ResponsibleNanoCode

Principle Five: Wider Social, Ethical Environmental & Health Impacts

Each Organisation should consider and contribute to addressing the wider social, environmental, health and ethical implications and impacts of their involvement with nanotechnologies

ResponsibleNanoCode

Principle Six – Engaging with Business Partners

Each Organisation should engage proactively, openly and co-operatively with business partners to encourage and stimulate their adoption of the Code.

ResponsibleNanoCode

Principle Seven – Transparency and Disclosure

Each Organisation should be open and transparent about its involvement with and management of nanotechnologies and report regularly and clearly on how it implements the Responsible Nano Code

ResponsibleNanoCode

How will it work?

- A *'Comply or Explain'* reporting philosophy – often used in governance and corporate responsibility Codes
- Companies and organisations adopting the code must comply with its principles...or ...explain if they do not, why not
- They report how they comply, usually in Annual and Social reports or statements and on their website
- The Code will be 'owned' by an international, multi-stakeholder body (to be created)
- Compliance criteria and guidance are devised by a multi-stakeholder panel

ResponsibleNanoCode

In summary

- A voluntary, principles-based Code for business
- With examples of how organisations may comply
- Designed to have International application
- Not intended to supplant or delay effective and appropriate legislation
- Monitoring and compliance of the Code through 'comply or explain' governance structure

ResponsibleNanoCode



A Code of Conduct for Nanotechnology: The BASF approach



Dr. Carolin Kranz
Corporate and Governmental Relations

3rd International Dialogue on Responsible Research and Development of Nanotechnology
Brussels, March 11, 2008

BASF at a Glance



BASF – The Chemical Company



- The world's leading chemical company
- Sales 2007: € 57,951 millions
- Income from operations (EBIT) 2007: € 7,316 millions
- Employees at year-end 2007: 95,175
- Our portfolio ranges from chemicals, plastics, performance products, agricultural products and fine chemicals to crude oil and natural gas

Sales Products: Nano Makes the Difference



adhesion



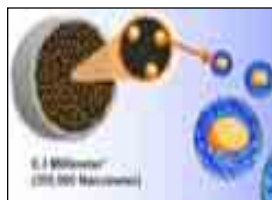
eco-efficiency



self-cleaning



dirt-resistance



bioavailability

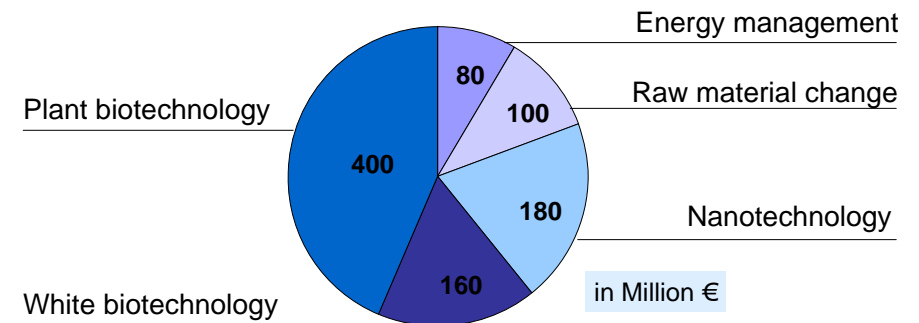


sun protection

Nanotechnology: Innovation Driver for BASF



2006 – 2008: About 920 Mio. € research investments in focus areas:



BASF R&D focuses on the development of nanoparticles as well as on the development of nanostructured surfaces, materials and systems. Examples are OLEDs, organic solar cells, surfaces on ship hulls to prevent fouling and nanoporous foams for heat insulation.

A Code of Conduct – Why?



- Large innovation potential
- Potential to address global challenges
- Nanomaterials on the market
- Employees handling nanomaterials
- Ongoing safety research
- Legal uncertainty
- Public acceptance but
- Consumer groups asking for labeling
- NGOs demanding regulation

A Code of Conduct maintains the necessary framework conditions for innovation and competitiveness. It sets principles, values and standards or rules of behavior that guide the decisions, procedures and systems of an organization. A Code is handled as an instrument of voluntary self-commitment and makes a company accountable towards society and politics.

5

The BASF Code of Conduct Nanotechnology



■ The BASF Code of Conduct is a voluntary commitment to responsible action based on our Values & Principles:

- protection of employees, customers and business partners
- protection of the environment
- participation in safety research
- commitment to open communication and dialogue

The BASF Code of Conduct was agreed upon by the Board. It describes the framework for our activities and is published on our website at: www.basf.de/dialogue-nanotechnology



6

Walking the talk: Occupational Safety



Guideline, that considers the particular situation of nanoparticles:

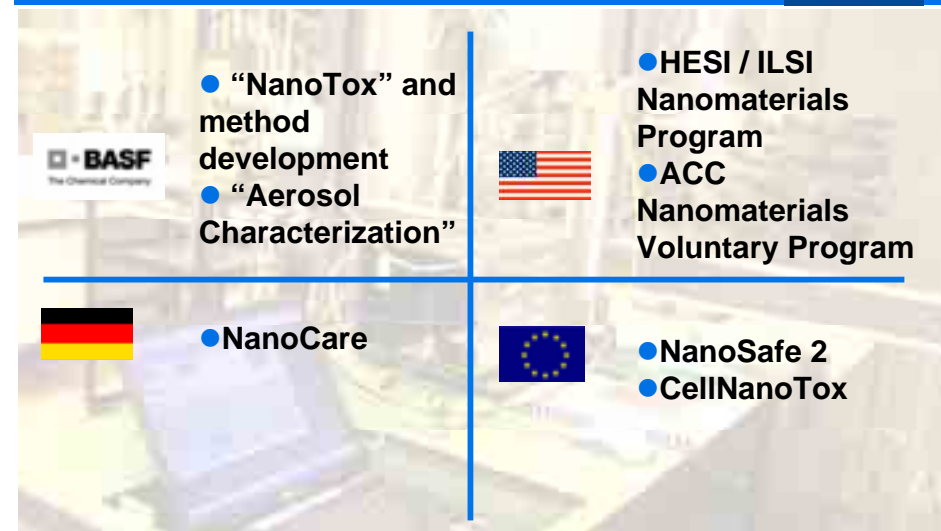
- A standardized occupational exposure measurement method is not yet available.
- A specific legal requirement apart from the existing occupational exposure limit values for dust is not yet existing.

Our approach is to work as far as possible in closed systems. If this is not possible, technical and organisational measures are additionally taken. Working areas subject to nanoparticle emissions are monitored by exposure measurements.



7

Walking the Talk: Safety Research



Walking the talk: Safety Research



www.basf.de/dialogue-nanotechnology/safety_research

Walking the Talk: Transparency and Dialogue



www.basf.de/dialogue-nanotechnology

- 2006: BASF hosted its first Stakeholder Event in Berlin
- 2007: BASF took part at the Evangelical Church Congress in Cologne
- 2008: BASF will start a dialogue with representatives from churches, environmental groups and consumer groups

Walking the Talk: Product Safety



- Circulation of information along the supply chain is crucial to protect up-stream users and consumers
- For chemical substances, safety data sheets are the established tool for information transmission
- BASF started to include information about nanoparticles into the safety data sheets
- E.g.: Mincor® TX TT: Do not use as spray!
- E.g. T-Lite®: Primary particle size < 200nm

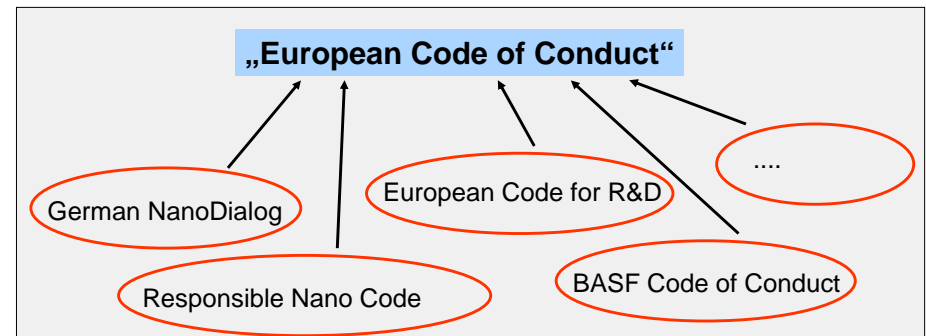
SDS: Sicherheitsdatenblatt gemäß Verordnung (EG) Nr. 1907/2006
Datum / überarbeitet am: 14.08.2007
Produkt: Mincor® TX TT

SDS: Sicherheitsdatenblatt gemäß 1115/2008
Datum: überarbeitet am: 14.08.2007
Produkt: T-Lite®

One Code for Everybody!



- Code of Conduct is a suitable means behind the current economic, scientific and regulatory situation.
- Currently there are different Codes applied or under development.
- Goal must be: One Code for Europe jointly developed by all stakeholders



Thank you for your attention!

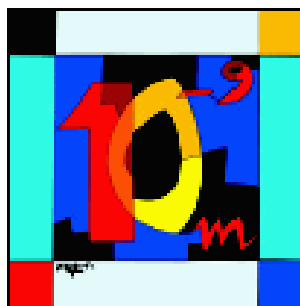


Zinc oxide particles protect against sunburn



Nanocubes can store energy-rich gases

Dr. Carolin Kranz
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Phone: +49 621 60 43360



PLENARY SESSION 2 BRIDGING THE GAP

Chairmanship: Humberto TERRONES (Mexico)

Short communication: Ongoing projects and prospective in the nanotechnology field in Brazil: José d'Albuquerque e Castro (S&T Ministry, Brazil)

Keynote lecture: Graziano BERTOGLI (ICS, UNIDO)

Case study: South-South cooperation by a speaker from the IBSA initiative (India, Brazil, South Africa): Baldev RAJ, India's coordinator for the tri-nation programme in the field of nanotechnology, Director of IGCAR, (India)

Short communication: Ongoing projects and prospective in the nanotechnology field in Argentina: Alberto LAMAGNA (CNEA, Argentina)



Brazilian Initiative on Nanoscience and Nanotechnology

José d'Albuquerque e Castro

3rd International Dialog on Responsible Research and
Development of Nanotechnology
Brussels, 11-12 March 2008

Nanoscience and Nanotechnoly

Federal Government initiatives:

1. National Program on Nanotechnology (MCT)

- ⇒ EMBRAPA (M. Agriculture)
- ⇒ FIOCRUZ (M. Health)
- ⇒ ANVISA (M. Health)
- ⇒ CAPES (M. Education)
- ⇒ SENAI (M. Labour)
- ⇒ INMETRO (M. Industrial Development)

2. Industrial, Technological and External Trade Policy (PITCE)

Nanoscience and Nanotechnoly

- National Program on Nanoscience and Nanotechnology
- Sectorial Funds
- Subvention Program (directed to Industries)

- Criation of 10 National Research Networks on N&N
- 4 Millennium Institutes

International Cooperation: many countries

- Binational Center for Nanotechnoly

Nanoscience and Nanotechnoly

- INMETRO: Nanometrology

- Anvisa: sanitary issues

- 6 out of the 10 Research Networks are dealing risk issues

**International Centre for Science and High Technology
United Nation Industrial Development Organization
High Technology & New Materials Area**

**International dialogue on
responsible nanotechnology
Bridging the gap
Opportunity for Developing Countries**

Bruxelles 11-12 March 2008

High Technology & New Materials Area

Developing Economies 1950's-2000's

- Division of labour, specialisation according to comparative advantage : global output higher, static gains from trade to partners
- Dynamic Gains: higher income, savings, investment, imports of capital goods embodying new technology
- Primary Exports : price and revenue instability, long run decline in terms of trade
- Many developing countries depended on 1-3 commodities for export earnings
- Primary sector a large proportion of GDP

High Technology & New Materials Area

Newly Industrialising Economies

- NIEs 1980 :Asian Four, Brazil, Mexico, Portugal, Greece, Turkey
- Labour-intensive , export orientation in electronics, clothing, toys
- Some moved to higher value added, capital intensive industrialisation paths
- 1980's-1990s: high technology in South Korea, Taiwan, Singapore ..where else? How?
- 2000's :China : labour intensive PLUS high technology industrialisation paths

High Technology & New Materials Area

A new complex international economy

- Deep, complex global integration of production due to MNCs and Foreign Direct Investment.
- Inter-affiliate flows and regional integration
- FDI mainly by and between rich OECD :tripolar and favours specific developing economies
- Poorer developing economies by-passed, except (STILL) in extractive industry enclaves
- UNCTAD : International Production
- Control by MNCs of production abroad, M&A, alliances, subcontracting

High Technology & New Materials Area

Period	Era	Impact	Results
1920's	Quantum Theory	Qualitative materials understanding microstructure-properties relationship	Transistor, atomic power & all modern technologies
1980's-1990's	Advanced Materials Revolution	Arrival of advanced materials enabled by processing power, modeling, simulation & fabrication of materials, mathematical advances	Advanced metals, ceramics, engineering plastics, composites
	Nanoscience & nanotechnology	Quantitative materials fundamental understanding: design and process materials with desired microstructure to achieve specific properties Fundamental understanding of properties of matter at the nanoscale	Materials by design
2000's	Nanoscience & nanotechnology	Early stage of fundamental scientific understanding, methodology, nanofabrication, building nanostructure, systems, devices	Nanoparticles, nano coatings, etc

©Kaounides, Fianti, Stingelin (2005)

Fundamental understanding

High Technology & New Materials Area

Period	Era	Impact	Results
2000's	Convergence of nano-bio-info-cogno	Sciences converging at the nanoscale and with advances in brain sciences	<p>Roco, Journal of Nanoparticles Research (2001)</p>
2000-2020	Convergence of nano-bio-info-cogno	Fuller, more quantitative Nanoscale materials understanding, modelling, simulation, fabrication/self-assembly, integrative platforms, system integration	<p>Roco, Journal of Nanoparticles Research(2005)</p>

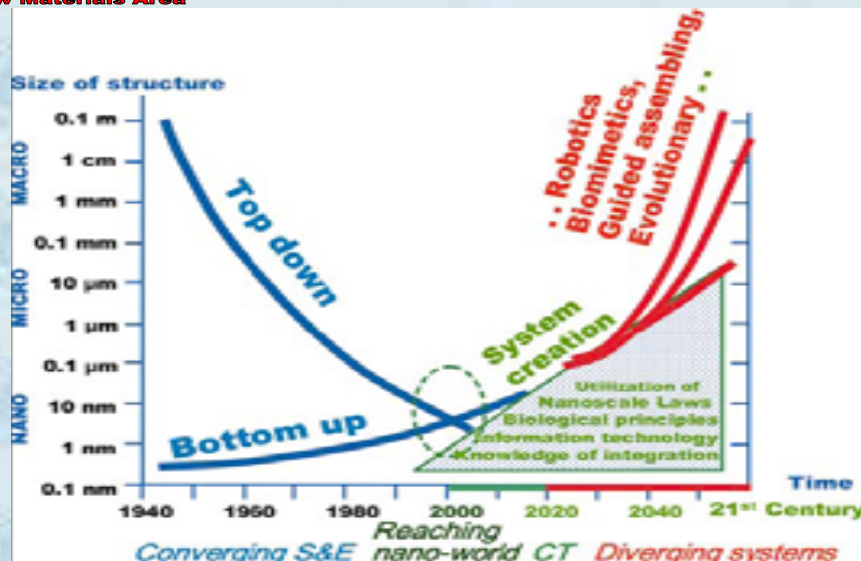
©Kaounides, Fianti, Stingelin (2005)

From the presentation of Lakis Kaounides, BSc, BComm, MA, FIoN to UNIDO EGM 12/2007

convergence of physics/micro-nanoelectronics,chemistry,biology

-convergence of technologies

High Technology & New Materials Area



Nanotechnology . Major sector of application

High Technology & New Materials Area

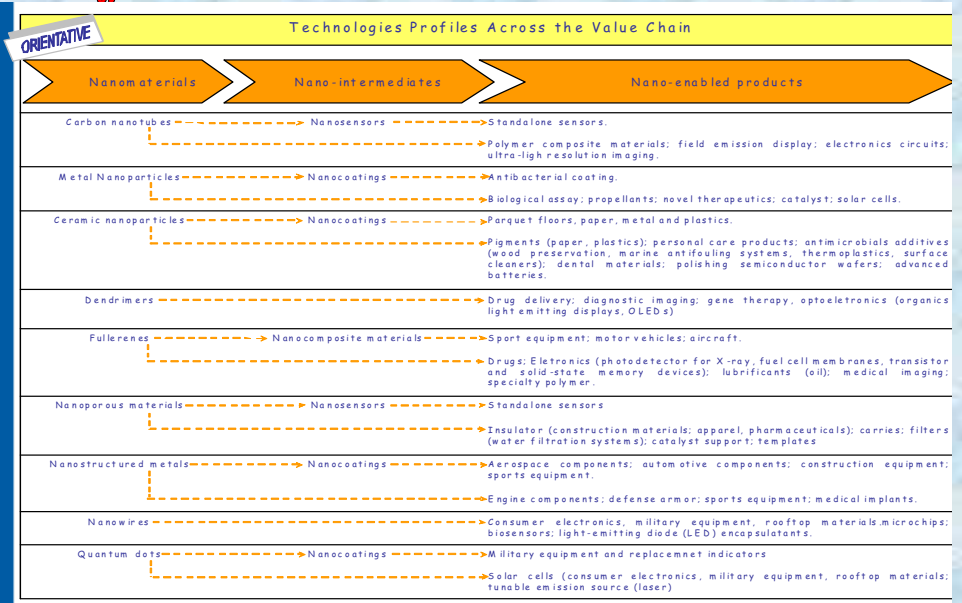


Table 7 – Estimate of the world market for the two main categories of the Nanotech.

Categories	Examples	2005 (€ Million)	Projected 5-year c.a.g.r. (2005-2010) , %	
Nanomaterials	▪ Nanowires	0.1	176	
	▪ Fullerenes	1.9	89	
	▪ Nanoporous materials	40.1	67	
	▪ Quantum dots	3.2	55	
	▪ Metal nanoparticles	66.0	54	
	▪ Ceramic nanoparticles	133.6	52	
	▪ Nanostructured metals	20.8	48	
	▪ Carbon Nanotubes	31.9	44	
	▪ Dendrimers	9.7	27	
	▪ Nano-enabled memories	3.7	280	
Nanointermediates	▪ Nano-enabled diagnostics	41.6	78	
	▪ Nanocomposite materials	207.8	65	
	▪ Nanotherapeutics	20.8	62	
	▪ Nano-enabled drug delivery systems	727.6	54	
	▪ Nano-enabled displays	460.0	54	
	▪ Nanosensors	7.4	52	
	▪ Nanocoatings	964.6	27	
	▪ Nano-enabled solar cells	964.6 (*)	N.M.	
	Total		3,705.0	

(*)projected for 2010

Source: Lux Research.

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Exhibit 30: The Top 10 Applications of Nanotechnology for Developing Countries

Ranking (Score)	Applications of Nanotechnology	Examples
1 (766)	Energy storage, production, and conversion	Royal 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
2 (706)	Agricultural productivity enhancement	Hybrid protein-polymer biomimetic membranes 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
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
4 (606)	Disease diagnosis and screening	TiO ₂ nanoparticles for the catalytic degradation of water pollutants Nanofilter 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
5 (558)	Drug delivery systems	Nanocapsules, liposomes, dendrimers, buckyballs, nanobiomagnets, and attapulgite clays for slow and sustained drug release systems
6 (472)	Food processing and storage	Nanocomposites for plastic film coatings used in food packaging Antimicrobial nanoemulsions for applications in decontamination of food, sealant, packaging, or food Nanotechnology-based antigen detecting biosensors for identification of pathogen contamination
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
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 insulation Self-cleaning surfaces (e.g., windows, mirrors, toilets) with bioactive coatings
9 (221)	Health monitoring	Nanotubes and nanoparticles for glucose, CO ₂ , and cholesterol sensors and for in-situ monitoring of homeostasis
10 (258)	Vector and pest detection and control	Nanosensors for pest detection Nanoparticles for new pesticides, insecticides, and insect repellents

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Source: Policy Forum

Selected nanotechnology programmes in Developing Countries

- Thailand: established National Nanotechnology Center (NANOTEC) to provide strong foundation and national competitiveness in nanotechnology
- Taiwan: cabinet (3.3.2006) to spend NT\$32billion(US\$1billion) over next 5 years mainly on nanotechnology
- Israel: Israel National Nanotechnology Initiative to make nanotech next wave of successful industry and attain global leadership. Israel Europe R&D Directorate-emphasis in nanoR&D projects in Framework programmes
- Vietnam: Saigon Tech Park , produced first nanoprodukt: nanocoal

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From the presentation of Lakis Kaounides, BSc, BComm, MA, FIoN to UNIDO EGM 12/2007

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Selected nanotechnology programmes in Developing Countries

- Chinese First Nanotechnology Park, in Xi'an, capital of northwest China's Shaanxi Province
- China's National Nanoscience Center
Cooperation among The Chinese Academy of Sciences (CAS), Peking University and Tsinghua University.
- Indian Institute of Technology Roorkee
- Asian Institute of Technology, Bangkok, Thailand
- Saigon Hi- Tech Park, Ho-Chi Minh City, Vietnam

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From the presentation of Lakis Kaounides, BSc, BComm, MA, FIoN to UNIDO EGM 12/2007

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Objectives

- To explore appropriate areas where to promote nano-science and nanotechnology for DCs,
- To thoroughly survey the state-of-the-art in the area in developing countries
- To promote a better understanding of the needs and opportunities in DCs in this area.
- To define the role of ICS with the support of the Trieste System in promoting and catalyzing the implementation of nanotechnology in DCs
- To discuss the role of education in promoting nanotechnology: the model of the USA and Europe and to propose training activities in developing countries

Conclusion and Recommendations

- Joint research projects and training of scientists, trainers and researchers in applied technologies
- Intellectual properties, licences and patents
- Partnerships between academia and industry to advance and implement nanotechnology for economic development. Support and promotion of cooperation between scientific and technological research centres and industry through the establishment of technology parks, incubators, and links with international technology centres as well as the extensive use of . In addition, financial incentives may be used to support university-industry partnerships.
- Nanotechnology assessment and the Risk assessment.
- Network among countries (North-South and South-South). Share and promote technologies/methodologies.
- Promote the conduction of surveys to assess potential regional pooling of existing resources and capabilities, establishing regional *fora* and identifying research institutions, foundations, and companies that have the interest and capacity to jointly develop new nanotech products and services;
- Create *ad hoc* private, public multilateral funds for nanoscience and nanotechnology research, development and application

General requests

More innovation rather than industry
More knowledge than information
More partnership than cooperation
More <i>responsible trade</i> than international assistance
More managerial skill than subsistence
More network than nationalism

Objectives

- A first , INTRODUCTORY meeting
- Complex , interdependent set of issues
- Debate and Understand key issues
- Develop first steps in creating a coherent, effective long run strategy by UNIDO
- Within the framework of a strategic orientation, identify first technology application and infrastructure projects
- Create processes for continuous development of UNIDO strategy and projects on the ground : intervene in debates by IPCC, UNEP, UNDP, Oxfam, Bali...
- Dissemination of first results: book and UNIDO papers with deadlines , milestones
- Follow-up action building on this week

Global, Corporate and Entrepreneurial Implications of Nanoscience and Nanotechnology

- Who does the R&D and who has the patents?
- Where is nanoscience and nanotechnology concentrated?
- How can NanoR&D be directed to adaptation, mitigation and development needs?
- How can developing countries build nanotechnology infrastructures and R&D capacity?

Who will commercialise nanoscience and nanotech in Developed Countries? And in Developing Countries ?
Who will manage this scientific revolution?

Recommendations

- Finance for seed, early stage, late stage , IPO , sustainable growth of nanotech enterprises?
- VC funds and Stock Markets in Europe? Asia?
- Timescale for commercialising nanoscience vs VC exit strategies and time horizon for return on funds invested from institutions

Training Opportunity for scientists and engineers in
multidisciplinary skills

But they also need skills in management

Skills in finance

Skills in technology management and technology strategy

Skills in high tech marketing

Skills in IP strategy

Skills in science and technology policy

Recommendations and Specific Plan of Action: Steps Required, Implementation and Monitoring of specific programmes at the sectoral and country specific level in 2008 and beyond , in order of priority

- Creating THREE NODAL nanoscience and nanotechnology research centres and networks: Nanotechnology R&D and Applications Centres (NARDA) which network with each other ,the other UNIDO International Centres, institutions within developing economies and the global nanoscience and nanotechnology network , centres of excellence across knowledge – based economies . Middle-East/Africa; Latin America; Asia. Each Centre could specialise in scientific domains , technologies and industry applications and/or socioeconomic need
- Creating a UNIDO Think Tank on science, technology , climate change and industrial development paths : leading thinkers globally in constant communication, constantly developing and building on the findings of this workshop and new knowledge, evidence and experience globally.
- Developing a UNIDO Strategy for Intervention at the ground level to build infrastructures, human skills, and research, development and application processes to (i) defend and adapt developing economies to the most dangerous and ongoing consequences of climate change already suffering the worst effects of climate change and disasters and (ii) transfer, adapt, and develop indigenous mitigation technologies consistent with global objectives, and regional/national shares of the mitigation effort during the relevant transition path and time scale.

Nanotechnology Programme

NANOTECHNOLOGY, OPPORTUNITY FOR DEVELOPING COUNTRIES

Promotion, diffusion and application of nanotechnologies
in Developing Countries
to improve social and economic development

Objectives

ICS has recognized the enormous potentiality that the nanotechnologies could represent for the Developing Countries as instrument of their growth; therefore an *ad hoc* multiyear programme will be carried out by the HTNM Area, with the objective of

1. promoting and implementing joint research projects and training of scientists, trainers and researchers in applied nanotechnologies,
2. promoting partnerships between academia and industry to advance and implement nanotechnology for economic development,
3. supporting and promotion of cooperation between scientific and technological research centres and industry through the establishment/upgrading of innovation centres and their linkages with international network as well as the extensive use of *ad hoc* funds and financial incentives
4. assessing nanotechnology and the concerned potential risks associate with their development and use
5. North-South and South-South networking to share and promote technologies/methodologies.

Subprogramme/Outcome/Project

SUBPROGRAMME : HTM/08/1 Nanotechnologies

Promotion, diffusion and application of nanotechnologies in Developing Countries to improve social and economic development

Partnerships and networking among R&D institutions, industries, public research institutes, technology centres and universities dealing with nanotechnologies

Enhance the presence of scientists, experts, researchers from Developing Countries in research programme/projects within nanotechnology institutions based in both Industrialized and Developing Countries

Capacity to create innovative products through the application, adaption and development of nanotechnologies to address local needs and international markets

Subprogramme/Outcome/Project

SUBPROGRAMME : HTM/08/2 Technology management

Provide conditions and structures for the professional promotion of scientists and technicians of African Countries

SUBPROGRAMME: HTM/08/3– Innovation Centres

Promotion of the new concept of Technology Transfer Centres as “innovation facilitators”, focused on:

- sustainability
- promotion of academia/industry partnerships in developing countries

Project	Output	Activities
HTM / 08/1 -1/01 <i>Nanotechnology for developing countries</i>	OP1: Strategic Plan to be implemented by ICS in favour of Developing Countries (three year plan)	<ul style="list-style-type: none"> • Conference on Nanotechnology in Developing Countries: opportunity and possibility
	OP2: Publication the State-of-the -Art on Nanotechnology and opportunity for DCs on medium and long term	<ul style="list-style-type: none"> • Workshop on the State-of the -Art of the technology
	OP3: Publication on possible risks and safety regulation for Developing Countries with regard to the development and utilization of nanotechnologies	<ul style="list-style-type: none"> • Workshop on safety regulation
HTM /08/1-2/01 <i>Nanotechnology regional networking</i>	OP3: Model of Regional nanofora to exchange information and pursuing common goals	<ul style="list-style-type: none"> • Design of model for regional fora • Workshop on model regional fora validation
HTM /08/1-3/01 <i>Establishment of ICS research and training network</i>	OP1 Creation of network including scientists, researchers and technicians from local academy, industry and R&D sectors as well as identifying institutions and or firms for carrying out training within the research/training activities	<ul style="list-style-type: none"> • Identification and selection of partner institutions for the programme (training and research) • Design and selection of research/training projects in connection with the interest shown by Developing Countries policy and programmes • Research projects implementation • Monitoring of the research projects
HTM/08/1-4/01 <i>Nano Project Award</i>	OP1: Portfolio of projects' proposal with complete scientific, technical, financial information including business plan ready to be presented to funding institutions and/or donors	<ul style="list-style-type: none"> • Promotion of the programme among researchers and institution in developing countries • Selection of research and/or development projects

Project title	Project number	No. of fellows	Country of origin
Portfolio of research projects in nanotechnologies	HTM/08/1-3-1	12	Developing Countries
Nanoproject award	HTM/08/1-4-1	1	Developing Countries
Teachnology management and transfer	HTM/08/2-1-1	10	African Countries

Socio-economic targets	Examples
Water Purification	Inexpensive decentralized water purification
Balancing Population & Resources	Crops that require less water
	Zero-waste manufacturing
	Increasing durability of manufactured goods
Health and living conditions	Fully recyclable products
	Environmentally friendly building materials
	Providing clean water to everyone
Drug and cosmetic carrier	Measure the efficiency of the system and detect poisonous gas emissions
Food preservation	Medical intervention to replace elements at the cellular and molecular level
Biofunctional textiles	Better cell activity with help of quantum dots
	To deliver active compounds
Optical Communication	Ecological protection from microbial contamination
	Giving additional functionality to garments supporting therapy and prevention in dermatology.
Making infotech Available to Everyone	Enhancing the fibre capabilities
	Reduce costs for oceanic telecommunication links by removing the need for amplifiers or repeaters
Combating Infectious Disease	Drastically reduce cost and increase performance
	Pervasive, self-configuring networks
Reducing the Threat of Terrorism	Smart dust and swarm
	Inexpensive, rapid diagnostics
	More effective antivirals and antibiotics
Meeting Global Energy Needs	Faster development of new drugs
	Inexpensive, ubiquitous biosensors
	Pervasive sensors and monitoring
	Pervasive computing and communication
	Many solutions above to level playing field
	Better fuel cells
	Better hydrogen storage
	Better solar cells
	Better batteries
	Better sunscreens
	More efficient lighting
	Carbon sequestration
	Decentralized generation and storage
	Achieving Sustainable Development

State of the art on Nanotechnology and opportunity for DCs in the medium and long term

Possible risks for Developing Countries in connection of the development and utilization of nanotechnology

Financial schemes to fund nanotechnology development in Developing Countries

Public support to nanotechnologies development in industrialized countries

Publications produced as results of research programmes on nanotechnologies

Portfolio of project proposal

Master Handouts Material

Business plan for Innovation Centre

Business plan for Local Venture Capital Fund

MEXICO

Pilot Project on Nanotechnology

Innovation Centre on Nanotechnology and Venture Capital Fund - Test case in Guanajuato - Mexico

GENERAL RECOMMENDATION

Innovation Centers as promoters of competitiveness

Creation of permanent mechanisms that integrate the public, private and education sector

Territorial approach / SMEs cluster

Need of selective policies, organized by productive and value chains

Responds to the regional, industrial and education needs



Territorial Network

SERVICES

- Technology selection and assessment
- Technology adaptation
- Promotion of local technologies
- Technology and financial management
- Training
- Applied research project
- Promotion and presentation (demo)
- Technology foresight
- Licenses and patents

Mexican Investment Fund for high technology

An annual portfolio of 100 projects
Participation of at least 30% en 5-10 projects/year

Start-up capital USD\$30 million

Innovation Centre on Nanotechnology and Venture Capital Fund - Test case in Guanajuato - Mexico

First of all, a new strategy for the innovation centers should be found, as to better reflect the new and enhanced role that such institutions are called to play with the aim of bridging the gap between academia and industry instrumental to the technology transfer activities. The focus must nonetheless be on the industries, which are the final targets and end users of the basic and applied research activities as well as innovations carried out by the Universities. Hence, industries should be facilitated in accessing the new ideas, evaluating and testing them, in industrializing such ideas and transforming them into process/products that can generate economic revenues.

In such a scenario, innovation centers become “*innovation facilitators*” which should have the following characteristics:

- Respond to the regional, industrial and education needs
- Integration to a value chain / industrial cluster
- Possess a clear and shared model and strategic vision
- Offer a well structured panel of services, such as

Technology selection and assessment

Technology adaptation

Promotion of local technologies

Technology and financial management

Training Promotion and presentation (demo' pilot plant)

Technology foresight

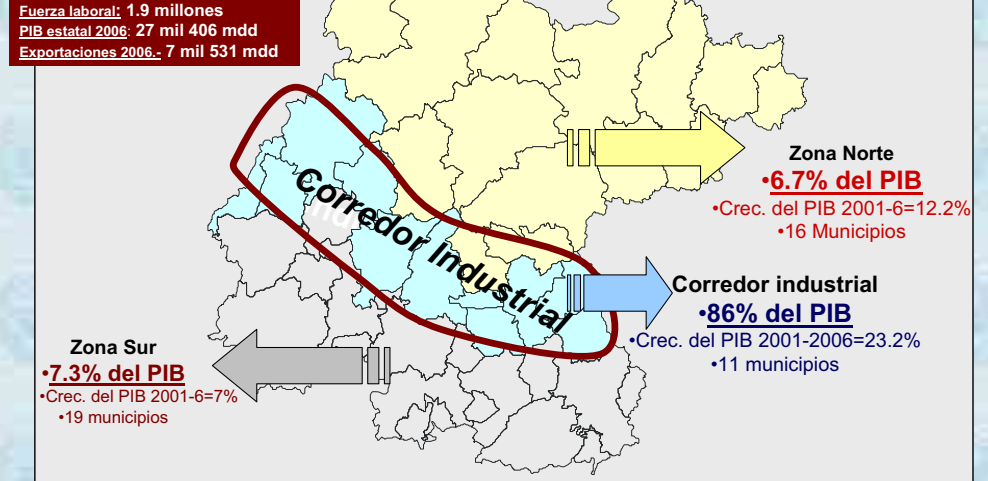
Licenses and patents

To overcome the traditional financial approach for the activities related to R&D (government support or funding against guarantee) the launch of a Mexican Venture Capital Fund (MVCF) is highly recommended. Such a fund could be a strategic tool to foster the current scientific sets of knowledge to be closely more linked to the market needs.

Mexican Venture Capital Fund for high technology
Comparative study of investment funds for high technology
Annual portfolio of 100 projects
Participation of at least 30% en 5-10 projects/year
Start-up capital USD\$20 million

Estado de Guanajuato
Población: 4.9 millones
Fuerza laboral: 1.9 millones
PIB estatal 2006: 27 mil 406 mdd
Exportaciones 2006: 7 mil 531 mdd

Composición Económica de Guanajuato



El Estado de Guanajuato es el eje de un círculo de 400 km. De radio en el cual se encuentra el 60% de la población y el 70% de las actividades de comercio exterior de México.





Corredor de Puertos Interiores en la Región del NAFTA.

G.Bertogli

Universities

- Instituto Tecnológico Superior de Irapuato
- Instituto de Ciencias Humanidades y Tecnologías de Guanajuato, A. C.
- Instituto Tecnológico Superior del Sur De Guanajuato
- Universidad Tecnológica de León
- Universidad Tecnológica del Suroeste De Guanajuato
- Universidad de La Salle Bajío, A.C.
- Universidad de Guanajuato
- Instituto Tecnológico de León
- Instituto Tecnológico de Roque
- Instituto Tecnológico de Celaya

Reserach Centres

- CIATEC, A. C.
- Centro de Investigaciones en Óptica,
- Centro de Investigación en Matemáticas, A. C.
- Instituto de Ciencias en Reproducción Humana, S.C.
- Centro de Investigación y de Estudios Avanzados del I.P.N. - Unidad Irapuato

<p><i>Ingeniería Bioquímica</i></p> <p>Aislamiento y Caracterización de microorganismos degradadores de hidrocarburos aromáticos</p> <p>Síntesis de una serie de análogos de auxinas y sus compuestos con zinc.</p> <p>Diseño y optimización de un biogestor para tratamiento de aguas residuales de origen porcícola</p> <p>Identificación y caracterización de cepas de <i>Yarrowia lipolytica</i> para la degradación de hidrocarburos pesados</p> <p>Diseño de equipo para desmineralizar agua</p> <p><i>Ingeniería de Materiales</i></p> <p>Síntesis de polímeros de coordinación de Zinc (II) y Cadmio (II) con ligandos nitrógeno donadores</p> <p>Diseño de una propuesta de un microsistema MEMS para la caracterización de materiales con propiedades eléctricas</p> <p><i>Ingeniería Electrónica</i></p> <p>Determinación de insecticidas en pimiento morrón mediante el uso de tecnologías MEMS</p> <p>Desarrollo de un Sensor para la Medición de la Corriente de Fuga Generada por la Acumulación de Contaminación en los Aisladores Eléctricos de Suspensión</p> <p>Desarrollo de un Sensor para la detección de fallas en contactores eléctricos a partir de la emisión de radiación infrarroja debido al arco eléctrico en las áreas de contacto.</p> <p>Desarrollo Teórico de un Sistema Multisensor para determinar Variables Críticas en Transformadores de Potencia de la Red Eléctrica Nacional</p> <p>Convertidores CD-CD análisis de fenómenos no lineales, diseño y síntesis de controladores</p> <p>Análisis comparativo entre los procesos de fabricación <i>polimums metalmums</i> para el desarrollo de un sensor de campos magnéticos</p> <p><i>Ingeniería de Sistemas</i></p> <p>Software para dispositivos móviles que permita la extracción de datos desde una base de datos remota y heterogénea.</p>

Id	Nombre	Proponentes			Pays	Sector	Descripción	Propuesta			Actividad a desarrollar	
		Un (1)	In (2)	Ot (3)				Inversion (miles dolares) (4)	Empleos (5)	Etapa (6)	Etapa de Analisis (7)	Desarrollo
03	Deatec S.r.l., Como		√		I	Química	J.V. para una unidad de ensamble de sistemas innovativos para el procesamiento de desechos de procesos industriales	300	1	Start Up	2 hojas	Identificación de la sociedad de ingeniería local como partner.
03	Global Portfolio Management Company, Inc., San Francisco			√	USA	Servicios Financieros	Abertura de una sucursal para la gestión de Hedge Funds en el mercado local	150	2	Start Up	2 hojas + Dossier Tecnico	√
03	Bridge of River S.A., Lugano		√		CH	I.T.C.	J.V. para producir software dedicado a servicios de eco-turismo cultural.	200	2	Seed Money	2 hojas	Identificación del partner local
03	HotelInnovation GmbH, Amburgo			√	D	Servicios Turísticos	J.V. per la realización de áreas de fitness, tales como realizados en la cadena hotelera "25H".	200	2	Seed Money	2 hojas + Dossier Tecnico	Identificación del partner local
04	Membrane Tech Inc., Fresno		√		USA	Química	J.V. para la realización de equipos y plantas de microfiltración	500	3	Start Up	2 Pagina + 1 Dossier Tecnico	Identificación de la sociedad de ingeniería local como partner.
04	Blossom Fund B.V.		√		NL	Servicios Financieros	Fondo cerrado para inversiones en seed & start-up en sector	250	N.S.	Seed Money /Start Up	Evaluación de la iniciativa	Posible aumento de capital via intercambio de deals.

High Technology & New Materials Area

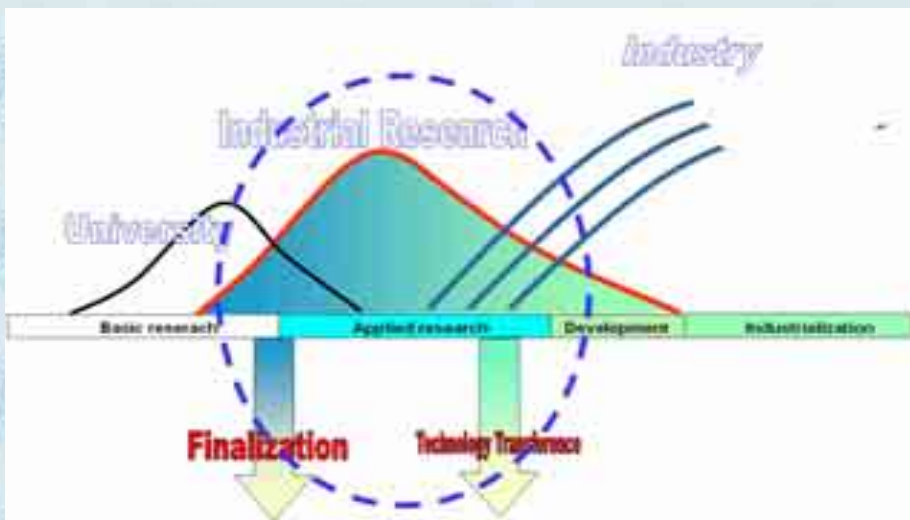
Id	Nombre	Proponentes			Pays	Sector	Descripcion	Propuesta			Actividad a desarrollar	
		Un (1)	In (2)	Ot (3)				Inversion (miles dolares) (4)	Empleos (5)	Etapas (6)	Etapas de Analisis (7)	Desarrollo
-04	IDL - NL B.V., Rotterdam		√		I	Logistica	J.V. nell'ITC aplicada en la gestion logistica fluvial Nota: El partner olandes esta conectado con un Fond de VC que pudeira invertir en la JV	100	3	Start Up	2 hojas	Ya identificado el Temporary Manager, disponible a transferirse en el lugar de la JV.
-04	KVE - Engineering B.V., Amsterdam			√	NLUS A	Quimica	Prototipos en material polimeros y eposidicos	350	4	Start Up	1 hoja	Identificacion del partner local
-04	DB - XL Ltd., Tel Aviv		√		IL	I.T.C.	J.V. para sistemas per sistemi biometricos avanzados para seguridad	350	5	Seed Money	1 hoja de presentacion + 1 equipo de test	Mercado potencia a evaluar. Identificacion de la sociedad de ingenieria local como partner.
Total:								3.650	30			

High Technology & New Materials Area

N°	Fecha	Nombre	Proponentes			Pays	Sector	Descripcion	Propuesta	Inversion (miles dolares) (4)	Empleos (5)	Etapas (6)	Actividad a desarrollar	
			Un (1)	In (2)	Ot (3)								Etapas de Analisis (7)	Desarrollo
1	15-03	M.A.C.T. - Membrane Application Centre Twente, Enschede	√			NL	Quimico	J.V. para un Centro Tecnologico sobre membranas para procesos industriales y tratamiento y recuperacion de desechos	250	2	Start Up	Business Plan Preliminar		
2	15-03	Esatroll S.A., Mendrisio		√		CH	Electronica	J.V. para ensamble de robot de pequenas dimensiones para diferentes usos	200	2	Start Up	2 hojas + CD de presentacion	Identificación del partner local	
3	20-03	Indune B.V., Utrecht		√		NL	Ingeniera hidraulica	J.V. para tecnologia de microinectores para ahorro de agua en riego e industrial	300	2	Start Up	2 hojas + proyecto tecnico	Estudio sobre la transferibilidad de la tecnologia.	
4	25-03	MicroInnova GmbH, Salzburg		√		A	Quimica	J.V. aplicacion de nanotecnologias en procesos industriales	500	2	Start Up	2 pagine + proyecto tecnico	Identificación de la sociedad de ingenieria local como partner.	

Innovation Centre

High Technology & New Materials Area



Venture Capital Fund

High Technology & New Materials Area

The draft of Business Plan on *Mexican Investment Fund for high technology* was presented and discussed mainly in the part concerning the exit route, the write off scenario, the management costs, the average of investment for each projects and the shareholders participation in the capital taking into account the experience of similar funds already in operation in Latin America (Uruguay, Costa Rica, Brazil). The Business Plan was adjusted accordingly.

At the same time, including the above mentioned recommendations, the methodologies to be apply in studying similar funds for high technology in developing countries was revised and finalized.

The State of Guanajuato agreed in funding the 50% of the envisaged initial capital (\$ 20.0 million).

The additional \$10.0 million capital share by

Fondo de Fondos	\$	5.0	million
CAF	\$	2.0	million
Other private investors	\$	3.0	million

The investment in each projects, for a total of 30 will be shared between the MVCF and the funds managed by CONACYT (*Consejo Nacional de Ciencia y Tecnologia*) as well as private investors.

Venture Capital Fund IRR for the Investments

Tab. 12 - Flujo de Caja Neto de las inversiones del Fondo (importe en miles de dolares)

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
11 Acciones	-5.879	0	221	4.109	4.505	2.356	887	6	6	383
Financiamiento	-1.037	30	30	30	30	1.068	0	0	0	0
Total	-6.916	30	251	4.140	4.535	3.424	887	6	6	383
12 Acciones	-5.389	0	202	3.767	4.130	2.160	813	6	6	351
Financiamiento	-951	28	28	28	28	979	0	0	0	0
Total	-6.340	28	230	3.795	4.157	3.138	813	6	6	351
13 Acciones	-3.593	0	135	2.511	2.753	1.440	542	524	234	
Financiamiento	-634	18	18	18	18	652	0	0	0	
Total	-4.227	18	153	2.530	2.771	2.092	542	524	234	
14 Acciones	-1.306	0	49	913	1.001	524	284			
Financiamiento	-231	7	7	7	7	237	0			
Total	-1.537	7	56	920	1.008	761	284			
15 Acciones				-163	0	6	114	125	102	
Financiamiento				-29	1	1	1	1	30	
Total				-192	1	7	115	126	131	
Flujo de Caja I1	-6.916	30	251	4.140	4.535	3.424	887	6	6	383
Flujo de Caja I2		-6.340	28	230	3.795	4.157	3.138	813	6	351
Flujo de Caja I3			-4.227	18	153	2.530	2.771	2.092	542	234
Flujo de Caja I4				-1.537	7	56	920	1.008	761	284
Flujo de Caja I5					-192	1	7	115	126	131
Flujo de Caja de las inversiones	-6.916	-6.310	-3.948	2.851	8.298	10.167	7.723	4.034	1.440	1.384
I.R.R inversiones	18,33%									

Venture Capital Fund IRR for the Fund

Tabla 11 - Flujo de Caja del Fondo (importe en miles de dolares)

	A1	A2	A3	A4	A5	A6	A7	A8	A9
ENTRADAS									
Capital gains	0	0	0	4.582	10.033	11.421	8.818	4.556	1.644
Dividendos pagados	0	0	381	594	564	367	173	72	38
Desinversiones (en valor nominal)	0	0	0	1.309	2.261	2.209	1.504	690	227
Interés sobre financiamiento	0	52	99	131	143	144	92	45	13
Reembolso del financiamiento	0	0	0	0	0	1.037	951	634	231
Otras entradas	0	0	0	0	0	0	0	0	0
Total entradas	0	52	480	6.617	13.000	15.179	11.538	5.996	2.152
SALIDAS									
Inversión en acciones	5.879	5.389	3.593	1.306	163	0	0	0	0
Financiamiento	1.037	951	634	231	29	0	0	0	0
Management Fee	461	461	461	461	461	461	461	461	461
Otros costos	20	20	20	20	20	20	20	20	20
Impuestos	0	0	0	1.423	3.998	4.691	3.584	1.759	514
Total salidas	7.397	6.821	4.707	3.441	5.172	4.064	2.240	2.240	994
Flujo de caja neto	-7.397	-6.769	-4.227	3.176	8.330	10.007	7.474	3.756	1.158
Flujo de caja neto acumulado		-14.166	-18.393	-15.217	-6.887	3.120	10.594	14.350	15.508
FLUJO DE LAS INVERSIONES									
Inversión anual	6.916	6.340	4.227	1.537	192	0	0	0	0
Capital a invertir en el año siguiente	1.729	1.153	768	192	0	0	0	0	0
Total capital invertido									
Capital no disponible para inversiones	651	434	289	72	0	0	0	0	0
Capital aportados en el año	9.296	7.927	5.284	1.801	192	0	0	0	0
I.R.R. (TIR) del fondo	16,20%								

Innovation Centre on Nanotechnology and Venture Capital Fund Spin off assessment



Innovation Centre on Nanotechnology and Venture Capital Fund - Letter of endorsement





High Technology & New Materials Area

Medium term strategy



thank you for the attention



High Technology & New Materials Area

AREA Science Park

Padriciano 99 • 34012 Trieste • Italy

tel +39 040.9228.126 • fax +39 040.9228.122

bertogli@ics.trieste.it • www.ics.trieste.it

**INDO-BRAZIL-SOUTH AFRICA (IBSA)
NANOTECHNOLOGY INITIATIVE
– A Case Study of Effective Cooperation**



Presented by:
India Chair: Baldev Raj
Distinguished Scientist & Director
Indira Gandhi Centre for Atomic Research
Kalpakkam – 603 102, INDIA

Brazil Chair : Prof.Dr. Jose Antonio Brum
South Africa Chair: Dr. Thembela Hillie

Talk at 3rd International Dialogue on Responsible Research and Development of Nanotechnology
11 March 2008, Brussels

India – Brazil – South Africa
A Few Commonalities in Challenges, Resources, Trends & Vision

- Three large democracies with rich culture and history
- Rich in human and natural resources
- Fast growing economies
- Strong friendship without conflict of interests
- Common concerns in health and resource management
- Issues in catering to huge population with large scatter in economic and intellectual potentials
- Strong base in Science and Technology ; Poised for rapid industrial growth

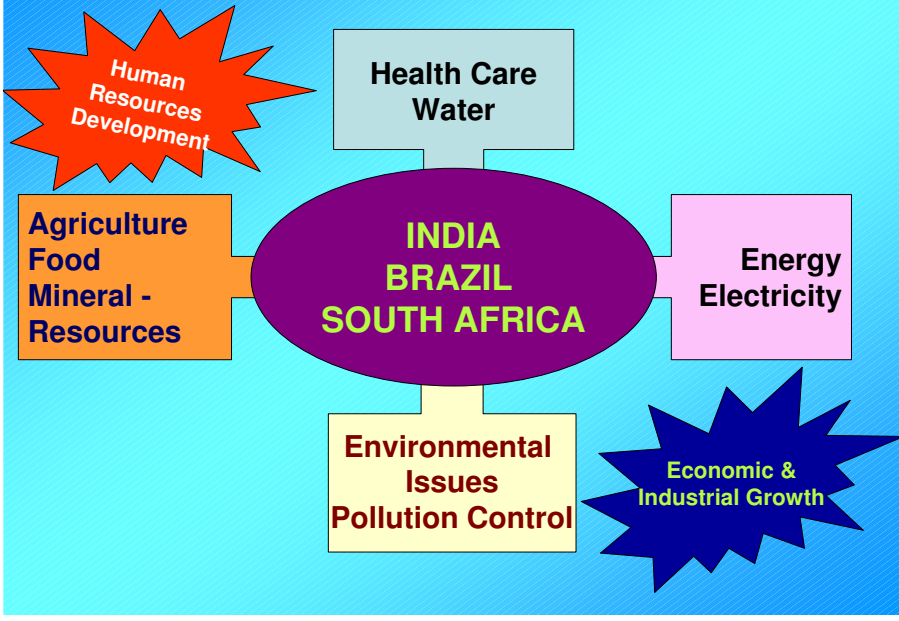
IBSA TRILATERAL CO-OPERATION

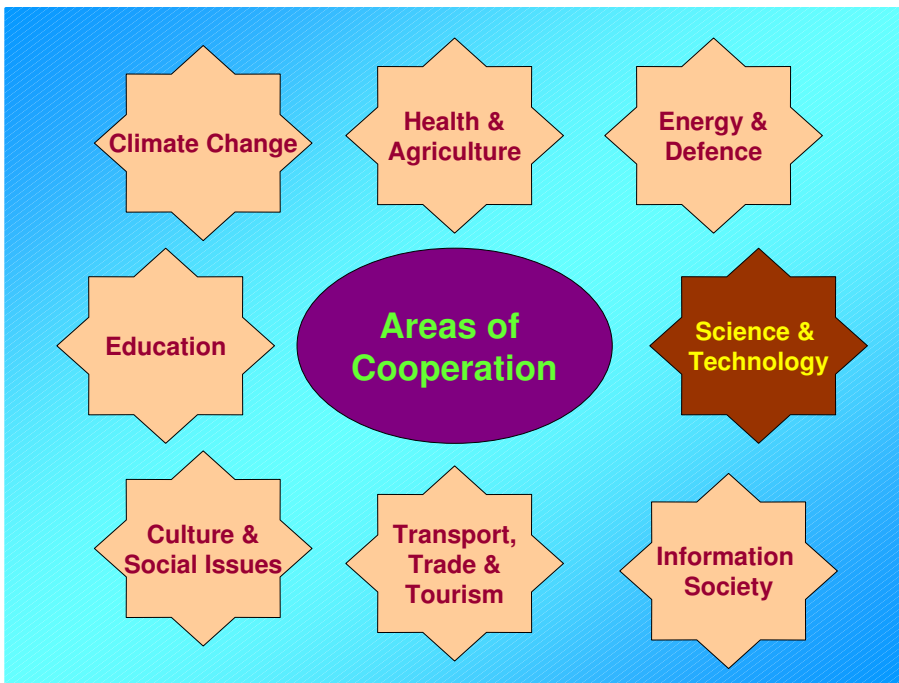
- IBSA is a trilateral, developmental initiative between India, Brazil and South Africa to promote South-South Cooperation and exchange.
- In the aftermath of discussions between the Heads of State and/or Government of the IBSA countries at the G-8 meeting that took place in Evian in 2003, the Foreign Ministers of the respective countries met in Brasilia on June 6, 2003. At this meeting between Ministers the launching of the IBSA Dialogue Forum was formalized through the adoption of the "Brasilia Declaration" .

(www.ibsa.nic.in)



Common Interests



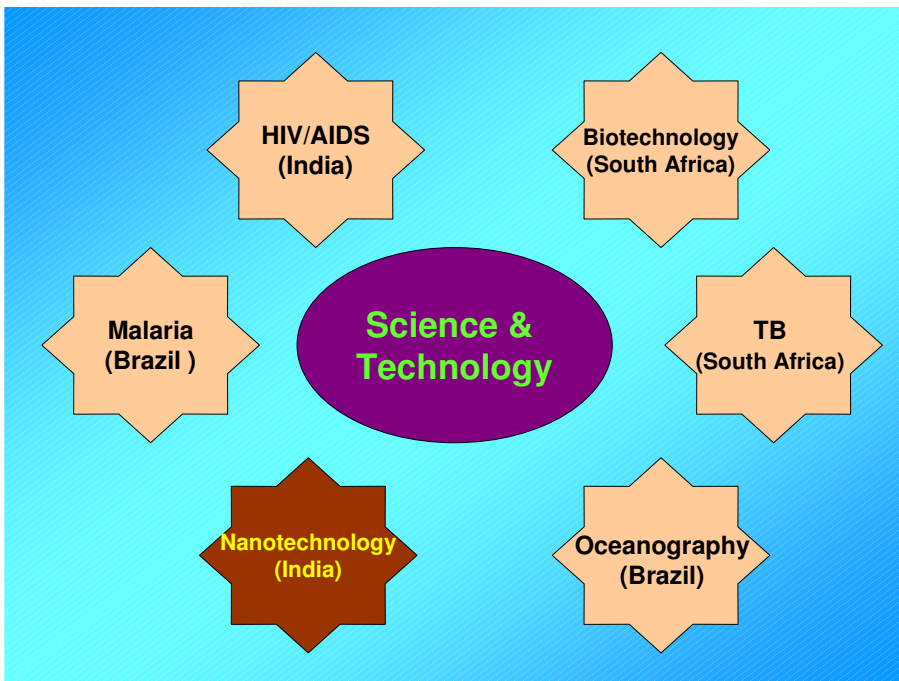


Objectives of IBSA Cooperation

The main objectives of the IBSA Dialogue Forum are:

- To promote South-South dialogue, cooperation and common positions on issues of international importance
- To promote trade and investment opportunities between the three regions of which they are part
- To promote international poverty alleviation and social development
- To promote the trilateral exchange of information, international best practices, technologies and skills, as well as to compliment each others competitive strengths into collective synergies
- To promote cooperation in a broad range of areas, namely agriculture, climate change, culture, defense, education, energy, health, information society, science and technology, social development, trade and investment, tourism and transport.

The IBSA Dialogue Forum has regular consultations at Senior Official (Focal Point), Ministerial (Trilateral Joint Commission) and Heads of State and/or Government (Summit) levels, but also facilitates interaction amongst academics, business and other members of civil society.



National Profiles in Nano Technology

INDIA	Brazil	South Africa
Energy Materials	Sensors for agriculture	Mineral Processing
Sensors	Solar Energy	Nano biotechnology
Nano devices	Nano Drug delivery & Therapy	Catalysis
Water Treatment & Desalination	Nano Metrology	Water Treatment
Novel Materials Synthesis	Advanced Fabrication and characterisation Facilities	
Nanobiotechnology		

Nanotechnology Initiative

- The objective of the IBSA nanotechnology initiative is to formulate tri- and bi-lateral mega collaborative programmes in the area of nanotechnology, of mutual interests to the participating nations.
- The accepted priority areas of common national interest to all three countries under this initiative include, advanced materials, energy systems, sensors, catalysis, health (TB, malaria and HIV), water treatment, agriculture and environment.
- Education and human resource development will remain as one of the major focus areas of the IBSA programme, towards nurturing young talents and motivating them to pursue a career in nanoscience and technology.



Three National Coordinators of IBSA nanotechnology initiative:
From Left to Right:
Prof Dr Jose Antonio Brum, Director, LNLS, Campinas, BRAZIL
Dr Baldev Raj, Director, IGCAR, Kalpakkam, INDIA
Dr Thembela Hillie, Principal Research Scientist, CSIR, South Africa
Picture taken in a IBSA Nano Initiative Meet held in India.



IBSA EVENTS

- **IBSA nanotechnology workshop - South Africa, 21 April 2005**
 - Three areas of mutual interest including, advanced materials, energy and health were identified.
 - It was agreed mutually that the delegation members will visit each of the participating countries, before finalizing the collaborative projects under this initiative.
- **Technical visit cum discussion meetings**
 - * Brazil - Nov. 6-10, 2006
 - * India - 2-6 April, 2007
 - * South Africa – 17-24 Nov. 2007



Brazil Visit : 6 – 10 Nov.2006

- 6 Member Indian Delegation and 7 member South African Delegation
 - ✓ Federal University of Rio Grande do Sul (UFRGS)
 - ✓ Brazilian Centre for Research in Physics (CBPF)
 - ✓ University of Rio
 - ✓ The National Institute of Metrology, Standardization and Industrial Quality (INMETRO)
 - ✓ Embrapa Agricultural Instrumentation
 - ✓ State University of Campinas (UNICAMP) and Brazilian Synchrotron Light Laboratory (LNLS) Campinas
- After detailed deliberations, specific areas of common interest for developing collaborations amongst the three countries were identified.
 - Sensors
 - Novel synthesis & Materials metrology
 - Solar cells, Bio-fuels & Catalysis
 - Drug delivery for Malaria, TB and Cancer
 - Water treatment
- It was decided that the details of the projects and possible partners in these areas will be discussed when the delegations visit India.

India Visit : 2- 6 April 2007

- 6 Members each from Brazil and SA
 - ✓ New Delhi – IIT Delhi , IUAC
 - ✓ Mumbai – BARC, TIFR
 - ✓ Bangalore – IISc, JNCAS
 - ✓ Kalpakkam – IGCAR
- It was ensured that experts in nanotechnology from all parts of India participate in the discussions in atleast one of the above mentioned destinations, to present and evolve their ideas for collaborative projects under this initiative.
- It was emphasized that one of the major focus of the IBSA programme should be towards nurturing young talents and motivating them to pursue research and to grow world leaders in nanoscience and technology.
- Possible collaborators for various theme projects were identified to finalise the proposal and present during the SA visit

South Africa Visit :

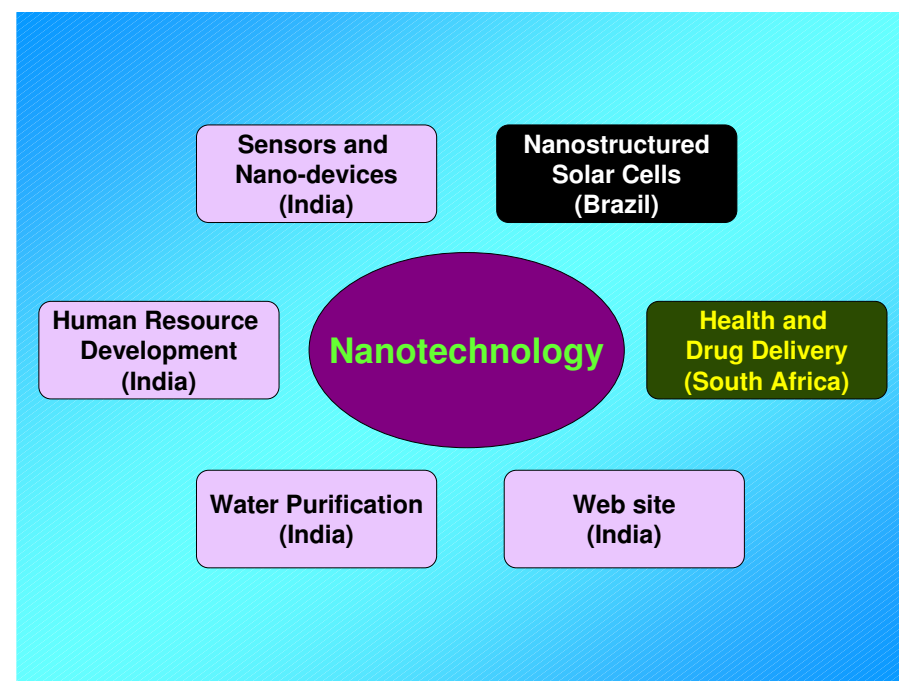
- 6 Member Brazil and 12 Member Indian Delegation
- 4 flagship projects and project coordinators with teams were identified
- Team for HRD formalized

Invited lectures at International Conferences to maximize Interactions

- ICONSAT , February 2008, Chennai, India
- Nano 2008, July 2008, Brazil
- Nano Workshop, July 2008, SA

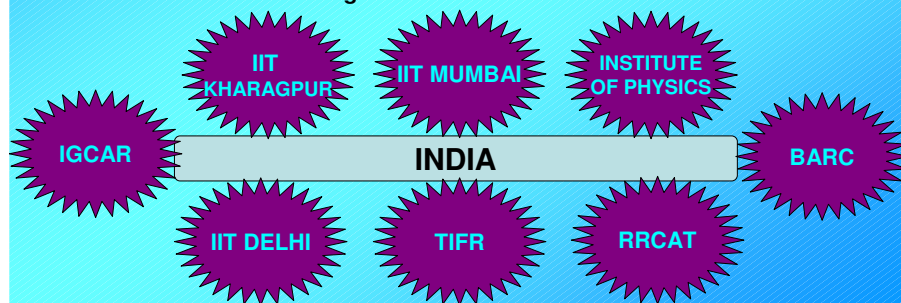
Technical Coordination

SUBJECT	INDIA	BRAZIL	SOUTH AFRICA
National Coordinator	Dr. Baldev Raj dir@igcar.gov.in	Prof. J.A. Brum brum@lnls.br	Dr. T. Hillie thillie@csir.co.za
Health and water	Dr. P.K.Gupta pkgupta@cat.ernet.in	Prof. Silvia Guterres nanoc@farmacia.ufrgs.br	Dr. Ndumiso Cingo cingon@unisa.ac.za
Energy	Prof. B.R.Mehta brmehta@iitd.ernet.in	Prof. Ivo A. Hummelgen iah@fisica.ufpr.br	Dr. Kenny Mathe KMathe@csir.co.za
Advanced materials	Dr.A.K. Tyagi akt@igcar.gov.in	Prof. Elson Longo liec@power.ufscar.br	Dr. Molefi Motuku molefim@mintek.co.za
Human Resource	Prof S.Ranganathan rangu2001@yahoo.com	Prof J.A. Brum brum@lnls.br	Prof Neil John Coville neil.coville@wits.ac.za
Web Site	Dr P.Shankar pshankar@igcar.gov.in	Dr Ana Flávia Nogueira anaflavia@iqm.unicamp.br	Dr. T. Hillie thillie@csir.co.za



Sensors and Nano Devices

- ❑ Gas Sensors based on SnO₂, ZnO and CNTs
- ❑ Gas Sensors based on size selected nano-particles
- ❑ Gas and Agricultural Sensors based on Micro-cantilevers and semiconductor nanostructures
- ❑ Multilayer GMR Sensors and Spin Valve Devices
- ❑ DNA based self-assembled quantum structures for bio-molecular recognition



Water Purification

Schedule	Indian Responsibilities	Brazilian Responsibilities	South African Responsibilities
1st Year	Sharing the Indian experience on different kinds of water treatment and purification technologies for societal benefits during short visit.	Sharing the Brazilian experience of use of membranes in waste water treatment at EMPRAPA	Sharing the South Africa experience on various water treatment technologies using raw water and recycled waste water, and the application of existing nanomaterials solution to water purification.
	Identification of a specific nanotechnology intervention for water purification/treatment that builds on the strengths of the individual country's projects.		
2nd Year	Visit of students/ young scientists/ engineers for long durations (6 months) for training and hands-on experience in identified nanotechnologies and membrane development for water purification/ water treatment.		
	Membrane development (nanofiltration/ ultrafiltration)		
3rd Year	Selection and development of water purification technologies for the specific site conditions and testing under specific conditions.		

Some Concerns and Issues in Nano Toxicity

- Nanoparticles may enter cells via:
 - Endocytosis
 - Receptor activation for initiation
 - Membrane penetration
 - Generally occurs with hydrophobic particles
 - Transmembrane channels
 - May be seen only with very small nanoparticles (~ 5 nm)

Research funding agencies should devote appropriate resources for studying the toxicology of nano-objects.

Contributed by
Prof. Paras N. Prasad (Email: pnprasad@acsu.buffalo.edu)

- **Bio-accumulation**
- **Intracellular aggregation** may eventually lead to cell death
- Entry of normally forbidden toxic molecules into cells by **adsorption to nanoparticles**
- **Nanoparticle induced activation of immune system** – Proteins may change their conformation during adsorption and may change function

Suggested Directions of Research

- **Decide on the identity of nanoparticles.** Most widely used must be investigated on high priority. (CNTs, fullerenes, Gold and Silver nanoparticles etc.)
- **Toxicology of the nanoparticles :** freshly made, aged and beyond shelf-life.
- **Toxicology of all the components, by-products, supernatants, residues must be assessed.**
- **Toxicity studies on relevant cell lines may also provide initial guidelines prior to live animal testing.**
- **Exposure to high doses as well as prolonged exposure to low doses must be investigated.**
- **Both short term and long term time effects must be assessed.**
- **Standard toxicological methodology may be followed initially. If these prove insufficient, then newer, improved methods may be developed by the toxicologists.**

Contributed by Dr. Yamuna Krishnan (Email: yamuna@ncbs.res.in)

Nanotoxicity Studies

- ✓ Risk Assessment has to be Balanced
- ✓ Learn From Radiotoxicity Regulations
- ✓ Periodic Reviews by Autonomous Authorities
- ✓ Panel of International Experts for Identifying Research Methodology, for Monitoring & Reviewing and Finally Preparing Safety Guidelines.
- ✓ Need for International Collaboration on Nanotoxicity Studies and Regulation

Key Issues for Most of Population

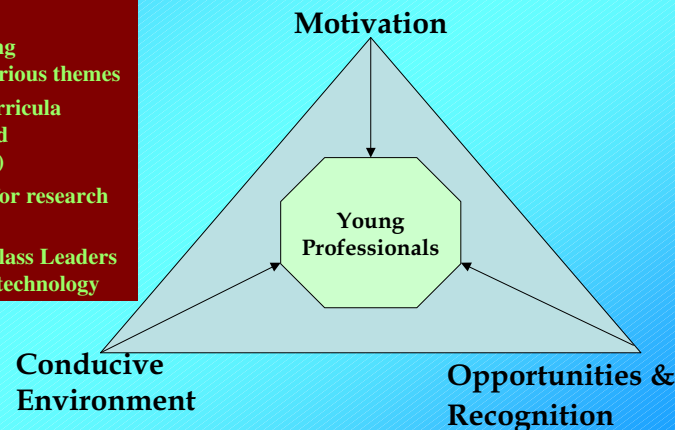
- * Water
- * Health Care and Nutrition
- * Energy
- * Infrastructure and technology for comfortable living

Nano Science and Technology offers One of the Best Possibilities and Opportunities in the Era of Human Civilization

Nurturing/Mentoring Young Talent

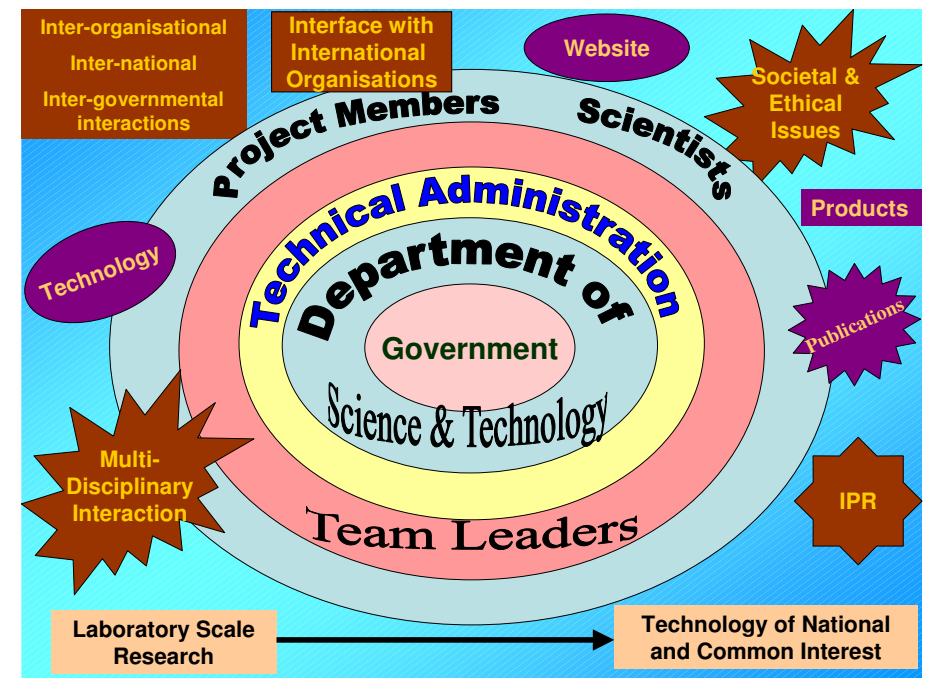
-Annual Workshops alternating in one of the three countries every year

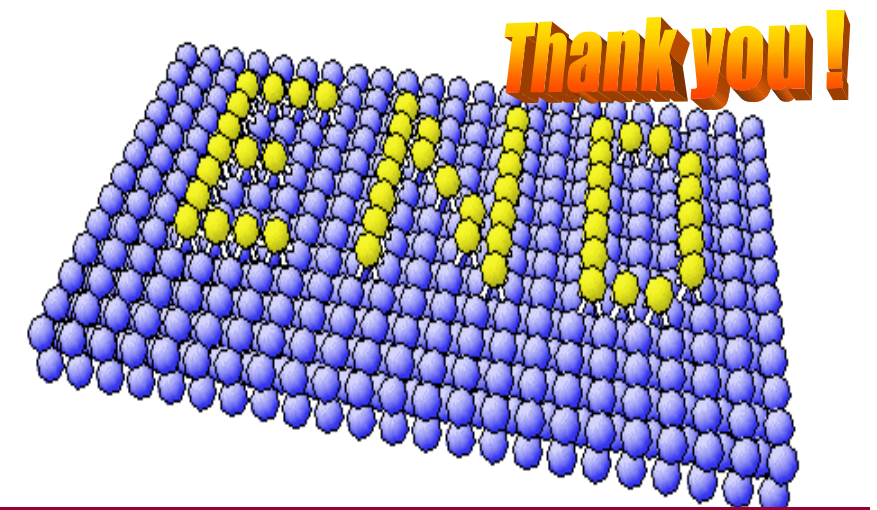
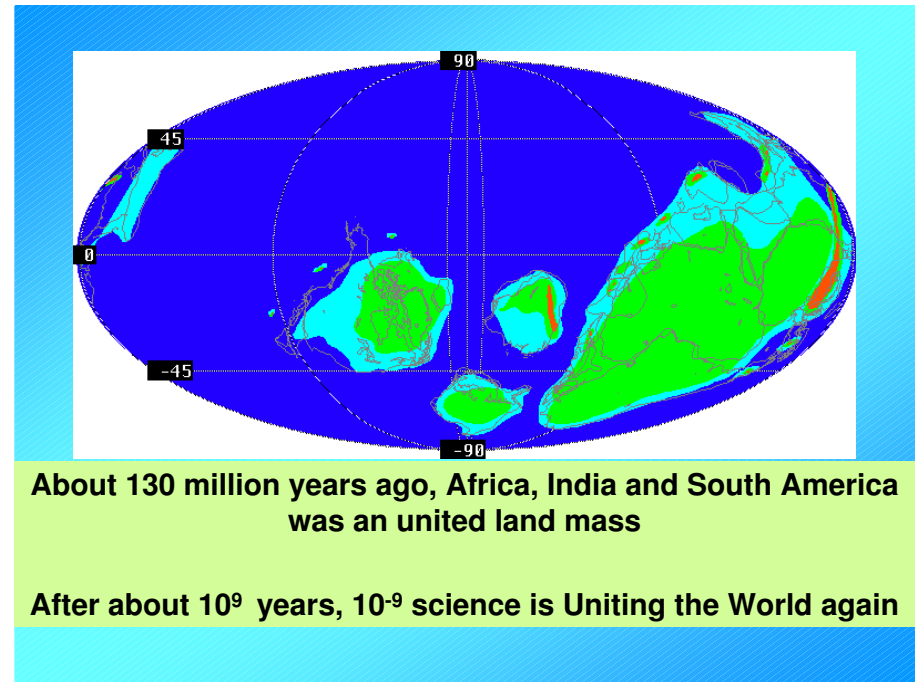
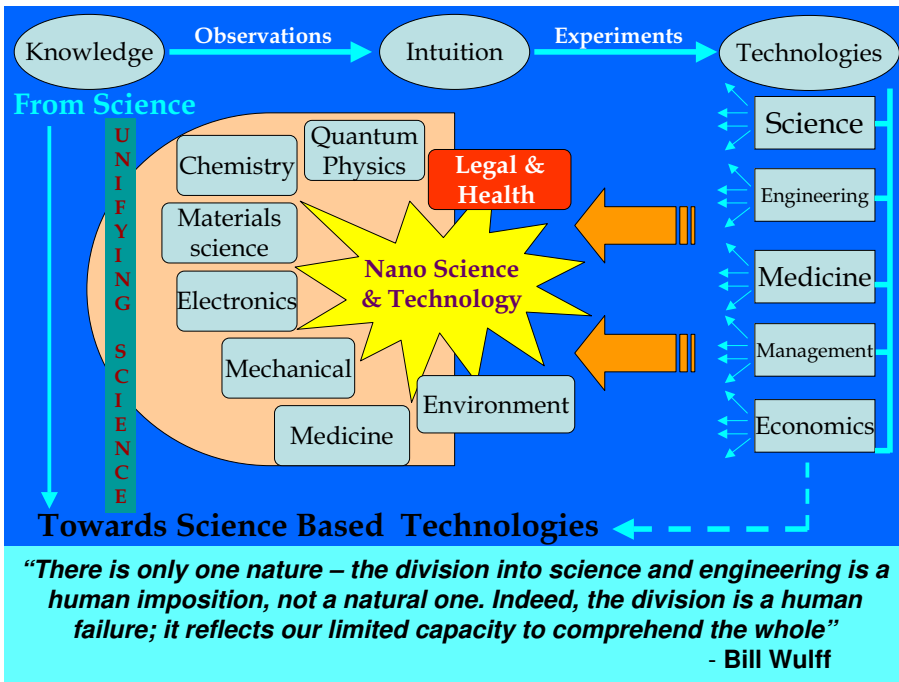
- Focussed Training Programmes on various themes
- Contribute to Curricula (expert lectures and books/publications)
- Exchange visits for research scholars
- Nurture World Class Leaders in Nanoscience & technology



"We are what we think. All that we are, arises with our thoughts. With our thoughts, we make the world"

- Buddha





CURRENT CHALLENGES TO THE HUMAN CIVILISATION
DEMAND INNOVATIONS, SHARING AND ETHICAL
COMMITMENT TO ENHANCE QUALITY OF LIFE TO THE LAST
CITIZEN OF THIS PLANET

Ongoing projects and prospective actions in nanotechnology Argentina

Alberto Lamagna

*National Atomic Energy Commission (CNEA)
3rd International Dialogue on Responsible Nanotechnology
Brussels- April 2008*



Actions in Argentina

- **Five National Networks on Micro-Nanotechnology**
- **Ministry of Science, Technology and Innovation**
- **Main Research Institutes and Universities**
- **Two Strategic Project Areas (Funding)**
- **Argentinean Nanotechnology Foundation (FAN)**
- **Institute of Nanoscience and Nanotechnology (INN- CNEA)**
- **Argentine-Brazilian Nanotechnology Center**



- National Networks on Micro-Nanotechnology
- * **Funds for young researchers internal trips and for laboratories of the network**

1) Self organization of bionanostructures for the transmission of molecular information and neurobiology and biological process.

Director : Dr. Bruno Maggio.

2) Argentinean network in nanoscience and nanotechnology : nanostructured materials and nanosystems (MaN).

Director : Dr. Carlos Balseiro.

3) Argentinean network on nanoscience and nanotechnology : Molecular, Supramolecular and Interphases.

Director : Dr. Roberto Salvarezza.

4) Network of Labs for the Design, Simulation and Fabrication of Micro and Nano Devices, Prototypes and Samples.

Director : Dr. Alberto Lamagna

5) Network for the Production and Innovation of Nanotechnology for Small and Medium Enterprises. Director : Dr. Joaquin Valdes



Ministry of Science, Technology and Innovation

Main guidelines (Nanotechnology is a strategic research address)

Starts with strategic research projects funding on Nanotechnology

Starts the coordination and complementation to finance various initiatives in different ministers

Main Research Institutes and Universities

National Atomic Energy Commission (CNEA)

University of Buenos Aires (UBA)

National Council of Science and Technology (CONICET)

National Institute of Industrial Technology (INTI)

Institute for Theoretical and Applied Physical -Chemical Research (INIFTA)

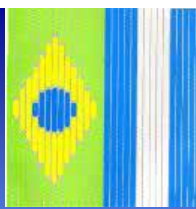
National Institute of Agricultural Technology (INTA)

Centers and University Labs in Cordoba, Santa Fe, Tucumán, San Luis, among others.



Argentinean-Brazilian Center of Nanotechnology

Since 2006



- To promote the exchange of young researchers
- Workshops and schools to train PhD students, Masters , etc
- To search common developing projects

Argentinean Coordinators:

Dr. Roberto C. Salvarezza (robsalva@inifta.unlp.edu.ar)

Dr. Alfredo Boselli (boselli@cnea.gov.ar)

Brazilian Coordinators:

Dr. José de Albuquerque e Castro (jcastro@if.ufrj.br)

Dr. Jairton Dupont (dupont@iq.ufrgs.br)

<http://www.cabnn.secyt.gov.ar/>



Argentinean Nanotechnology Foundation (FAN)

Administration Council: President: Fernandez Prini *

Executive Director : Pablo Traub

Scientific Advisor Council : President : Alberto Lamagna

Argentinean science produces knowledge but no economic value , so to promote and stimulate the private companies and research governmental labs to work together on the nano- and micro-technologies field, in 2006, FAN 's called for nanotechnology and micro technology Ideas-Project finance, receiving 20 applications, 10 of them from different companies.

Funding joint projects between academic-research institutions and companies

On this first call for projects, nine preliminary "projects-idea" were approved in order to be prepared with more detail for their final selection. The fields were:

environment

space

medicine

diagnosis

measurement technologies

microelectronic

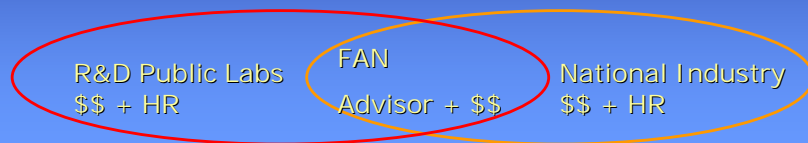
veterinary

www.meccon.gov.ar/fan



* Initial Budget 10 million dollars

FAN` s Scope



Competitive products
for a global market



Institute of Nanoscience and Nanotechnology at CNEA

Manager: Dr. Carlos Balseiro + Scientific Council

CAB -Bariloche



CAC -Buenos Aires



- Staff: 45 researchers and 60 post-graduate students (Ms. + PhD)
- Production: ~150 papers/year
- Budget: ~ 1.5 MU\$ / year of CNEA, ANPCyT, Antorchas, CONICET, etc.

- *Strategic Projects "co-funding" of Ministry of Science and Technology*

- I) Interdisciplinary Center for Nanoscience and Nanotechnology (CINN)*

Dr. Ernesto Calvo

II) Network for the design, fabrication and characterization of micro and nano devices for space, security and health applications – Stage 1

Dr. Alberto Lamagna

total integrated budget: > 3.5 million dollars per project between 2008-2010



- *Strategic Projects : Network for the design, fabrication and characterization of micro and nano devices for space, security and health applications – Stage 1 (Director: Dr. Alberto Lamagna)*

Subprojects

- 1) **National Space Program,**
RF switch MEMS (X band)
- 2) **Security, to develop a novel Ion Mobility Spectrometer (micro-nano device for networking sniffer chips)**
- 3) **Nanomedicine :**
drug delivery, nanobiosensor

- *Strategic Projects : Interdisciplinary Center for Nanoscience and Nanotechnology (CINN).*

Dr. Ernesto Calvo

- 1) Synthesis and characterization of molecules and nanostructures, molecular self-assemblies and functionalized surfaces
- 2) Fabrication and Characterization of nano and micro structured materiales- Multi-technique characterization
- 3) New phenomena at nano scale
- 1) Theoretical and Computational Model at nanoscale level. Design of materials and devices
- 5) Physical an Chemical Sensors and Actuators using the properties of nanoscale. New Instrumentation.



- **Future Challenges**

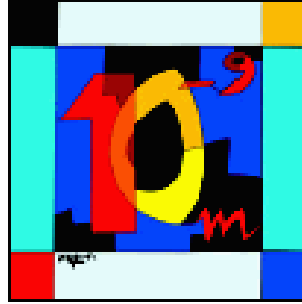
- **Our decision makers and politicians need to continue with this vision of the nanotechnology**
- **Continue the tendency of the increasing investments on R&D but not only from public sources (private sectors must invest !)**
- **Increase projects development between industry and state labs.**
- **Scientists need to foster this change**



Thank you for your attention!

alamagna@cnea.gov.ar





PLENARY SESSION 3 ENABLING MEANS

Chairmanship: Masafumi ATA (J)

Keynote lectures: OECD Working Parties related to nanotechnologies, by Dirk PILAT (OECD)

Keynote lecture: Standardisation and progress done by the ISO TC 229 technical committee on nanotechnology by Peter HATTO (ISO)

Keynote lecture: IPR issues by Yves VERBANDT (EPO)

Follow up; 2nd International Dialogue on Responsible Research and Development of Nanotechnology



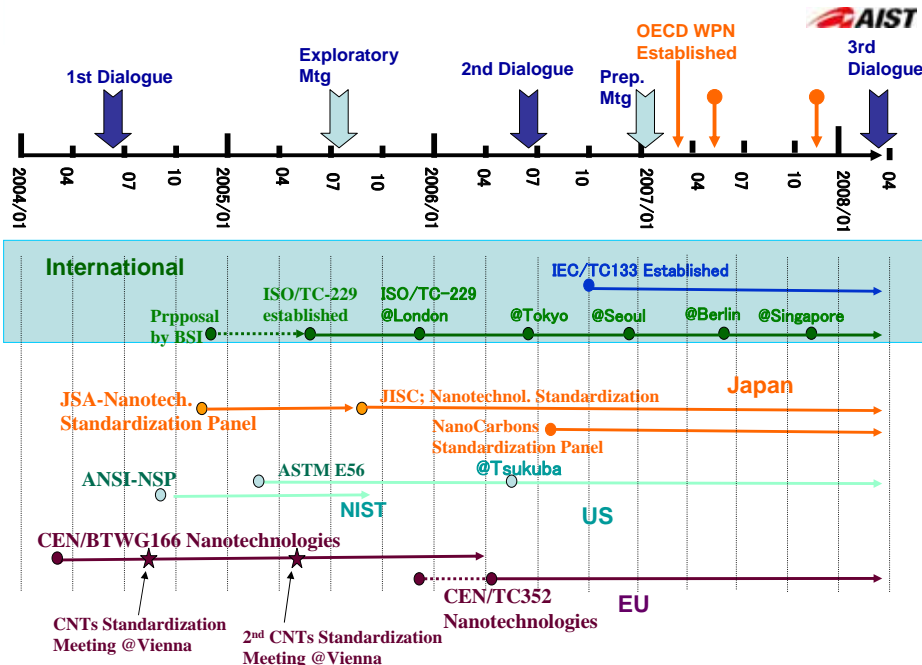
July 2004, 1st Dialogue @ Alexandria Virginia, USA
 July 2005, Exploratory meeting @ Brussels
 June 2006, 2nd Dialogue @ Tokyo Japan
 January 2007, Preparatory meeting @ Capetown, South Africa
 March 2008, 3rd Dialogue @ Brussels

Masafumi ATA, AIIST-HQs

The 2nd International Dialogue on Responsible Research and Development of Nanotechnology
 26 – 28 June 2006 @ Gakushi-Kaikan Tokyo
 Organized by Dr. Hiroyuki Abe (CSTP), Dr. Hiroyuki Yoshikawa (AIIST), and Dr. Teruo Kishi (NIMS)
 Moderated by Dr. Kazunobu Tanaka (JST, AIIST)

88 Participants from 21 Economies and EC

- Breakout Discussion on;
- 1, EHS (Dr. B. Karn)
 - 2, ELSI (Dr. A. Rip)
 - 3, Education and Capacity Building (Dr. T.-K. Lee)
 - 4, Developing Countries Issues (Dr. T. Pornsinsirak)
 - 5, Standard Setting (Dr. P. Hatto)



The Asia Nano Forum (ANF)

The First Asia Nano Forum Summit 2004 (ANFoS2004)
 Held in Phuket, May10-11th



13 Economies ; Australia, China, Hong Kong, India, Indonesia, Korea, Japan, Malaysia, New Zealand, Singapore, Taiwan, Thailand and Vietnam,



ISO TC-229 2nd meeting
 21st-23rd June 2006, Tokyo



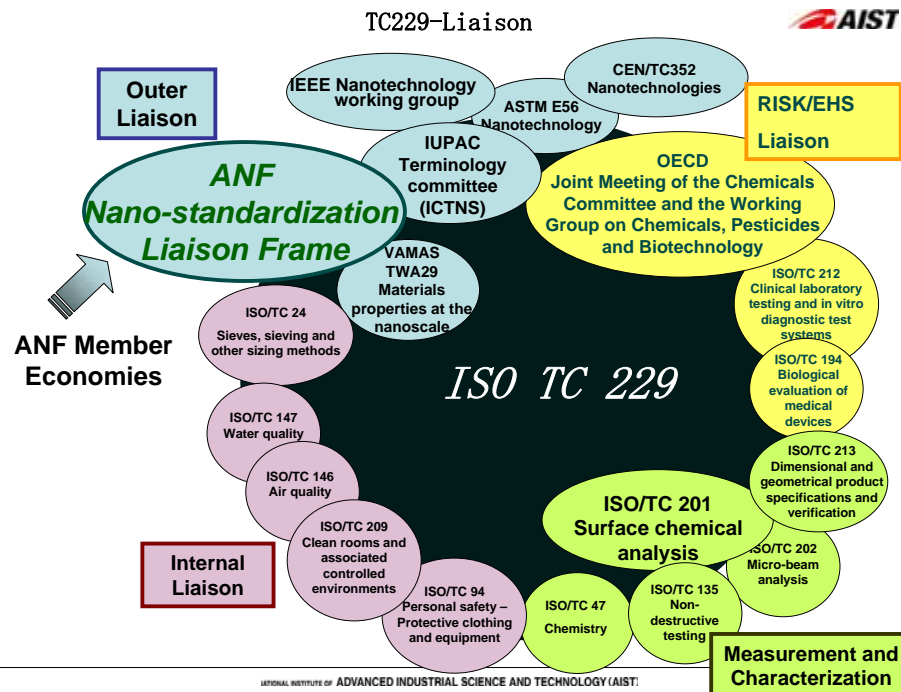
2nd Dialogue
 26th-28th June 2006, Tokyo



ICON Asia Meeting,
 30th Nov ~ 1st December 2006, Tokyo



ISO TC-229 3rd meeting,
 4th-7th December 2006, Seoul Korea



In the Preparatory Meeting held in Cape Town (January 2007);

IP issue, standardization of nanotechnology were chosen as item in the agenda for the 3rd International Dialogue on Responsible R&D of Nanotechnology.

⇒ Plenary Session 3; enabling means



Thank you for your active discussion in advance

INTERNATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY (AIST)



Nanotechnology and Nanomaterials

Work of the OECD

1

Nanotechnologies at OECD

OECD has TWO Committees addressing Nano

Committee on Scientific And Technological Policy (CSTP)

Working Party on
Nanotechnology (WPN)

Focus of work

Socio-economic analysis of
nanotechnology and the
facilitation of international
collaboration in R&D and
science & technology policies

Chemicals Committee (CC)

Working Party on Manufactured
Nanomaterials
(WPMN)

Focus of work

Human health and
environmental safety implications
of manufactured nanomaterials
(mainly the chemicals sector)



2

Working Party on Nanotechnology

Focus of work

Socio-economic analysis of nanotechnology and the facilitation
of international collaboration in R&D and S&T policies

- Project A: Statistics and Measurement
- Project B: Nanotechnology Impacts on Companies and Implications for the Business Environment
- Project C: International R&D collaboration
- Project D: Communication and public engagement
- Project E: Policy Dialogue
- Project F: Global Challenges: Nano and Water

3

Working Party on Manufactured Nanomaterials

Focus of work

Human health and environmental safety implications of
manufactured nanomaterials (mainly the chemicals
sector)

- Project 1: Database on Human Health and Environmental Safety Research
- Project 2: Research Strategy(ies) on Human Health and Environmental Safety Research
- Project 3: Testing a Representative Set of Nanomaterials
- Project 4: Manufactured Nanomaterials and Test Guidelines
- Project 5: Co-operation on Voluntary Schemes and Regulatory Programmes
- Project 6: Co-operation on Risk Assessment:
- Project 7: The Role of Alternative Methods in Nanotoxicology
- Project 8: Exposure Measurement and Exposure Mitigation

4

WPMN

- Established in September, 2006
- Three meetings to date:
 - October 26-27, 2006
 - April 26-28, 2007
 - November 28-30, 2007
 - Next meeting: 11-13 June 2008
 - 5th meeting: 4-6 March 2009
- Chaired by Jim Willis, USA
- Objective: *To promote international co-operation in health and environmental safety related aspects of manufactured nanomaterials, in order to assist in their safe development*
- Works through the implementation of (8) projects

5

Who attends the WPMN?

Countries:

- Australia, Austria, Belgium, Canada, Denmark, European Commission, Finland, France, Germany, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Poland, Slovakia, Spain, Sweden, Switzerland, United Kingdom, United States
- Observers:
 - Argentina, China, Israel, Thailand, Brazil, India, Russia
 - ISO, WHO, UNEP
 - BIAC, eNGOs (ED and FOE), TUAC, WWIC (past)
 - ICAPO request

6

Project 1: OECD Database on Safety Research

- Objective: *to develop a global resource, which identifies research projects that address environmental, human health and safety (EHS) issues associated with manufactured nanomaterials. This will include research projects which are planned, underway or completed.*
- Chair: Australia
- Status:
 - Prototype database available January, 2008
 - Data entry -10 weeks ~ March-May
 - Rollout on or before WPMN-4

7

Project 2: Research Strategies on Manufactured Nanomaterials

- Objective: *to exchange information and identify common research needs to address human health and environmental safety issues associated with manufactured nanomaterials, and to undertake to meet those research needs.*
- Chair: Germany
- Status:
 - Initial research matrix complete
 - Next steps to focus on strategies

8

Project 3: Safety Testing of a Representative Set of Manufactured Nanomaterials

- Objective: *to agree and test a representative set of manufactured nanomaterials (MN) using appropriate test methods.*
- Co-Chairs: USA and European Community
- Status:
 - Testing program agreed encompassing 14 nanomaterials and a range of endpoints.
 - Sponsorship program agreed to/guidance manual under development

Project 4 : Manufactured Nanomaterials and Test Guidelines

- Objectives:
 - *To review existing OECD Test Guidelines for adequacy in addressing manufactured nanomaterials.*
 - *To identify the need for development of new or revision of existing test guidelines.*
- Co-chairs: USA and European Commission
- Status:
 - Reviewing existing guidelines for potential applicability
 - Working in 4 subgroups
 - Physical-Chemical Properties
 - Biotic Effects
 - Bioaccumulation and Degradation
 - Health Effects

Project 5: Co-operation on Voluntary Schemes and Regulatory Programmes

- Objectives:
 - *To identify common elements of the various information gathering initiatives, in place or planned.*
 - *To identify applicable current and proposed regulatory regimes and how they address information requirements, hazard identification, risk assessment and exposure mitigation/ risk management of manufactured nanomaterials.*
 - *To share information on existing or proposed guidance documents on practices to reduce occupational or environmental exposure to or releases of manufactured nanomaterials .*
- Chair: Canada
- Status:
 - Initial comparisons conducted
 - Developing a model "template"
 - Developing a clearinghouse for "International Sharing and Comparison of Data on Manufactured Nanomaterials"

Project 6: Co-operation on Risk Assessment

- Objective: *to evaluate risk assessment approaches for manufactured nanomaterials through information exchange and identify opportunities to strengthen and enhance risk assessment capacity.*
- Chair: UK
- Status: Reviewing results of survey.

Project 7: Alternative Methods in Nano Toxicology

- New project to evaluate and, where applicable, validate in vitro and other methodologies
- Chair: UK
- Status:
 - Invitation to has been circulated
 - Needs to integrate with SG3 and SG4
 - Testing needs to be considered during sponsorship.
 - Report on available methods expected by WPMN-4

Project 8: Exposure measurements and Exposure Mitigation

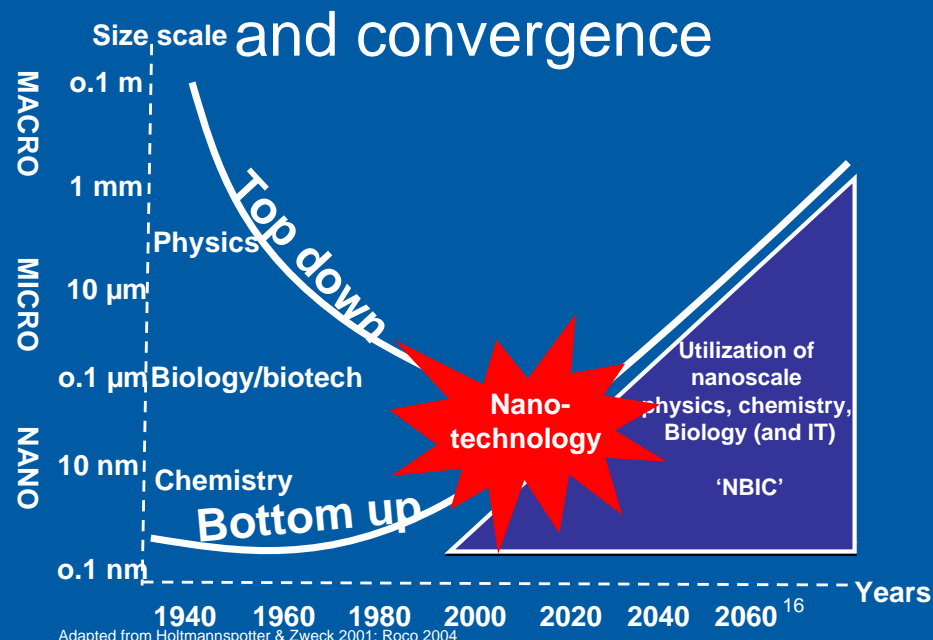
- New project to develop guidance on exposure measurements and exposure mitigation, with an initial focus on occupational settings.
- Chair: USA
- Status:
 - Invitation to participate has been circulated



The Working Party on Nanotechnology (WPN)

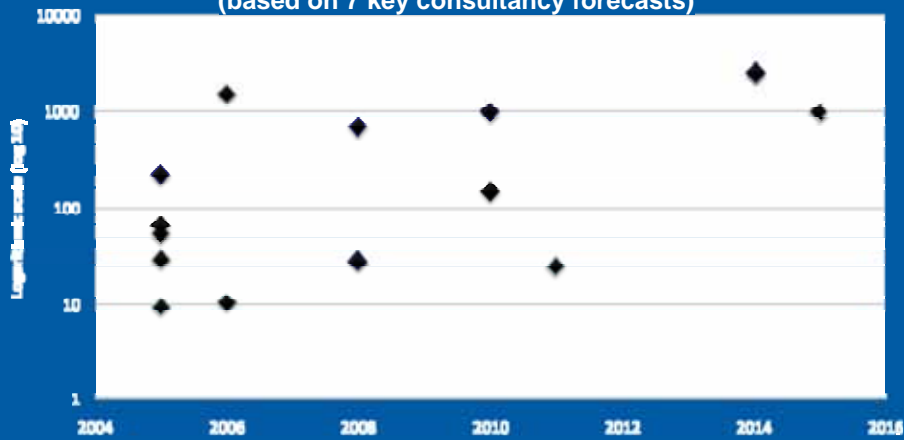
Background and content

Nanotechnology emergence



Forecasted global market size for “nanotechnology products”

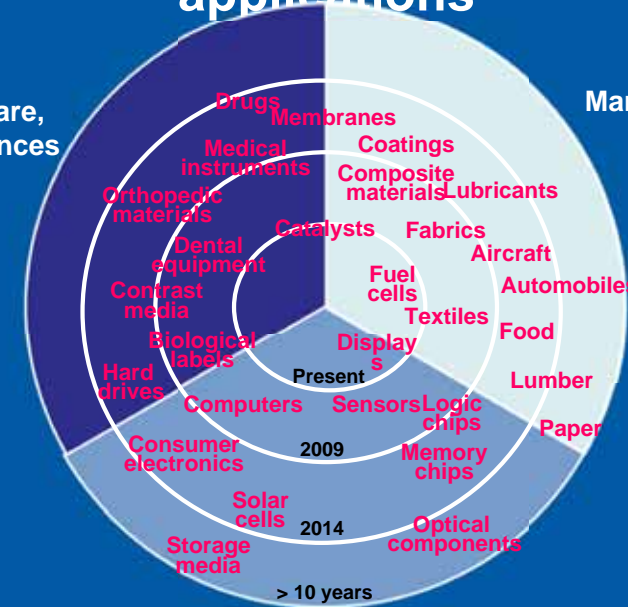
(based on 7 key consultancy forecasts)



Potential nanotechnology applications

Healthcare, life sciences

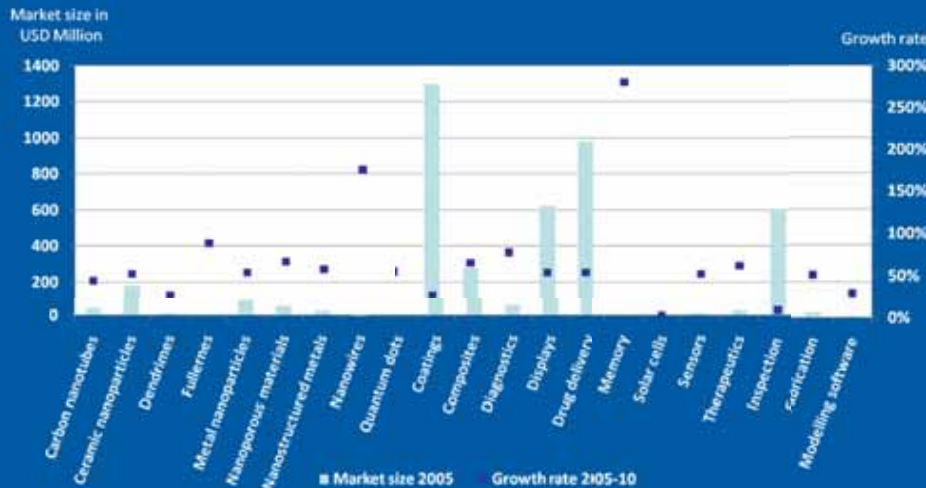
Manufacturing, materials



Electronics, IT

Source: LuxResearch (2006)

Sub-area market forecasts

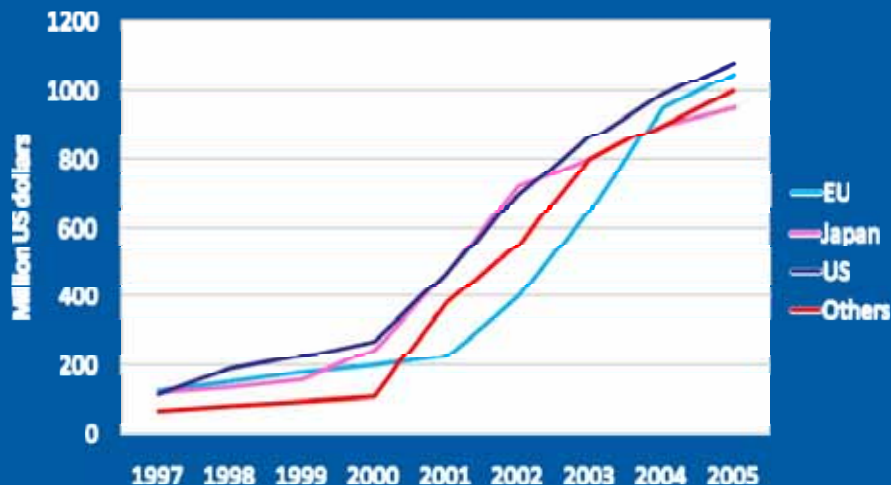


Source: LuxResearch 2006

Large socio-economic promises...

- Future market size somewhere in the range of 1 to 2.6 Trillion US Dollars by 2015 (estimates by consultancy firms)
- Can contribute to addressing issues of global concern: climate change, accessible health care, energy and resource limitations (e.g. water) etc.
- Eventually also (with a lag) a large impact on the global economy through productivity and growth effects?

...have encouraged public R&D investments



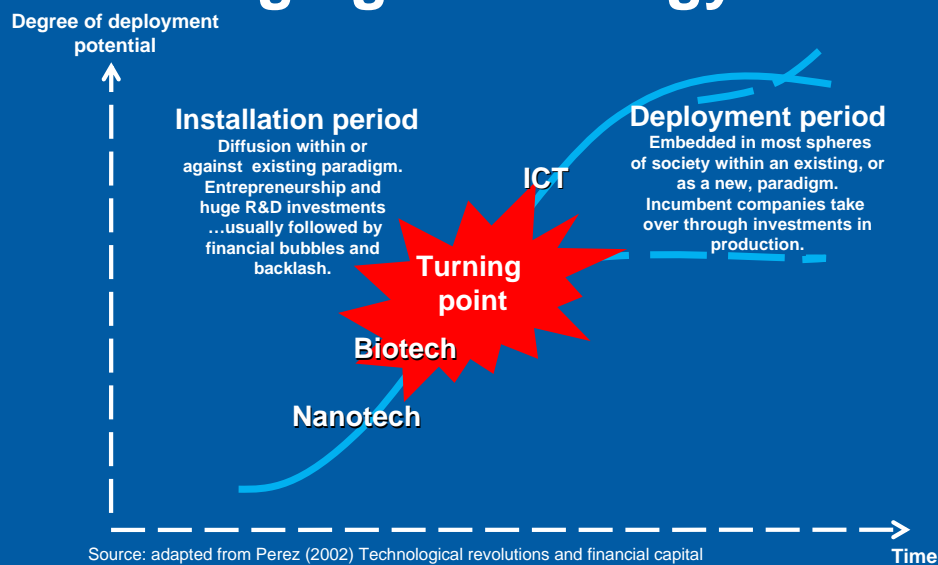
Source: PCAST (2005)

Could nano really become a next general purpose technology (GPT)?

- “A GPT is a technology that initially has *much scope for improvement* and eventually comes to be *widely used*, to have *many uses*, and to have *many and strong innovation complementarities*”
- Prominent examples: steam engine, electricity, microelectronics (ICT)

Source: Helpman (1998), Lipsey et al. (2005) etc.

Typical life-cycle of emerging technology areas



Source: adapted from Perez (2002) Technological revolutions and financial capital

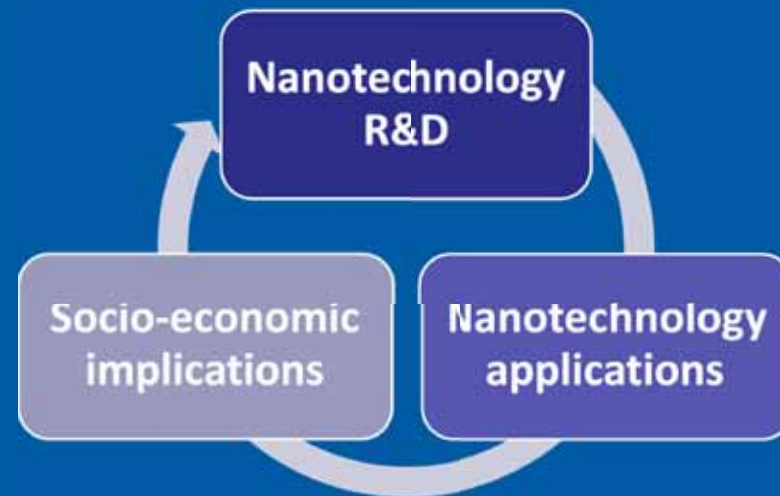
Challenges and the need for coordinated policies

Major challenges ahead...!

- Definitional and measurement problems: lack of reliable and comparable indicators and statistics
- Are new policies, partnerships, business models and environments required? What is truly new and specific to nanotechnology?
- Environment, health and safety concerns
- Ethical, legal and societal issues : public perceptions? (compare with ICT and biotech)

5/13/2008

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5/13/2008

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The Working Party on Nanotechnology

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Vision statement

“The objective of the WPN is to advise on emerging policy-relevant issues in science, technology, and innovation related to the responsible development of nanotechnology”

5/13/2008

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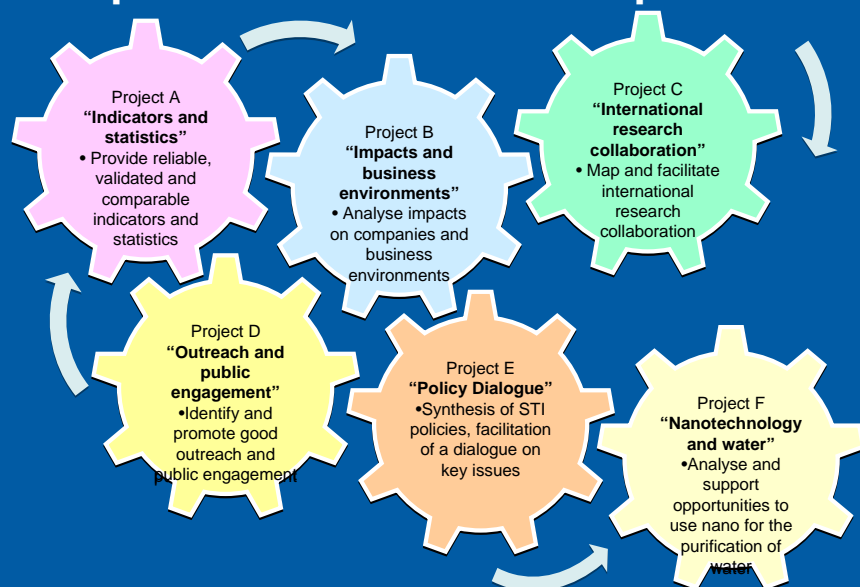
The WPN

- WPN established by the CSTP in March 2007
- Work is coordinated with the OECD WPMN and with other intergovernmental organizations
- Involves 30 OECD member countries, the EC, ISO, BIAC and TUAC.
- Currently involvement of some OECD non-member countries (Russia, Israel, South Africa, China)
- 1st meeting in Leuven, Belgium, 8-9 May. 2nd meeting in Paris 13-16 Nov., next meeting 21-24 April 2008
- WPN Bureau overall coordinating body,

Focus areas and objective of WPN



WPN project objectives and possible interrelationships



Content of WPN (I)

- **Project A “Indicators and Statistics”**
 - Objectives: provide reliable, validated and comparable indicators and statistics
 - Present activities: ‘Nanotechnology at a glance’, framework for nanotechnology statistics, pilot surveys
- **Project B “Impacts and Business Environments”**
 - Objectives: analyse impacts on company activities (what’s special about nano?), implications for the business environment
 - Present activities: literature overview, company case studies in selected application areas, synthesis from policy viewpoint

Content of WPN (II)

- **Project C “International research collaboration”**
 - Objectives: facilitate international research collaboration
 - Present activities: map patterns of international research collaboration, database/portal of research infrastructures
- **Project D “Outreach and public engagement”**
 - Objectives: identify and promote good communication

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Content of WPN (III)

- **Project E “Policy Dialogue”**
 - Objectives: information gathering and synthesis on S&T policies in nano across countries, facilitation of policy dialogue
 - Present activities: survey and first synthesis work, planning of workshop program
- **Project F “Global Challenges: Nano and water purification”**
 - Objectives: analyze opportunities for the use of nano for the purification of water as a global challenge
 - Present activities: fact-finding, planning of workshop session at NTNE2008 conference

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OECD Contacts

- **Working Party on Manufactured Nanomaterials:**
 - Peter Kearns, peter.kearns@oecd.org
 - www.oecd.org/env/nanosafety
- **Working Party on Nanotechnology:**
 - Christopher Palmberg: christopher.palmberg@oecd.org
 - www.oecd.org/sti/nano

5/13/2008

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Progress on standardization for nanotechnologies – ISO/TC 229

Dr Peter Hatto,
Chairman ISO TC 229 and BSI NTI/1 Nanotechnologies
standardization committees
Director of Research, IonBond Ltd, UK

3rd International Dialogue on Responsible Research and
Development of Nanotechnology
Brussels, 11-12 March 2008

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Standards

Standards can be of two types:

- Metrological standards: length, mass, time, quantity of matter – primary and secondary standards
- Written standards

Written Standards provide agreed ways of:

- Naming, describing and specifying things
- Measuring and testing things
- Managing things e.g. quality and environmental management: ISO 9001 and ISO 14000
- Reporting things as in e.g. proposed ISO 26000 (Social Responsibility)

To:

- support research, commercialisation, market development and established markets
- provide a basis for procurement based on technical requirements and quality/environmental management
- support appropriate legislation/regulation

Can be **NORMATIVE**, defining what **MUST** be done in e.g. a specific test method, or **INFORMATIVE**, providing information only.

Standards are **VOLUNTARY** unless called in a contract or regulation (e.g. “New Approach” directives in Europe)

Standards provide a means of “validated quantification”

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Overview

- **Standards and standardization**
 - Role of standards
 - Standardization organisations
 - Development of formal standards
 - “Soft” governance standards
- **Standardization for nanotechnologies**
 - Why is nanotechnology important?
 - What needs standardizing and why?
 - Current standardization committees
 - Existing standards, standardization projects and proposals
 - Pre- and co-normative research to support future needs
 - Recent and future UK standards publications

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Standards

Standards are:

- Ubiquitous – covering such things as shoe sizes, nuts and bolts, petrol grades, warning signs, pipes and fittings, fire extinguishers, gas cylinders, electrical sockets and plugs, steel specifications,.....
- Virtually invisible to “the man in the street” – there are over 16,500 International Standards, many with multiple parts;
- But are absolutely critical to our modern way of life – covering things such as CDs/DVDs, internet protocols, credit cards, pin numbers, quality and environmental management,.....

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There are over 560 ISO standards and other documents applying to road vehicles plus ISO 3779 covering the vehicle identification number (VIN)



There are more than 190 ISO standards and other documents applying to fasteners



Even wine tasting glasses have a standard – ISO 3591, Sensory analysis – Wine tasting glass



ISO TC/145 has developed ISO 9186, Graphical symbols – Test methods for comprehensibility and for comprehension



ISO 9654-1, Banking – “Personal Identification Number management and security” provides instructions to financial institutions in the development, implementation and/or the operation of systems and procedures for the protection of PIN throughout their lifecycle.



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ISO 10002:2004, Quality management -- Customer satisfaction -- Guidelines for complaints handling in organizations



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ISO/TC 222 – “Personal financial planning” has published ISO 22222:2005 - Personal financial planning -- Requirements for personal financial planners



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and standardization

Standards can be:

- **FORMAL** – developed by independent experts working under the auspices of a National, Regional or International standards body
 - AFNOR, BSI, DIN, JIS, (NSBs)
 - CEN, CENELEC, ETSI.....
 - ISO, IEC & ITU
- **INFORMAL** – developed by a SDO (Standards Development Organisation)
 - ASTM, IEEE, SAE, SEMI, VDI...(>600 SDOs IN US)
- **PRIVATE** – developed by a company or trade association

FORMAL standards are:

- **PROPOSED, DEVELOPED AND APPROVED** by the members of the standards body (or an accredited organisation)
- Based on **CONSENSUS** (i.e. no sustained opposition) not necessarily unanimity.

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- **GLOBAL**

- 157 National members
- partnerships and liaisons with some 700 international and regional organizations

- GLOBAL

- **INCLUSIVE**

- GLOBAL
- INCLUSIVE

- **DEMOCRATIC**

- GLOBAL
- INCLUSIVE
- DEMOCRATIC

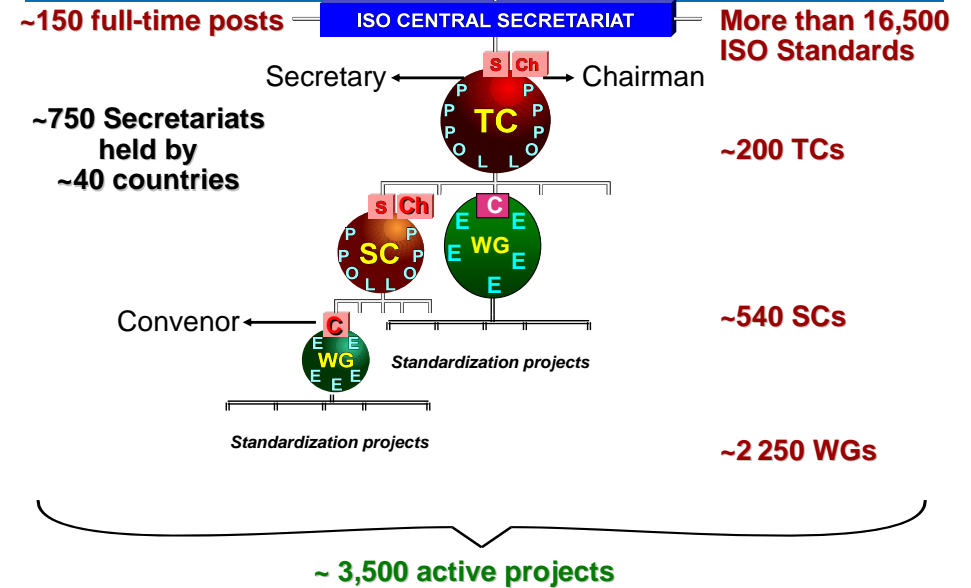
- **MEMBER DRIVEN**

International Organization for Standardization

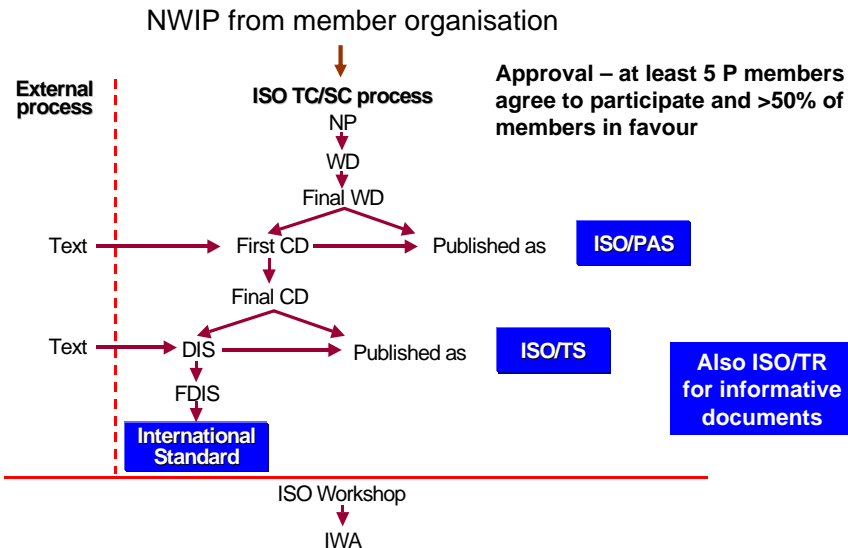
- GLOBAL
- INCLUSIVE
- DEMOCRATIC
- MEMBER DRIVEN
- Process is based on well established principle of CONSENSUS
- Standards are:
 - Proposed, commented on and approved by members
 - Developed by experts nominated by members
 - Voluntary
- Recognised as providing critical elements of Governance through ISO 9001, 14001 (and ISO 26,000 – expected to be published in 2008).
- ISO structure includes “horizontal” committees on
 - CERTIFICATION AND ASSESSMENT (CASCO),
 - CONSUMER POLICY (COPOLCO),
 - DEVELOPING COUNTRIES (DEVCO)
 - REFERENCE MATERIALS (REMCO)

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Extent of ISO System



Development of International Standards Process accommodates special needs



“Soft” governance standards

- ISO 9001:2000 Quality management systems – Requirements
- ISO 14001:2004 Environmental management systems – Requirements with guidance for use
- ISO 14064-1:2006 Greenhouse gases -- Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals
- ISO 16813:2006 Building environment design -- Indoor environment -- General principles (*sustainable building*)
- ISO 22000:2005 Food safety management systems -- Requirements for any organization in the food chain
- ISO 24510:2007 Activities relating to drinking water and wastewater services -- Guidelines for the assessment and for the improvement of the service to users
- ISO/PAS 22399:2007 Societal security - Guideline for incident preparedness and operational continuity management
- ISO/WD 26000 Guidance on social responsibility (*still in development*)

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ISO/IEC Guides

- ISO/IEC Guide 7, Guidelines for drafting of standards suitable for use for conformity assessment
- ISO/IEC Guide 37, Instructions for use of products by consumers
- ISO/IEC Guide 41, Packaging – Recommendations for addressing consumer needs
- ISO/IEC Guide 46, Comparative testing of consumer products and related services – General principles
- ISO Guide 64, Guide for the inclusion of environmental aspects in product standards
- ISO/IEC Guide 71, Guidelines for standards developers to address the needs of older persons and persons with disabilities
- ISO/IEC Guide 73, Risk management – Vocabulary – Guidelines for use in standards
- ISO/IEC Guide 76, Development of service standards – Recommendations for addressing consumer issues
- ISO/IEC Guide 98, Guide to the expression of uncertainty in measurement (GUM)

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Why is nanotechnology important?

US Interagency Working Group on Nano Science, Engineering and Technology (IWGN) workshop on Nanotechnology Research Directions (Sept. '99):
“nanotechnology will be a strategic branch of science and engineering for the 21st century, one that will fundamentally restructure the technologies currently used for manufacturing, medicine, defence, energy production, environmental management, transportation, communication, computation and education.”

US NSF report on “SOCIETAL IMPLICATIONS OF NANOSCIENCE AND NANOTECHNOLOGY” March 2001:
“the impact of nanotechnology in the 21st century is likely to be at least as significant for health, wealth and security as the combined influences of antibiotics, integrated circuits and polymers.”

Projected world-wide market for n-t enabled products will be from \$500 billion to <\$3 trillion by 2015

“It is estimated that Nanotechnology is presently at a level of development similar to that of computer/information technology in the 1950s” (Nanostructure Science and Technology: A Worldwide Study, WTEC Panel report, 1999)

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The challenges

The Interagency Working Group on Nanotechnology workshop in 1999 concluded:

“while recognizing nanotechnology’s potential to spawn an industrial revolution in coming decades, the consensus was that the challenges ahead in basic discovery, invention and eventual manufacturing are formidable. New methods of investigation at the nanoscale, novel scientific theories, and different fabrication paradigms are critical.”



“Nanotechnology will only become a coherent field of endeavour through the confluence of three important technological streams:

- *New and improved control of the size and manipulation of nanoscale building blocks;*
- *New and improved characterization (spatial resolution, chemical sensitivity, etc) of materials at the nanoscale;*
- *New and improved understanding of the relationship between nanostructure and properties and how these can be engineered”*
- *And don’t forget safety and consumer acceptance!!*

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Needs for standardization

1. To support research, commercialisation and market development
2. To provide a basis for procurement – technical/quality/environmental management
3. To support appropriate legislation/regulation

Challenges: currently there are:

- *No internationally agreed terminology/definitions for nanotechnology(ies).*
- *No internationally agreed protocols for toxicity testing of nanoparticles.*
- *No standardized protocols for evaluating environmental impact of nanoparticles.*
- *Existing “methods of test” may not be suitable for nanoscale devices and nanoscale dimensions.*
- *Measurement techniques and instruments need to be developed and/or standardized.*
- *New calibration procedures and certified references materials are needed for validation of test instruments at the nanoscale.*
- *Multifunction nanotechnology systems and devices will need new standards.*

Partial solutions

- *Some existing standards may be applicable e.g. for chemical analysis and imaging (ISO TCs 201 and 202) and particle detection/sizing (ISO TC 24)*

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Major issues

- *Diversity of disciplines impacted by and contributing to nanotechnologies*
- *Global impact*
- *Speed of development and apparent speed of commercialisation*
- *Critical areas:*
 - *Coordination and harmonization across stakeholders*
 - *Terminology*
 - *Measurement and characterization*
 - *Potential health, safety and environmental impacts*

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International Organisation for Standardization committee ISO/TC 229 - Nanotechnologies

- Established in June 2005 with UK Chair and Secretariat
- 39 members – 30 “P” and 9 “O” (see http://www.iso.org/iso/standards_development/technical_committees/list_of_iso_technical_committees/iso_technical_committee.htm?commid=381983)
- Liaisons with 15 other ISO TCs and 6 external bodies – IEC/TC 113, CEN/TC 352, Asia Nano Forum, EC JRC, OECD and VAMAS
- Exploring additional external liaisons for emerging economies

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International Electrotechnical Commission committee IEC/TC 113 – “Nanotechnology standardization for electrical and electronic products and systems”

- Established June 2006 with US Chair and German secretariat
- http://www.iec.ch/cgi-bin/procgi.pl/www/iecwww.p?wwwlang=e&wwwprog=dirdet.p&progdb=db1&css_color=purple&committee=TC&number=113
- 26 members - 15 “P” and 11 “O”
- First meeting March 2007
- Agreed to establish two Joint Working Groups with ISO TC/229:
 - JWG 1 – Terminology and nomenclature
 - JWG2 – Measurement and characterization
- Together with a third Working Group:
 - WG3 – Performance
 - **New Work Item: GUIDE FOR CARBON NANOTUBE SPECIFICATION FOR ELECTROTECHNICAL APPLICATION**

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European Committee for Standardization committee CEN/TC 352 - Nanotechnologies

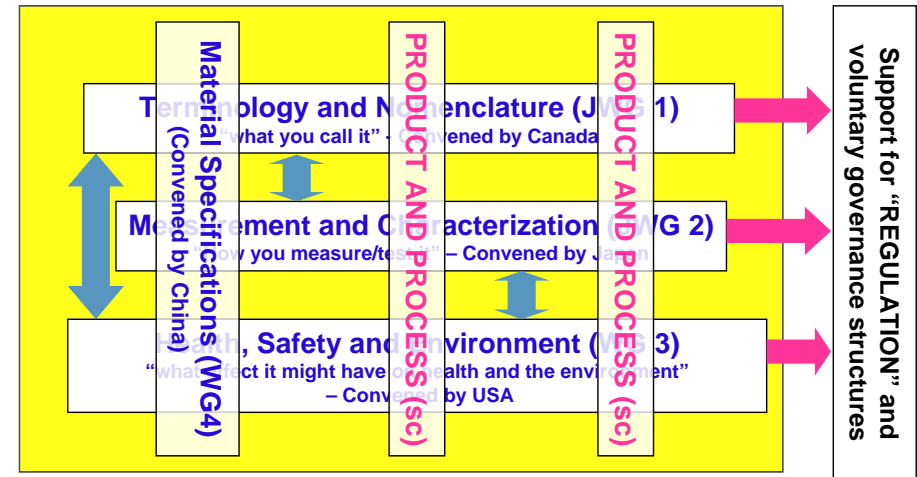
- <http://www.cen.eu/CENORM/Sectors/TechnicalCommitteesWorkshops/CENTechnicalCommittees/CENTechnicalCommittees.asp?param=508478&title=CEN%2FTC+352>
- Established November 2005 following proposal from UK and recommendations from CEN/BTWG 166
- UK Chair and Secretariat
- Works closely with ISO/TC 229 and “topics of mutual interest will be developed under the ‘Vienna Agreement’ with ISO lead”.
- Developing work programme in areas of specific interest to Europe and areas that will be relevant to European legislation.
- Responding to EC Mandate for “the elaboration of a programme of standards to take into account the specific properties of nanotechnology and nanomaterials”

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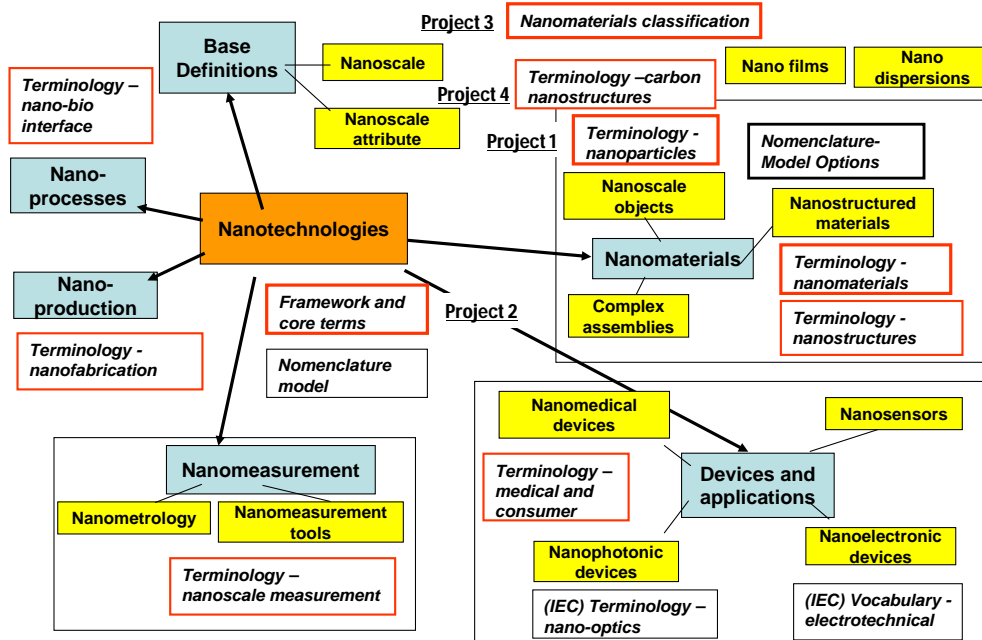
Other internationally relevant standards organisations

- ASTM International – E56 committee
- IEEE Standards Association – Nanoelectronics standards roadmap and standards development
- SEMI - ITRS

TC 229 – Structure/working areas



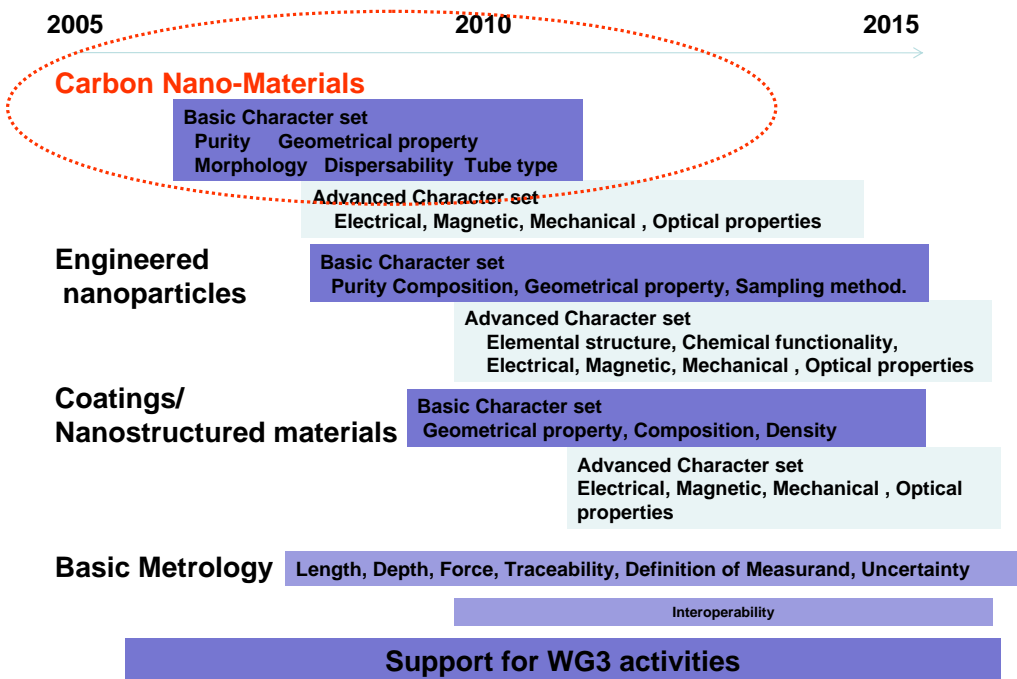
JWG1: Strategic Roadmap



TC 229 Current work programme – JWG1

- ISO/TS: Terminology and definitions for nanoparticles – Document now approved as TS 27687 – awaiting resolution of comments
- ISO/TR: Terminology and nomenclature for nanotechnologies – Framework and core terms
- ISO/TS: Outline of Nanomaterials classification ("Nano tree")
- ISO/TS: Terminology and definitions for carbon nanomaterials
- NWIP: ISO/TS: Nanotechnologies - Core Terms - Terminology and Definitions (ballot closes 6 May 2008)

JWG2: Draft Roadmap



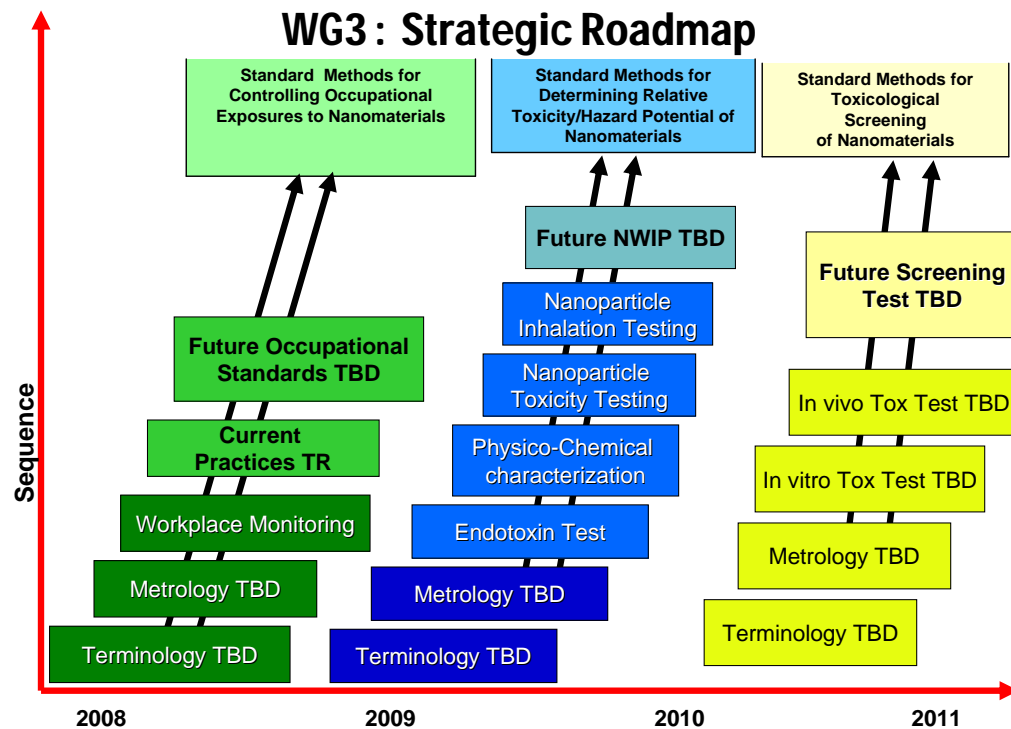
TC 229 Current work programme – JWG2 – SWCNT work

- ISO/TS: The Use of Transmission Electron Microscopy (TEM) in the Characterization of Single-walled Carbon Nanotubes
- ISO/TS: The Use of Scanning Electron Microscopy (SEM) and Energy Dispersive X-ray Analysis (EDXA) in the Characterization of Single-walled Carbon Nanotubes
- ISO/TS: Technical Specification for the Use of UV-Vis-NIR absorption spectroscopy in the Characterization of Single-walled Carbon Nanotubes
- ISO/TS: Technical Specification for the use of NIR-Photoluminescence (NIR-PL) Spectroscopy in the Characterization of Single-Walled Carbon Nanotubes
- ISO/TR: Use of Thermo Gravimetric Analysis (TGA) in the purity evaluation of Single Walled Carbon Nanotubes
- ISO/TR: Use of Evolved Gas Analysis-Gas Chromatograph Mass Spectrometry (EGA-GCMS) in the Characterization of Single-Walled Carbon Nanotubes
- ISO/TS: Use of Raman Spectroscopy in the Characterization of Single Walled Carbon Nanotubes.

JWG2 – MWCNTs and other

- ISO/TS: Measurement Methods for the Characterization of Multi-Walled Carbon Nanotubes
- ISO/TS: Determination of meso-scope shape factors of multiwalled carbon nanotubes
- ISO/TS: General Framework for Determining Nanoparticle Content in Nanomaterials by Generation of Aerosols

WG3 : Strategic Roadmap



TC 229 Current work programme – WG3

- *ISO/TR: Safe Practices in Occupational Settings Relevant to Nanotechnologies – should be balloted shortly.*
- *ISO/IS: Endotoxin test on nanomaterial samples for in vitro systems*
- *ISO/IS: Generation of nanoparticles for inhalation toxicity testing*
- *ISO/IS: Monitoring of nanoparticles in inhalation exposure chambers for inhalation toxicity testing*
- *ISO/TR Guidance on physico-chemical characterization of engineered nanoscale materials for toxicologic assessment.*

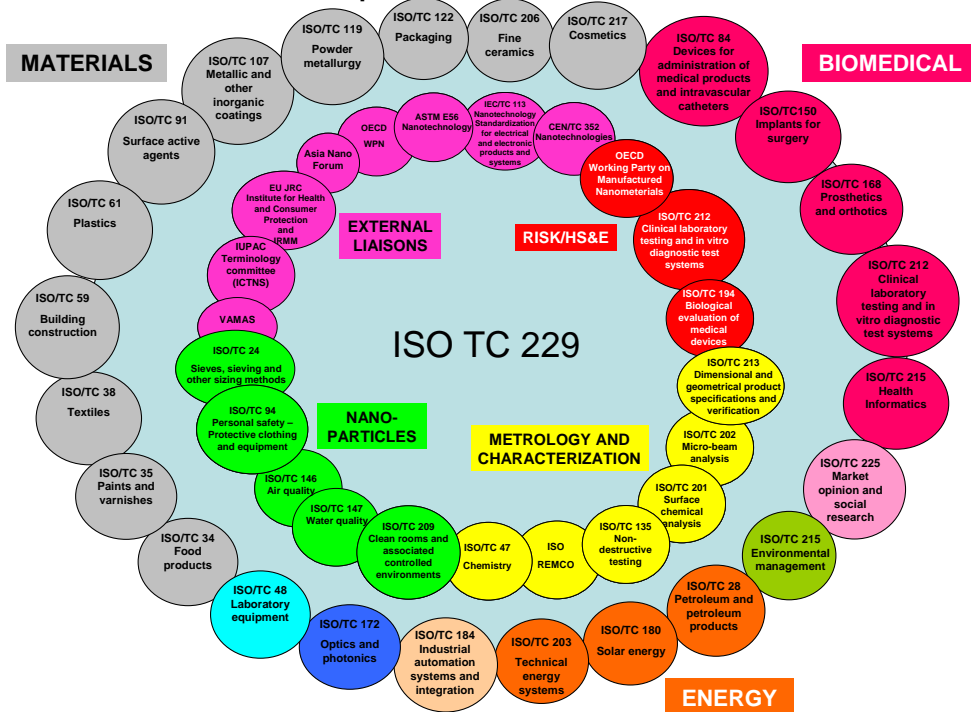
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TC 229 Current work programme – WG4

- *ISO/IS: Materials specification for nano-titanium dioxide*
- *ISO/IS: Materials specification for nano-calcium carbonate*

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Current and potential liaisons for ISO/TC 229



Pre- and co-normative research requirements:

- **Critical areas are risk/regulation: Development and delivery needed of:**
 - test methods to detect and identify nanoparticles, and to characterize nanoscale materials and devices.
 - protocols for bio- and eco-toxicity testing, including protocols to evaluate effects of short and long term dermal, nasal, oral and pulmonary exposure to, elimination of, and fate determination for nanomaterials and nanoscale devices.
 - protocols for whole life cycle assessment of nanoscale materials, devices and products.
 - risk assessment tools relevant to the field of nanotechnologies.
 - protocols for containment, trapping and destruction of nanoparticles and nanoscale entities.
 - occupational health protocols relevant to nanotechnologies, in particular for industries dealing with nanoparticles and nanoscale devices.
- **Collaboration with OECD Working Party on Manufactured Nanomaterials (OECD WPMN)**

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Publication of the “nano-nine” by BSI

6 terminologies and 3 guides
(+PAS 71 – Vocabulary for nanoparticles)

All available for free download at
www.bsigroup.com/nano

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Terminologies

<p><u>PAS 131:2007</u></p> <p>PUBLICLY AVAILABLE SPECIFICATION</p> <p>Terminology for medical, health and personal care applications of nanotechnology</p> <p>ICS 01.040.11, 11.040.99</p>	<p><u>PAS 132:2007</u></p> <p>PUBLICLY AVAILABLE SPECIFICATION</p> <p>Terminology for the bio-nano interface</p> <p>ICS 01.040.11, 11.040.99</p>	<p><u>PAS 133:2007</u></p> <p>PUBLICLY AVAILABLE SPECIFICATION</p> <p>Terminology for nanoscale measurement and instrumentation</p> <p>ICS 01.040.17, 17.040.99</p>
<p><u>PAS 134:2007</u></p> <p>PUBLICLY AVAILABLE SPECIFICATION</p> <p>Terminology for carbon nanostructures</p> <p>ICS 01.040.71, 71.040.99</p>	<p><u>PAS 135:2007</u></p> <p>PUBLICLY AVAILABLE SPECIFICATION</p> <p>Terminology for nanofabrication</p> <p>ICS 01.040.51, 71.040.99</p>	<p><u>PAS 136:2007</u></p> <p>PUBLICLY AVAILABLE SPECIFICATION</p> <p>Terminology for nanomaterials</p> <p>ICS 040.71, 71.040.99</p>

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PAS 130:2007

PAS 130

PUBLICLY AVAILABLE SPECIFICATION

Guidance on the labelling of manufactured nanoparticles and products containing manufactured nanoparticles

ICS 71.100.99

“The BSI document does an admirable job of untangling the confusion, and stating clearly and concisely the purposes of labelling; what the limitations are, and how nano-specific labels might be used effectively in different circumstances. I’m sure it will not be the last word on the issue, but at least it sets the scene for making real progress.

It’s not as much fun as the ETC Group’s bright yellow nano-hazard labels, but it’s probably a tad more useful”

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PD 6699-1

PD 6699-1:2007

PUBLISHED DOCUMENT

Nanotechnologies –

Part 1: Good practice guide for specifying manufactured nanomaterials

ICS 71.100.99

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Nanotechnologies –

Part 2: Guide to safe handling and disposal of manufactured nanomaterials

ICS 13.100; 71.100.99

“Is the document any good? Here’s the short answer:

If you are developing, producing, handling, or otherwise working with engineered nanomaterials, **READ THIS GUIDE!**”

“In the case of the BSI guide, its value lies in down-to-earth know-how. This is a shop-floor manual for making decisions where the rubber hits the road.”



Why standards for nanotechnologies are important

Standards will help to ensure that nanotechnology is developed and commercialised in an open, safe and responsible manner by supporting:

- safety testing, legislation and regulation
- worker, public and environmental safety
- commercialisation and procurement
- patenting and IPR
- communication about the benefits, opportunities and potential problems associated with nanotechnologies

This will be achieved by providing agreed ways of:

- Naming, describing and specifying things
- Measuring and testing things
- Health and environmental safety testing, risk assessment and risk management



Acknowledgements

- ISO Central Secretariat for permission to use the cartoons at the beginning of this presentation
- Mr Pascal Krieger the artist who produced the cartoons, which are covered by ISO copyright
- Anyone wishing to know more about ISO should visit WWW.ISO.ORG

Thank you!



3rd Intn'l Discussion on Responsible Research in Nanotechnology

Brussels, 11-12 March 2008

Nanotechnology at the European Patent Office

Dr. Ir. Yves Verbandt, European Patent Office



European Patent Office

- European Patent Convention (EPC)
 - Established a system of law for the grant of European patents
 - European patents have the effect and are subject to the same conditions as a national patent
- 30+ contracting states (incl. Croatia, Norway, Turkey, ...)
- Unitary protection standards in the contracting states
 - One application, one language
 - “A la carte” market by designation of countries
- Costs less than three separate national patents
- Strong
 - Thorough search: patent documents and other available knowledge
 - Substantive examination = sound legal protection

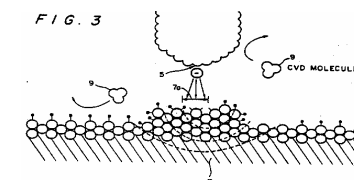
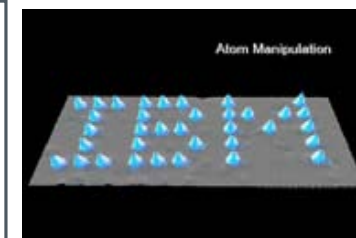
Outline

- Brief presentation European Patent Office
- What is nanotechnology?
- Challenges for the EPO
- Legal issues

International Patent Classification (IPC) Narrow definition

Patent Offices:
B82 Nanotechnology
= Nanostructures & Manufacture

- “Nano-structure” is an atomically precise arrangement of matter which:
 - (i) is formed solely from an atom, a molecule or an extremely limited collection of atoms or molecules ...;
 - (ii) has been formed by having its atoms or molecules **individually manipulated** as discrete units during its manufacture



Y01N Label in European Classification

Nanotechnology

- In this subclass the term 'nanotechnology' covers all things with a controlled geometrical size of at least one functional component below 100 nanometers (nm) in one or more dimensions susceptible to make physical, chemical or biological effects available which cannot be achieved above that size without a loss of performance
- This subclass covers equipment for the analysis, manipulation, processing, fabrication and measurement with a precision below 100 nanometers (nm);
- (If appropriate, the same document can receive more than one tag in this subclass)

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Challenges

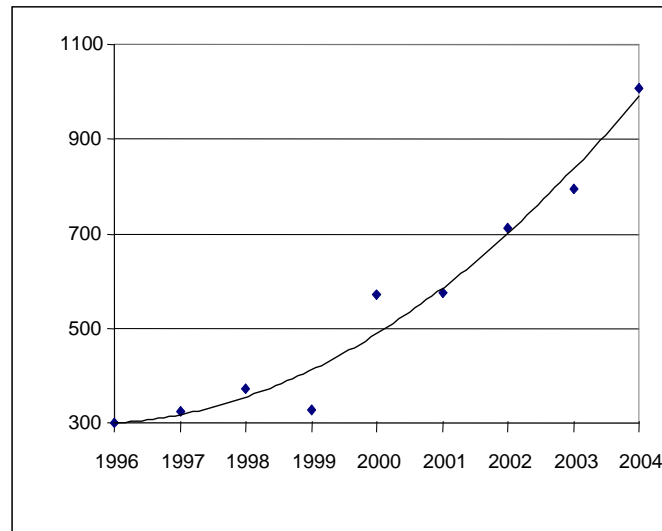
- **Multidisciplinary**
- **Rapid growth** of number of patent applications

Hence,

- Examiner: Where to find prior art?
- Office: Workload management

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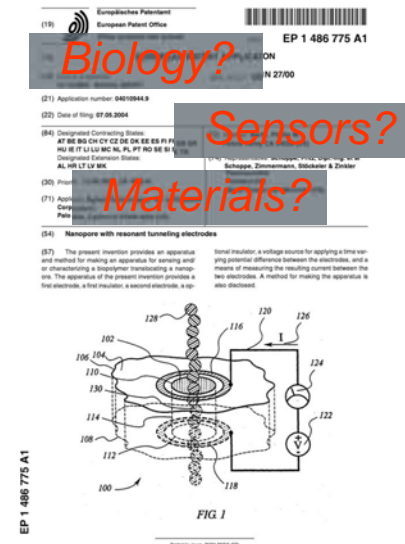
Published EP applications in nanotechnology



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Multidisciplinary

- Nanopore with resonant tunneling electrodes
- For sensing and/ or characterizing a biopolymer
- Method of making the apparatus



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Nanotechnology Working Group

- Inventorise and tag nanotechnology applications in EPO.
- Create/increase awareness in EPO about nanotechnology.
- Serve as experts/switchboard for examiners having difficult/interdisciplinary nanotechnology applications.
- Harmonise nanotechnology practice and classification with other patent offices (JPO, USPTO).
- Cooperate with and help external parties.

Nanotech patents scattered over IPC

[SECTION A](#) – HUMAN NECESSITIES

[SECTION B](#) – PERFORMING OPERATIONS; TRANSPORTING

[SECTION C](#) – CHEMISTRY; METALLURGY

[SECTION D](#) – TEXTILES; PAPER

[SECTION E](#) – FIXED CONSTRUCTIONS

[SECTION F](#) – MECHANICAL ENGINEERING;

[SECTION G](#) – PHYSICS

[SECTION H](#) – ELECTRICITY



Classification & Tagging

CLASSIFICATION

[SECTION A](#)

[SECTION B](#)

[SECTION C](#)

[SECTION D](#)

[SECTION E](#)

[SECTION F](#)

[SECTION G](#)

[SECTION H](#)

TAGGING

[SECTION Y](#)

Methodology

1. Identify nanotechnology classifiers
(about 50 out of 3700 examiners)

2. Nanotechnology classifiers identify all ECLA entries falling under Y01N definition (out of 130 000 ECLA entries)

3. Critical review of listed technologies by VDI-TZ
(Technology competence centre of the German Engineering Society)

4. Y01N-TAGGING code for nanotech
(120.000+ documents out of 31 million classified docs)

Y01N Label

Y01N2	Nanobiotechnology
Y01N4	Nanotechnology for information processing, storage and transmission
Y01N6	Nanotechnology for materials and surface science
Y01N8	Nanotechnology for interacting, sensing and actuating
Y01N10	Nanotechnology for optics
Y01N12	Nanomagnetism



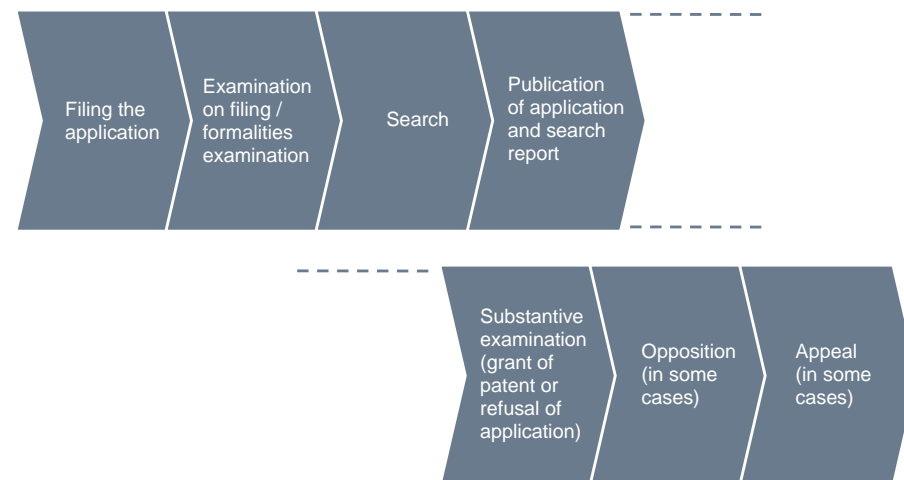
Trilateral comparison

	EPO	USPTO	JPTO
"nano"-TAG	Y01N	977/DIG1	ZNM
Type of docs	EP,WO,US,DE, BE,FR,UK, NL + others & non-patent literature	US	JP

Summary

- Nanotechnology patents are scattered over all IPC/ECLA sections
- Emerging technology with high growth rate
- EPO has created Y01N tag to respond to various challenges
- Y01N can be and is used to monitor trends
- EPO actively cooperates with others in this area

The European patent grant procedure



Substantive examination: Does the European patent application meet the requirements of the EPC?

- Patents shall be granted for any inventions which are susceptible of **industrial application**, which are **new** and involve an **inventive step**.
- A patent application must disclose the invention in a manner **sufficiently clear and complete** for it to be carried out by a person skilled in the art
- The claims shall define the matter for which protection is sought. They shall be **clear and concise and supported by the description**.
- Patents shall **not** be granted when contrary to "**ordre public**" or **morality**, plant or animal varieties, methods of treatment by surgery or therapy, diagnostics methods

Legal texts

European Patent Convention (EPC)

- Articles
 - Art. 54(1): novelty
 - Art. 56 : inventive step
 - Art. 83 : sufficiency of disclosure
 - Art. 84 : clarity
- Rules

Guidelines for Examination

(Internal Instructions)

Hierarchy

What's special about Nanotechnology?

- Terminology → **Clarity**
- Enablement → **Sufficiency of disclosure**
- Miniaturisation → **Inventive step**

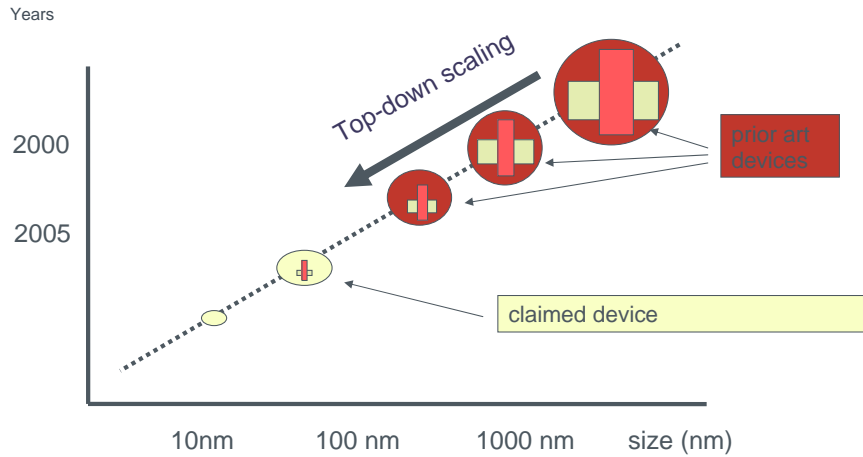
Inventive step

An invention shall be considered as involving an inventive step if, having regard to the state of the art, if it is **not obvious** to a person skilled in the art.

Issues in Nanotechnology:

- Obvious selection
- Unexpected technical advantage
- Combination of features

Miniaturisation



Surprising effect or general trend ?

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Sufficiency of disclosure

The application must disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

Purpose:

(i) to ensure that the application contains sufficient technical information to enable a skilled person to put the invention as claimed into practice;

(ii) to enable the reader to understand the contribution to the art which the invention as claimed has made.

Application as a whole!

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Person skilled in the art

• Ordinary practitioner aware of common general knowledge

• Common Knowledge:

- Basic handbooks
- Monographs
- Textbooks

• If the invention lies in a new field of research:

- patent specifications
- scientific publications

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Clarity

Issues in Nanotechnology

- Relative terms or unusual terminology; parameters
- Essential features
- Functional features
- Product-by-process claims
- Result to be achieved
- Support by description

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Substantive examination

- Refusal of the application
- Grant of the European patent:
 - Limitation
 - Opposition
 - » maintenance (original or amended)
 - » revocation
- Appeal



- The Legal Board of Appeal and the Technical Boards of Appeal give independent final rulings on appeals against decisions taken during search, substantive examination and opposition procedures.
- The Enlarged Board of Appeal gives decisions and opinions in order to ensure application of the law or if an important point of law arises.



Conclusion

- EPO has created Y01N tag to monitor nanotechnology patents and patent applications
- The tag is publicly available at esp@cenet
- NTWG monitors legal issues.

Acknowledgments

Members of NTWG:

R. Absalom, M. Scheu, P. Polesello, C. Kallinger, W. Förster, V. Veefkind, A. Dullaart, R. Michalitsch, A. Neumann

Disclaimer

The opinions expressed in this presentation are mine. They should be considered neither to represent the policy of the European Patent Office, nor to imply any commitment by the EPO to any particular course of action.

Thank you for your attention!

nano@epo.org



Reference websites :

Scenario's for the future of IP:

<http://www.epo.org/topics/patent-system/scenarios-for-the-future.html>

Cost of a European patent:

<http://www.epo.org/patents/Grant-procedure/Filing-an-application/costs-and-fees.html>

London agreement:<http://www.epo.org/topics/issues/london-agreement.html>

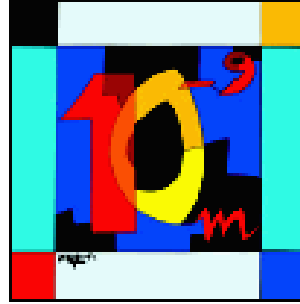
Seminars and workshops on IP issues: <http://www.epo.org/patents/learning.html>

Yves Verbandt

Examiner, Measuring & Optics | Dir. 1.2.3.4

European Patent Office

<http://www.epo.org>



PLENARY SESSION 4 SOCIETAL ENGAGEMENT

Chairmanship: Renzo TOMELLINI (EC)

Keynote lecture: Masahiro TAKEMURA (J)

Case study: Global networking of social scientists. Philippe LAREDO, coordinator of the PRIME network of excellence.

Special lecture: Progress achieved in China on responsible development of nanotechnology, Chen WANG (China)

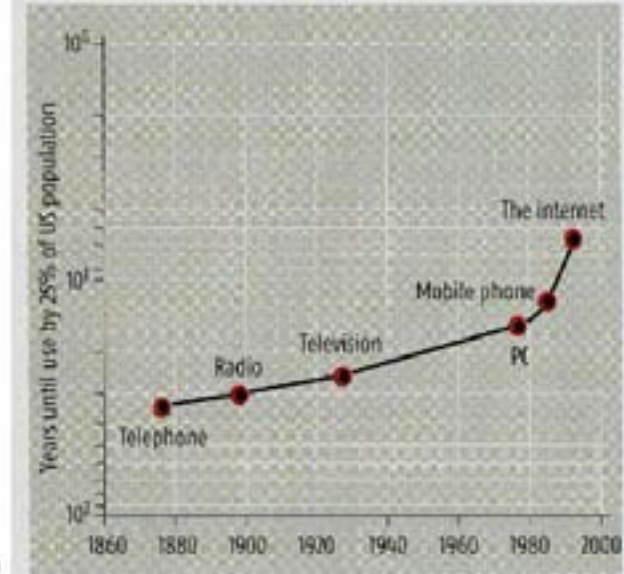
Round Table with Evonik, IRGC, L'Oréal, NIA

- Plenary session 3: Societal engagement
- Chairmanship: Renzo TOMELLINI (EC)
- Keynote lecture: Masahiro TAKEMURA (J)
- Case study: Global networking of social scientists. Philippe LAREDO, coordinator of the PRIME network of excellence
- Special lecture: Progress achieved in China on responsible development of nanotechnology, Chen WANG (China)
- Round Table with Evonik, Greenpeace, IRGC, L'Oréal, NIA
- Debate: what we have learnt from the dialogue with the public

R. Tomellini, March 2008. These slides do not necessarily represent the position of the European Commission or engage it in any way.

MASS USE OF INVENTIONS

The length of time between the invention of a device and its mass use by the US population is falling rapidly

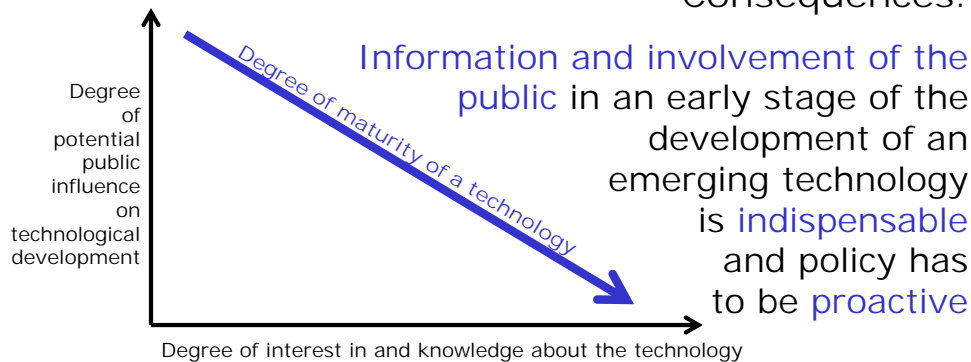


Source: Ray Kurzweil

R. Tomellini, March 2008. These slides do not necessarily represent the position of the European Commission or engage it in any way.

The effect of public engagement

Consequences:



A **real partnership** between science, society and policy has to be established, in form of an **open dialogue with open results**

R. Tomellini, March 2008. These slides do not necessarily represent the position of the European Commission or engage it in any way.

Why to communicate ?

Moral engagement when spending taxpayers' money

Information → communication → dialogue

Societal awareness

Active listening by the Public Authorities

Adaptation of policies

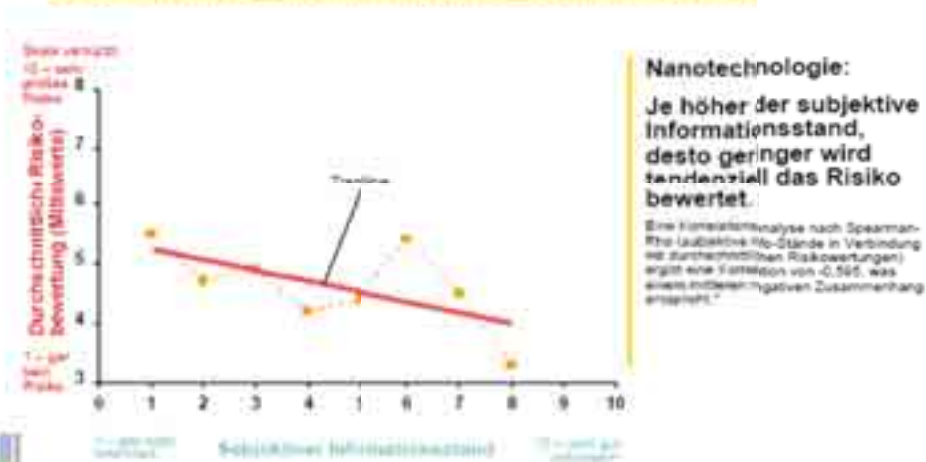
Societal acceptance

The public of today is the customer of tomorrow

R. Tomellini, March 2008. These slides do not necessarily represent the position of the European Commission or engage it in any way.

GERMANY: the more you know, the less you fear

Zusammenhang Informationsstand - Risikobewertung



From: KommPassion Survey "Wissen und Einstellungen zur Nanotechnologie", November 2004

R. Tomellini, March 2008. These slides do not necessarily represent the position of the European Commission or engage it in any way.

Basis for a « consensual innovation »

Creativity
Inclusivity
Responsibility
Credibility
Accountability

R. Tomellini, March 2008. These slides do not necessarily represent the position of the European Commission or engage it in any way.

3rd International Dialogue on Responsible Research and Development of Nanotechnology

Societal Engagement

- Japan's Experience since 1st IDRRDN -

March 12th, 2008

Masahiro Takemura

National Institute for Materials Science

1

Japan's Open Debate on Societal Implications of Nanotechnology Kicked off in August 2004

- Open Forum "Nanotechnology and Society"
 - ◆ Organized by AIST, August 2004 – March 2005
- Symposium "Nanotechnology and Society"
 - ◆ Organized by AIST, NIMS, NIES and NIHS, Feb. 1st, 2005



Symposium "Nanotechnology and Society"

2

Third Science & Technology Basic Plan (2006-2010) by Council for Science & Technology Policy (CSTP)

1. Basic Ideas

2. Strategic Priority Setting in S&T

- ◆ Promotion of basic researches
- ◆ Prioritization of R&D for policy-oriented subjects
 - Priority promotion areas; Life science, IT, Environmental sciences, **Nanotechnology & materials**
 - Promotion areas; Energy, MONODZUKURI tech., Infrastructure, Frontier (outer space & oceans)
- ◆ Promotion strategy for prioritized areas

3. S&T system reforms

4. Public Confidence and Engagement

- ◆ Responsible actions regarding ELSI
- ◆ Reinforcement of accountability and public relations of S&T activities
- ◆ Promotion of public understanding of S&T
- ◆ Facilitation of public engagement with S&T-related issues

5. Missions of CSTP

3

Promotion Strategy for Nanotech. & Materials

NANO-ELECTRONICS

- Next-Generation silicon-based electronics
- Nano-scale manufacturing technology for electronics
- Energy-saving & environmentally-friendly electronics
- Electron/photon-controlled nano-electronics
- Cost reduction tech. for electronic components
- Nano-electronics for security

MATERIALS

- Materials to promote the use of unpopular energy
- Materials to deal with toxic substances
- Materials for environmental protection
- Materials for most advanced electro-apparatus
- Next-generation manufacturing technology
- Materials for highly efficient use of energy
- Substitution & saving tech. for rare or deficit Materials
- Materials for secure & safe society
- Materials for competitive transport equipment

NANO-BIOTECHNOLOGY & BIO-MATERIALS

- Molecular imaging technology for analysis
- DDS and imaging tech. for treatment and diagnosis
- Detection technology for ultra traces of Substances
- Regeneration initiation materials
- Manipulation technology for molecules
- Apparatus with super-microscopic processing tech.
- Patient-friendly bio-devices
- Nano-biotechnology applied food

FUNDAMENTALS for NANOTECHNOLOGY & MATERIALS

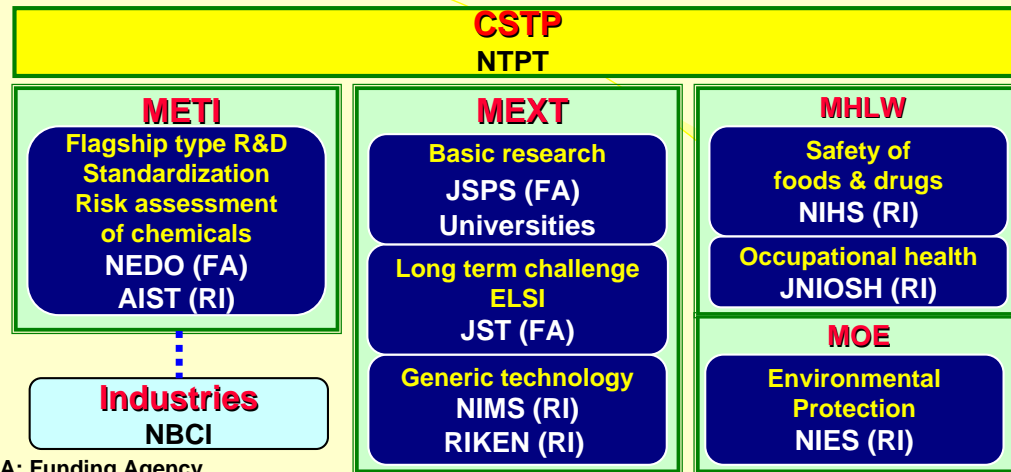
- Measurement & processing tech.
- Simulation and design Technology
- Human resource development and Environmental Improvement for R&D Activities
- Quantum beam utilization
- **Responsible R&D of Nanotechnology**

NANO- and MATERIALS SCIENCE

- Quantum computational tech., clarification and control of interface functions, mechanism clarification of nano-scaled bio-systems, strongly correlated electronics

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Organizations for Nanotechnology Governance



FA: Funding Agency

RI: National Research Institute

CSTP: Council for Science and Technology Policy, MEXT: Ministry of Education, Culture, Sports, Science and Technology, METI: Ministry of Economy, Trade and Industries, MHLW: Ministry of Health, Labor and Welfare, MOE: Ministry of the Environment, NTPT: Nanotechnology Project Team, JSPS: Japan Society for the Promotion of Science, JST: Japan Science and Technology Agency, NIMS: National Institute for Materials Science, NEDO: New Energy and Industrial technology Development Organization, AIST: National Institute of Advanced Industrial Science and Technology, NIHS: National Institute of Health Sciences, JNIOOSH: National Institute of Occupational Safety and Health, Japan, NIES: National Institute for Environmental Studies

5

Main Government Projects for Nano-EHS & ELSI in Japan

- MEXT: Research study on facilitation of public engagement on nanotechnology (2005)
- MEXT: Multi-disciplinary expert panel on societal implications of nanotechnology (2006)
- METI: Standardization of nanoparticle risk evaluation method (2005-)
- METI-NEDO: Risk assessment of manufactured nanoparticles (2006-)
- MHLW: Development of evaluation methods for health impacts of nanomaterials (2005-)
- CSTP Coordination Program of Science and Technology Projects: Developing Nanotechnologies and Engaging the Public (2007 -)
- MEXT-JST-RISTEX: Innovation and Institutionalization of Technology Assessment in Japan (2007-)

6

The 2nd International Dialogue on Responsible Research and Development of Nanotechnology

- June 27-28, 2006, Gakushi-Kaikan, Tokyo
- Organized by Dr. H. Abe (CSTP), Dr. H. Yoshikawa (AIST), and Dr. T. Kishi (NIMS), and moderated by Dr. K. Tanaka (JST, AIST)
- 88 participants from 21 economies and EC (policy makers, academia, expert, private sectors, ...)
- Breakout discussion (facilitator)
 - ◆ EHS (Dr. B. Karn)
 - ◆ ELSI (Prof. A. Rip)
 - ◆ Education and Capacity Building (Dr. T.-K. Lee)
 - ◆ Developing Countries Issues (Dr. T. Pornsinsirak)
 - ◆ Standard Setting (Dr. P. Hatto)



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Issues on Societal Engagement

- **Multi-Stakeholder Communication**
 - ◆ Risk communication without identified risks
 - Neither identified risks nor little scientific data but concerns
 - ◆ Benefits for industry
 - ◆ Thorough and continuous discussion by limited and fixed members and open discussion
 - ◆ Involvement of citizens
 - Little interests and of citizens until benefits and risks become real
- **Comprehensive Technology Assessment**
 - ◆ Framework for ELSI
 - Technological and societal viewpoints and time scale
 - ◆ Development of methodology
 - ◆ Institutionalization
- **International Cooperation**
 - ◆ Activation of international network of social scientists
 - Ex. International Nanotechnology and Society Network

8

Activities on Communication by AIST

Nanotechnology Debate (continuing)

1. Let's talk about precautionary principle (Feb. 01, 2007)
2. How nanotechnology appears in TV and newspaper (Aug. 23, 2007)
3. Better communication for risk and benefit of nanomaterials (Dec. 20, 2007)

Symposium: Future vision and public engagement of nanotechnology

February 5, 2007 @ Toranomon Pastoral

Symposium on nanotechnology R&D strategy

Commercialization and social acceptance of nanotechnology
February 1, 2008 @ Tokyo International Forum

CSTP Coordination Program of Science and Technology Projects

Developing Nanotechnologies and Engaging the Public

Research on database index development for a basis of facilitation of nanotechnology R&D has started in FY 2007.

- Workshop "Promote nanotechnology R&D with attention to social acceptance"
February 14, 2008 @ Tokyo Big Sight Conference Tower

We discuss with diverse stakeholders including public about responsible R&D of core technology which generate benefit for society, appropriate management of technology, and things to do to be accepted in society.

Courtesy to Ata, Ishizu and Sekiya 9



"Innovation and Institutionalization of Technology Assessment in Japan", JST-RISTEX

- Leader: Tatsujiro Suzuki, Univ. of Tokyo
- Organizers: Univ. of Tokyo, NIMS, and others

■ Tasks:

- ◆ Historical Analysis of so-called "TA" activities in Japan
- ◆ Development of an innovative TA methodology
- ◆ **Implementation of TA: Dealing with Nanotechnologies**
- ◆ Recommendations for new TA methodologies and Institutionalization of TA in Japan

10

Nanotechnology Assessment by "Innovation and Institutionalization of Technology Assessment in Japan", JST-RISTEX

■ Selection of Target Nanotechnologies

- ◆ High social needs, clear application, and near commercialization
- ◆ Focusing mainly on 2nd generation
- ◆ Targets in the 1st stage:
 - Medical diagnosis
 - Energy conversion/storage
 - Food processing

■ Cognitive Maps

- ◆ Problem structuring methods

■ TA Panel

- ◆ Step by step approach
- ◆ Involvement of multi-stakeholders

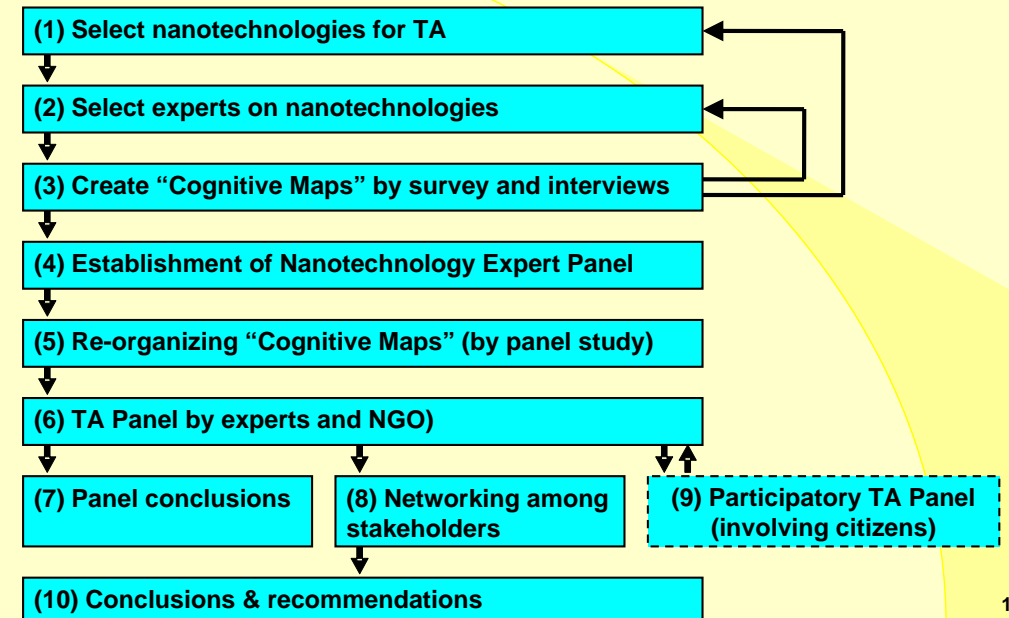
■ Output

- ◆ Lessons for Institutionalization

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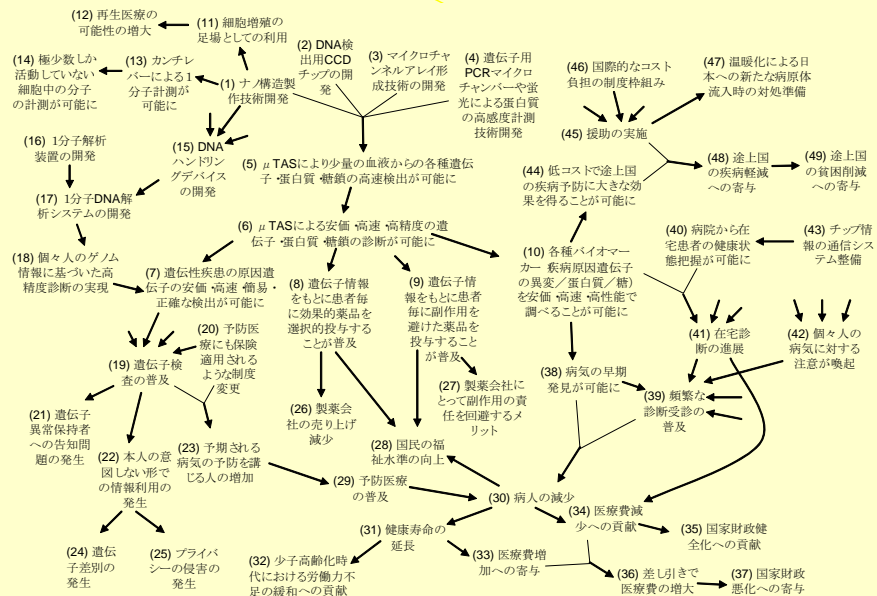
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Nanotechnology Assessment by "Innovation and Institutionalization of Technology Assessment in Japan", JST-RISTEX



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Example of Cognitive Map



Issues on Societal Engagement

Multi-Stakeholder Communication

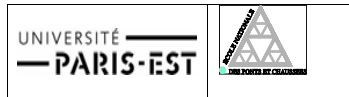
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Comprehensive Technology Assessment

- ◆ Framework for ELSI
 - Technological and societal viewpoints and time scale
- ◆ Development of methodology
- ◆ Institutionalization

International Cooperation

- ◆ Activation of international network of social scientists
 - Ex. International Nanotechnology and Society Network



Nano S&T and society: discussing the engagement of social scientists

Philippe Larédo

Universities of Paris-Est and Manchester

At

Third International Dialogue on Responsible R&D of nanotechnology

Brussels, March 11-12, 2008

The question raised

- Objective: discussing the global networking of social scientists
- A preliminary interrogation: how have social scientists been involved in such arena?
- My understanding of the issue: should there be policy cooperation (as accounted for in sessions 1 & 2)?
- The approach taken: look for 3 major issues highlighted by the recent EC call for an observatory: scientific developments, market unfolding, social impacts

Scientific Developments (1)

- The common wisdom: breakthrough, frontier or transformative science, built upon
 - new equipment to work at the nano level
 - reinforced interdisciplinary work
 - Business as usual? Or
 - new organisations: Mesa+, Minatec...
 - new facilities: e.g. US NNIN, 5 DOE labs...
 - new geographical concentrations?
- > need for research about production situations in nano S&T at the level of labs, organisations and global dynamics

Scientific developments (2)

- What situation for social science research? The example of global dynamics
- In the US NSF centre + nanobank, In Europe, PRIME project agglomerating national investments
 - Exchanges in terms of methods & results, including through winter schools
 - ... and a multiplication of efforts: DOE, European Observatory, OECD programme, plus various national developments
- > Which coordination at stake? Agents only? Or also principals?

Market expectations & unfolding

- Nano to follow bio, with new markets and start-ups? Or more 'nano-enabled' products & markets?
- For Abernathy (1985) 'revolutionary innovations', i.e. radically new ways of designing and producing existing products
- Stakes = potential hidden risks for health & the environment
- Past cases and the mix of scientific controversies, economic & political interests & public (dis)trust
--> need to follow consumer practices
-->do we have more to learn from past cases (e.g. GMO or Asbestos, but also Shell Oil Rig...)

Social Impact (1)

- Only nano-enabled? No, also 'architectural innovations' (i.e. breaking from previous technologies & markets)
- Meaning simultaneous transformations of 'industry' knowledge base, qualities (embedded in standards & norms), and societal values
- Key driver for 'socio-technical shaping' = controversies (major lesson from sciences studies, Latour). Closure drives to robust compromises (Rip) enabling investment.
- Hype = marker of limited closure, with 2 main forms of difficulties

Social Impact (2)

- Difficulties with technological anticipations. See on-going controversy on scenarios on molecular nanotechnology --> need for more research on foresight processes
- Difficulties related to societal dimensions see Callon & Rip hybrid fora (15 years ago) and work on mediations & concerned groups as support for a rich civil society nurturing 'technical democracy'

Social impact (3)

What about Social Sciences?

- An unexpected focus on 'direct' democracy and the self-engineering of new mediations (role of funding agencies?): not very productive (see Stilgoe 2007)
- How to reflect on this? Blair's position? or a wrong assessment of the role of social scientists?
- Role: study emergence and deployment of new collectives & mediations,
- Expectations from society: enhance abilities to analyse situations and problem-solving capabilities

Social Impact (4)

- And social scientists are as other scientists: they can 'change hats' to
 - create start-ups
 - develop consultancy or expertise (in particular collective expertise in scientific committees)
 - develop methods to help actors integrate upstream societal aspects (e.g. SOCROBUST or CTA)
 - jointly participate in the delineation of societal dimensions of a particular issue
- BUT these are two complementary activities. Which require different funding streams.

To conclude

- A presentation of an open on-going debate
- Social scientists at international level: INSN international nanotechnology & society network (37 institutions, 11 countries).
- My objective: highlight the need for research
- My plea: too little attention from policies, furthermore too little coordinated
- My suggestion: policies should be clearer in delineating the two roles of social scientists, and differentiate in their nano-related investments
 - programmes 'for' social sciences,
 - and programmes 'mobilising' social sciences

Nano S&T and Society: Discussing the Engagement of Social Scientists

Philippe Larédo

Universities of Paris-Est and Manchester

Presentation to the session ‘societal engagement’

Third International Dialogue on Responsible Research and Development of Nanotechnology
Brussels, March 11-12

I have been asked to present you “a case study” about the global networking of social scientists

I must say the issue surprised me. It thus drove me to inquire about the involvement of social scientists in such arena for dialogue.

I thus did a small review of the previous meetings and I also screened some recent workshops like these of Helsinki and Brussels on safety.

I was struck by three aspects : (a) there was a significant involvement of non-governmental organisations, (b) there has been quite strong reliance of polls and surveys to speak about future markets or public attitudes or perceptions, and (c) they were very few social scientists involved, and when this was the case, they were less presenting and discussing research results, than accounting for their activity as ‘social engineers’, for instance in developing consensus conferences, focus groups, juries, constructive technology assessments, and other forms of public inquiries.

This reinforced my interrogation: why would one ask, in a session on societal engagement, social scientists to speak about the way social scientists work and network? And not about the issues raised and how they address them, including needs for cooperation and ‘global networking’. Furthermore, for doing, social scientists heavily rely on public funding, and this raises the question of how public programmes include these aspects, and in particular nanotechnology programmes which all include risk and safety dimensions as well as social, ethical and legal dimensions.

For doing this, I have chosen to take the example of one programme, the European Commission one, summarise the main issues it raised and then try and see what has been done and is being done by social scientists and how (and also what is not being done). This will drive me to suggest that programmes have mostly addressed the issue of mobilising social

science, and far less the issue of nurturing new developments and new research by social scientists. The last EC call called for the creation of a « European Observatory », which should be organised around three main issues dealing with scientific developments, with markets expectations and unfolding, and with social impacts.

Before doing this, since I am not familiar with this arena, let me just say a few words about the context from which I make these developments.

- (a) First I am not a specialist on public debate (and all forms of dialogue) though I spent one decade in a lab famous for its work on scientific controversies. My research foci are on breakthrough innovation and on research policies, being a professor both in Paris and Manchester, in two universities that share a similar characteristics, this of resulting from a recent merger, a quite unusual phenomenon in the university landscape.
- (b) I coordinate the EC funded network of excellence on research and innovation policies (PRIME, www.prime-noe.org) that gathers 55 European institutions, over 250 active researchers in its activities. The network has developed links and activities both with our US and Latin American colleagues, while participating to a number of conferences in Japan. The network has developed important activities both on knowledge dynamics (with a specific project on nano sciences and technologies, called nanodistrict) and on multi-actor governance (especially linking with the development of the ERA).
- (c) I also happen to be the chair of the programme committee of the French ANR programme on nanosciences and nanotechnologies, a situation which has made me aware of the difficulties faced by social sciences when dealing with nanotechnology and converging sciences at large. The interested reader can look at the 2008 call and how its sixth priority a-has been framed to nurture new research developments in social sciences¹.

Let me now turn to the three entry points taken.

(1) Scientific Developments

¹ www.agence-nationale-recherche.fr:80/AAPProjetsOuverts?NodId=17&lngAAPIId=156

There is an assumption that we face ‘breakthrough’ or ‘frontier’ or ‘transformative’ science which drives to ‘convergence’. For nano researchers, working at the nano level would thus mean new types of equipment and new forms of interdisciplinarity. This might have strong consequences for institutional arrangements and policies.

Is it interdisciplinarity business as usual ? or does it require new organisational arrangements ? Why for instance did the University of Twente merge previous separated faculties in one institute, Mesa + ? Why did CEA and INPG (later followed by CNRS and University Joseph Fourier) join forces in Minatec ?

Do researchers simply add AFM or STM microscopes at their bench ? or do we need new ‘technology platforms’, and this not only in nanoelectronics ? The two cases mentioned above are good examples of this, but the 5 DOE labs or the NNIN initiative between 13 US research universities are illustrations of such transformations.

And do such new modes of production have an impact on the location of research activities in one country or worldwide, a clear topic of interest for this dialogue ?

This means that the study of transformations in the production of ‘nano-related’ scientific and technological knowledge is a clear focus of research, both at the micro level of working practices, at the meso level of organisations, and at the more macro level of global dynamics and their potential implications for policy.

This latter level is interesting to review for meeting discussing the coordination of public policies. Both in the US (with the NSF centre and with the nanobank developments) and in Europe (mostly within PRIME, nanodistrict project,² which links EU support from with funding from national programmes, in France, The Netherlands, Finland, Italy or Israel just to mention a few), there are on-going developments and exchanges between both spaces (classical ones through conferences but also through a recent winter school we organised). And initiatives multiply with DOE in the US, the above-mentioned observatory at EU level, or the OECD working party, notwithstanding a number of other national developments.

This is, as mentioned by F. Roure in her keynote speech, a clear case where it would be probably interesting that funding agencies confront what they do, coordinate their effort and push for more trans-country cooperation.

(2) Market expectations and unfolding

After biotechnologies, many policies have assumed that nanotechnology would follow a similar path based on breakthrough markets and start-up firms. Is this the case ? One can doubt it when

² for its development, see nanodistrict.org, for the first main results, see the special issue of Research Policy on emerging nanotechnologies (vol 36, issue 6, July 2007)

one looks at ‘nano-enabled’ products on the market, as illustrated by the presentations from BASF.

This opens a wide range of issues about what Abernathy (back in 1985 in a beautiful article called after Schumpeter, the winds of creative destruction) called ‘revolutionary’ innovations, that is radically new ways of designing and producing existing products.

Here the classical relationships with users about the functionalities of products are not relevant for coping with change. What is at stake, we were told when discussing nanoparticles, lies in potential hidden risks for health or the environment. This conference is a marker of the growing importance given to procedures guarantying worker and consumer safety.

Yet, we are faced with rather classical issues about technology assessment and the limitations of after-the-fact approaches. We know from past cases how difficult such issues can be, taken in between scientific controversies about health or environmental impacts, economic and political interests, and consumer trust (and more often distrust) in information provided (even by public authorities). Have we a good vision of on-going developments ? This is not sure if I look at the few on-going studies made on consumers’ perceptions and practices. Have we fully learnt from past cases? GMO and Asbestos are cases in point, but there has been many others from which to learn (for instance the Shell Oil Rig in the 1990s). History becomes a resource to take distance (as recalled by Dominique Pestre in his recent work for the EC group on convergence). Here is for me a clear case where programmes take too many things for granted and where it is important to develop research that will help to better delineate problems.

(3) Social impacts

Are nano-enabled products and markets the sole direction? Clearly no, told us M. Rocco in his introductory lecture. Abernathy then spoke of ‘architectural innovations’, that is innovations that break both from previous technologies and from previous uses.

Studies have shown that such innovations entail transformations not only on our agreed knowledge base (as our guest, R. Tomellini, and the previous speaker, M. Takemura, come from Steel research, I do not resist to recall how difficult it has been to change the received wisdom about how much coal could be injected in blast furnaces, a beautiful comparative analysis made between France and Japan by one of my ex-PhD students, E. Jolivet), but also on the definition of relevant qualities (and corresponding norms and standards, including safety) and on the societal values they embed (remember the exemplary case of Edison and city lighting, where the invention of the incandescent bulb went with arguments about safety and hygiene in the city of New York).

It has been one central lesson from science studies to show that all these innovations were both technically and socially shaped, and, as brilliantly demonstrated by Bruno Latour and Arie Rip,

and that the key driver for this socio-technical shaping lied in controversies, which, once closed, offer « robust » and lasting compromises which are a central resource for deploying investments. Hype phenomena with their ups and downs are good illustrations of the difficulty to arrive at robust compromises.

Sometimes these difficulties deal with technology anticipations. We have a good case on-going with molecular nanotechnology. The recent controversy about the scenarios made by the « center for responsible nanotechnology » is there to tell us that anticipatory exercises can be problematic, that engineering hype is a normal dynamics that has also to be carefully scrutinised. Under which conditions can then anticipatory exercises feed the policy or strategy making process ? Such questions explain why we witness a rapid growth of an academic community dealing with foresight. And they should probably drive public programmes to develop specific reflections on conditions of robustness of scenarios used, a typical issue for international collaboration.

More often these difficulties are related to societal dimensions. Callon and Rip, more than 15 years ago, coined the term « hybrid fora » to qualify these arenas that are central for establishing compromises, and which gather heterogeneous actors coming with very different types and sources of knowledge. Work done then also highlighted the fact that, as for representative democracy, users or citizens concerned seldom express themselves directly but through the building of ‘concerned groups’ which would act as ‘spoke persons’. And that is was important to consider the key role of these ‘mediations’ in the construction of a rich civil society and as a central aspect of what Callon has termed ‘technical democracy’.

This is a central issue for what we are discussing in this meeting. One would have expected that social scientists would have focused on the study of these mediations, on the emergences of specific social groups, on the growing role of NGOs, and the ways they gain legitimacy and involve themselves in the democratic debate and in policymaking processes. However many social scientists have taken an unanticipated route. Rather than studying existing mediating bodies and processes, colleagues have tried, often pushed by public programmes (see for instance the NSF call for centres on nanotechnology and society), to develop new forms of mediation by shaping citizens juries, or, like Demos and our colleagues from Lancaster and Durham, testing novel forms of ‘nanodialogue’. I join the conclusions of John Stilgoe when reflecting on this experience. Though it drove to unusual dialogues, it did not prove very fruitful, as has been the case of most other experiences I know of.

What to conclude from this ? It does not reduce the need or will of citizen involvement in the shaping of policies that engage the future. We (I use we to signify the citizens of a given society) on the contrary, should anticipate that in the type of knowledge society Europe is aiming at, this need will be growing. It simply says that we should not mix all situations. Social

scientists are not there to ‘conduct’ or ‘produce’ mediations, or to say it differently to make participatory democracy work. They are there to study its deployment, develop understanding about how new collectives emerge, how new organisations become legitimate in discussing certain issues, how new fora are shaped and under which conditions they are performative or become productive, etc. And what we, as members of a given society, can expect from them, social scientists, is, rather than providing solutions, that they enhance our abilities to analyse situations and our problem-solving capabilities.

Of course social scientists do and should involve themselves in on-going dialogues. But they do this like hard or life scientists do, change hat and create companies or act as consultants or experts, especially in the numerous expert groups or scientific committees established by public authorities. They can also try and develop methods and processes that can help actors integrate upstream societal dimensions (see for instance the EU funded SOCROBUST project³ or the work done by A. Rip and colleagues to develop CTA approaches that researchers can embed in their own programmes or projects⁴). In a way one can interpret this as the applied part of social science research. But, as both roles are not confused when discussing academics that create start-ups, they should not also for social scientists.

What I present here is an open debate that is for instance very visible in the way the « international nanotechnology and society network » has been established. INSN gathered beginning of 2007 researchers from 37 institutions from 11 countries. The network aims both to advance knowledge et promote institutional innovation that can improve anticipatory governance.

Let me now conclude.

Taking the three entry points proposed by the Commission, I have tried to show that it is important to ask social scientists to involve themselves in nano technology developments and debates, and to participate jointly with other scientists, policymakers or societal groups in the delineation of societal dimensions and potential social effects.

But that this is not enough. The development of nano sciences and technologies require a deeper understanding of on-going processes and pose conceptual questions that require ‘fundamental’ academic research.

This has strong implications about the shaping of policies and programmes. And here let me conclude by taking my hat of president of a national programme committee.

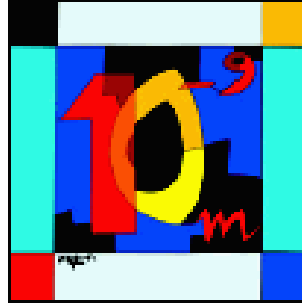
I recognise that the involvement of scientists is critical. But I fear that it will be productive only if it is nurtured by more academic research for the development of new conceptual frameworks and

³ www.createacceptance.net/fileadmin/create-acceptance/user/docs/Socrobust_final_report.pdf

⁴ www.nanoned.nl/TA/

theories. And I fear that we have too little of the latter type of projects, and even more limited organised collaboration between funding agencies.

This is why I suggest to differentiate in nanotechnology programmes, programmes 'for' social sciences and policies 'mobilising' social sciences.



SPECIAL LECTURE

Progress achieved in China on responsible development of nanotechnology,
Chen WANG (China)



Progress of Responsible R&D on Nanotechnology in China

Chen Wang

National Center for NanoScience and Technology, China
Beijing 100190, China
2008-3-12



Outline

1. Research Framework and Policy
2. Research Activities in Environment, Health, and Safety (EHS)
3. Progress of Nanostandardization in China
4. Interaction with the Society



Outline

1. Research Framework and policy

2. Research Activities in Environment, Health, and Safety (EHS)
3. Progress of Nanostandardization in China
4. Interaction with the Society

Governmental Nanotechnology Policy

A Strategic Approach at the National Level to Find New Industrial Applications for This Technology--- NanoBio and Nanodevice

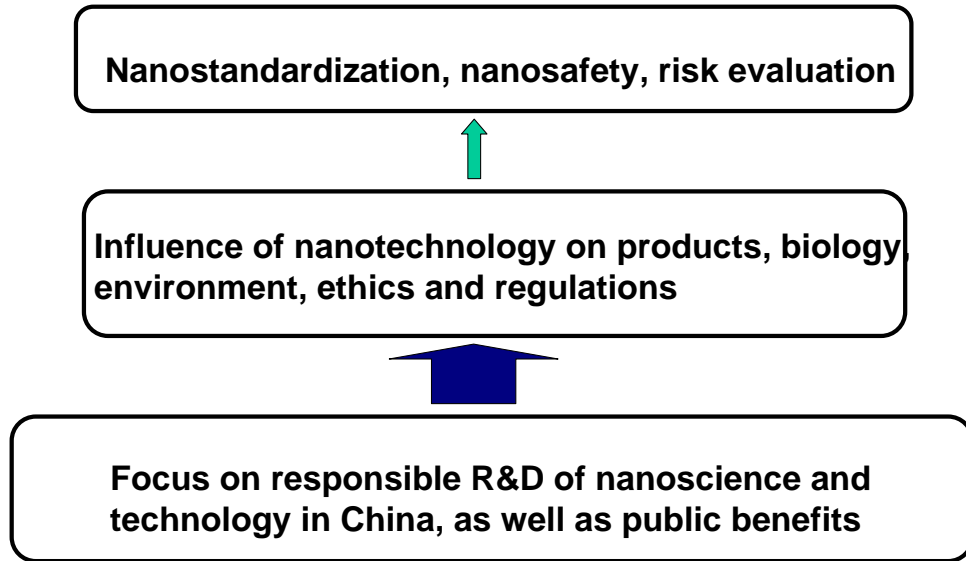


Nanotechnology for Improving Traditional Products-Nanomaterials, Nanocomposites

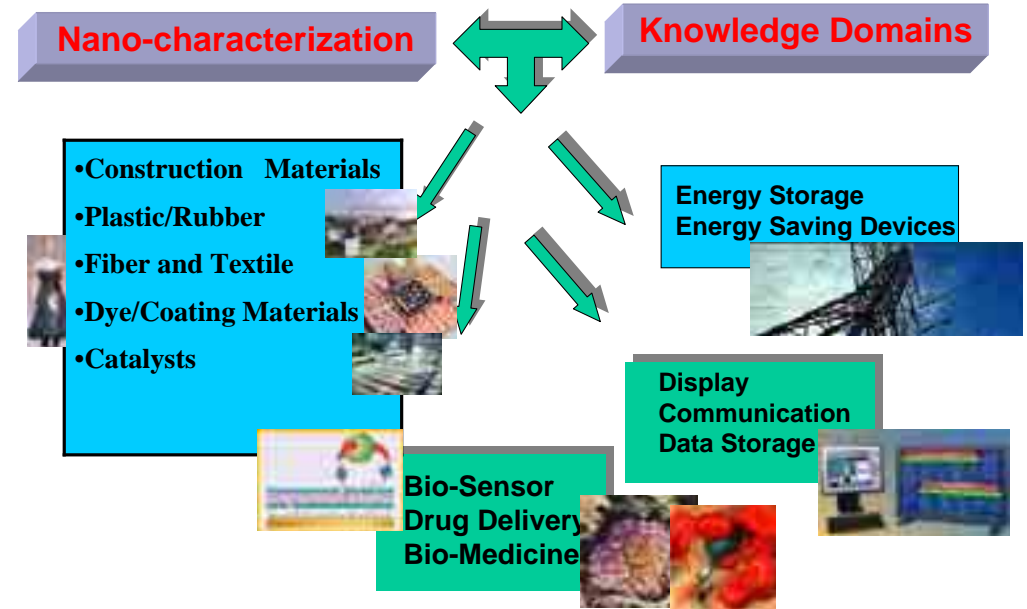


Enhance the Basic and Applied Research to Increase the Creative Ability and Form Creative Systems for Long Term Progress of NanoScience and Technology in China

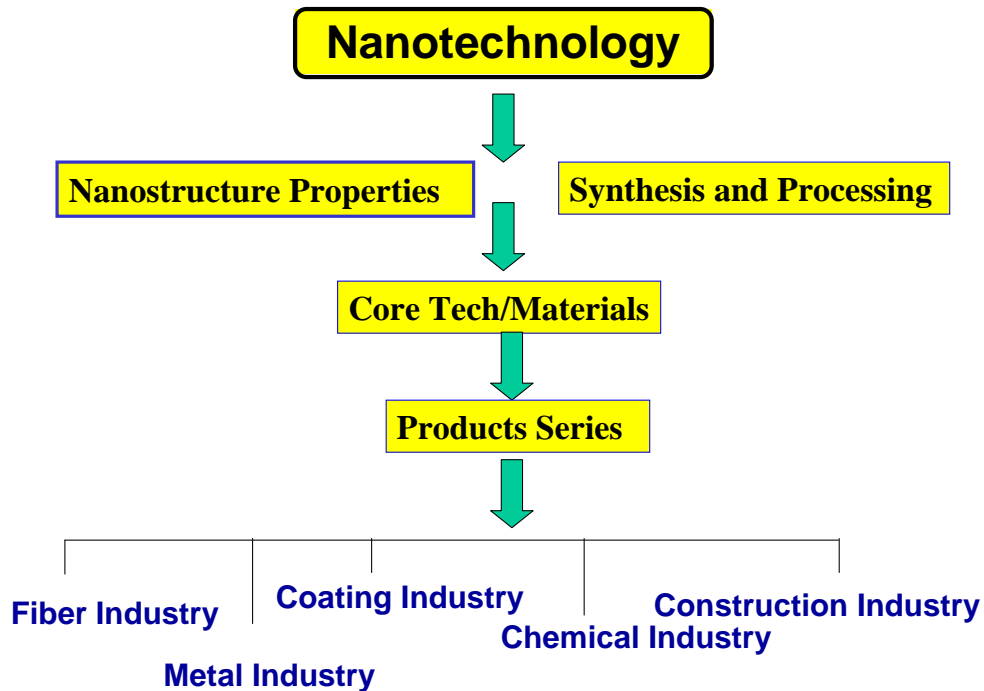
Governmental Nanotechnology Policy



Main Industrial Applications of NanoTech



Improving Traditional Industries

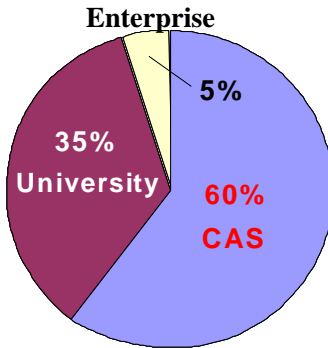


Commercialization in China

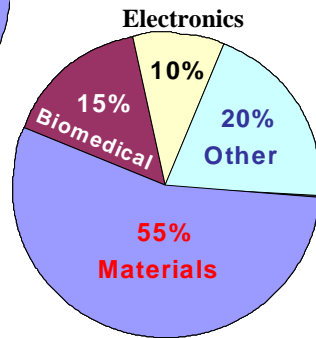
- Until the end of 2006, there are more than 800 Nanotech. enterprises and 120 institutions involved in Nanotech.
- Main Products are nanopowders of oxides, metals and their applications, such as coatings, fibers, papers, ceramics, catalysts etc.

R&D Distribution in China

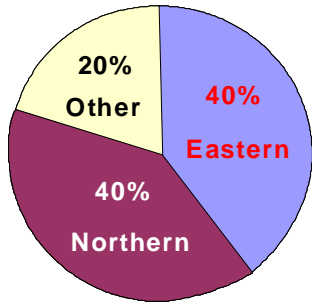
R&D Distribution by Institutions



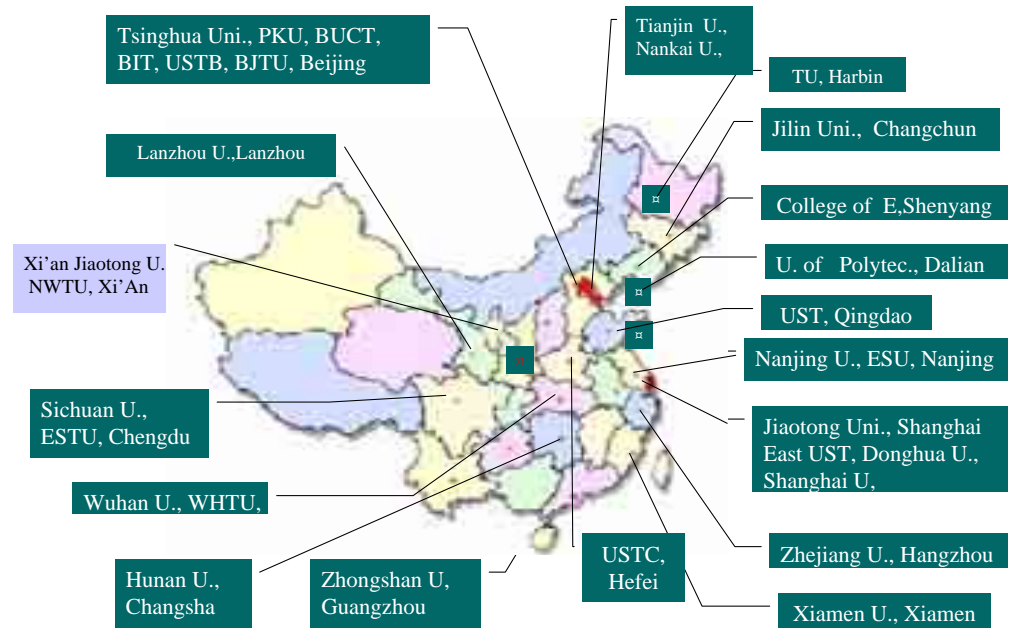
R&D Distribution by Applications



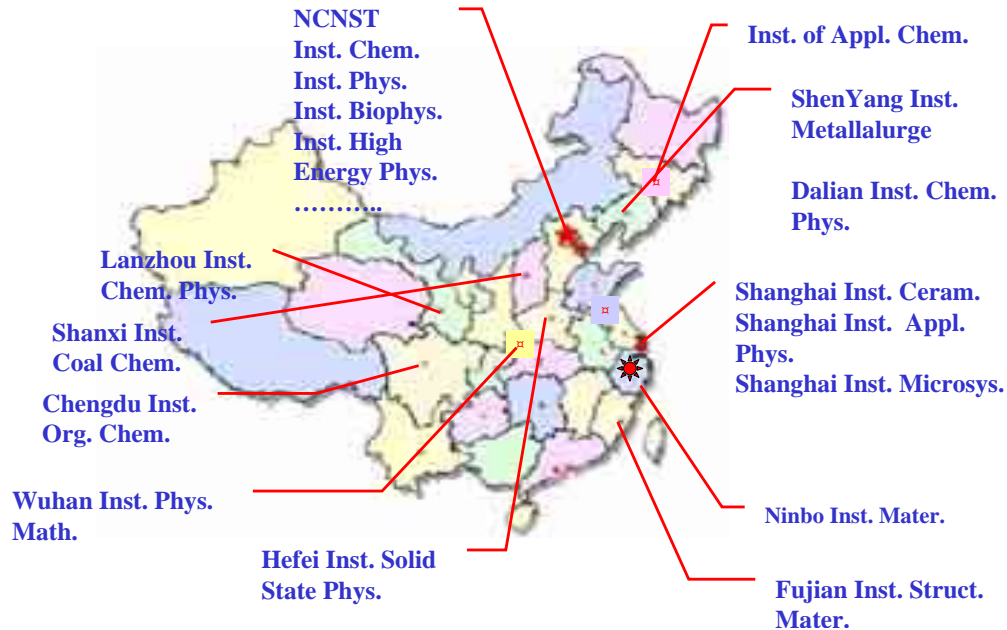
R&D Distribution by Region



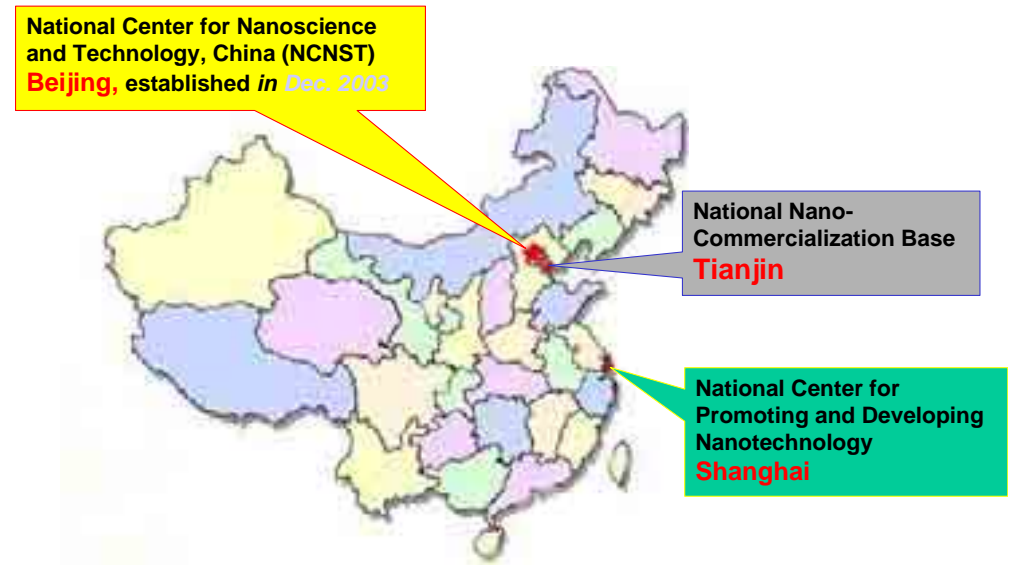
Most Competent Universities in Application of Nano Tech & Materials



Institutes of CAS engaged in nanoresearch (~30)



National Centers for Nanotechnology in China



Working with International Communities

- Observer to OECD's WPMN, WPN
- Observer to VAMAS, TWA 29 on Nanotechnology
- Bilateral collaborations

Outline

1. Research Framework and Policy
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Environment, Health and Safety Research in China

NSFC	Basic research: environmental effects of nanoparticles; nanoparticles in air pollution; water purification; nanoscale processes in the environment ;
MOST	Toxicology of manufactured nanomaterials; Fate, transport, & transformation in human body; Human exposure and bioavailability; Transport & transformation of nanoparticles in the environment, exposure & risk analysis;
CAS	"Safety Issues of Nanomaterials in Their Applications" has also been approved by the CAS Knowledge Innovation Program in 2006.
MoE	Potential toxicity of nanomaterials, Transport & transformation of nanoparticles in the environment.
MoH	Risk assessment of manufactured nanomaterials in working place.



2004



National Nature Science Foundation of CHINA

In 2004, NSFC launched a 5-year major project supporting the study on the toxicological effects of carbon nanomaterials.

NCNST 國家納米科學中心 2006



National Nature Science Foundation of CHINA

NSFC's 11th Five-Year Plan

Major Project:

Environmental activity and Health impact of ambient superfine particles (2006-2010)

During 2005 and 2006, several free applications have been approved to study the ecological and environmental impacts of nanomaterials.

NCNST 國家納米科學中心 2006

National Key Basic Research Program of China (973 Program)

Health and Safety Impacts of Nanotechnology: Exploring Solutions (2006-2010)

- Contract No: 2006CB708600
- Approved by the Ministry of Science and Technology of China (MOST)
- Support: 3.2 M USD
- Core Lab: China Nanosafety lab.



NCNST 國家納米科學中心

Established the specific Lab for Nanotechnology EHS issues

- 2001, initiated the study on EHS issues of manufactured nanomaterials/particles,
- 2003, established Lab for Bio-Environmental Health Sciences of Nanomaterials, in IHEP, CAS
- 2005, Joint Laboratory for Biological Effects of Nanomaterials and Nanosafety (NCNST-IHEP). (Briefly, China Nanosafety Lab)

National Center for NanoScience and Technology , China (NCNST)
Institute of High Energy Physics (IHEP), Chinese Academy of Sciences (CAS)

Participating EU project

- PHIME=Public Health Impact of long-term, low-level Mixed element Exposure in susceptible population strata (FOOD-CT-2006-016253, 2006-2011)**
- Integrated Project within EU's FP6 (Food quality and safety)
 - Merged with PHIMETTC (Targeted Third Countries)
 - Time: 25 February, 2006 – 2011
 - EU budget 13.4 MEUR

Existing Governmental Regulations in China



2003: Environmental Regulations for New Chemical Substance

Outstanding concerns:

Toxicology and ecotoxicology of artificial nanomaterials

US: Toxic Substance Control Act (TSCA)

Codes of Conduct for Responsible Nanoscience and Nanotechnology Research

Outline



1. Research Framework and Policy

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3. Progress of Nanostandardization in China

4. Interaction with the Society

Aspects of nano-standardization



- Production stage
- Characterization
- Processing and handling
-
- Products

● Working Group for Nanomaterial Standardization(2003.12)

● 2005-06-20 National Technical Committee on Nanotechnology of Standardization Administration of China (SAC/TC279):

Sub-committee on nanomaterials
Working groups on SPM

Micro\nano fabrication
Nanoindentation testing
Health, safety and environment



Nanotechnology Standards of China				
Serial Number	Number	Title	Published	Identical or Modified to ISO (IEC)
1	GB/T 18735-2002	General specification of nanometer thin standard specimen for analytical transmission electron microscopy (AEM/EDS)	2002	None
2	GB/T 19345-2003	Amorphous and nanocrystalline soft magnetic alloy strips	2003	None
3	GB/T 19346-2003	Measuring method of magnetic properties at alternative current for amorphous and nanocrystalline soft magnetic alloys	2003	None
4	GB/T 13221-2004	Nanometer powder—Determination of particle size distribution—Small angle X-ray	2004	ISO/TS 13762:2001,MOD Particle size analysis -- Small angle X-ray scattering method
5	GB/T 19588-2004	Nano-nickel powder	2004	None
6	GB/T 19589-2004	Nano-zinc oxide	2004	None

Nanotechnology Standards in China				
Serial Number	Number	Title	Published	Identical or Modified to ISO (IEC)
7	GB/T 19591-2004	Nano-titanium dioxide	2004	None
8	GB/T 19619-2004	Terminology for nanomaterials	2004	None
9	GB/T 19590-2004	Nano-calcium carbonate	2004	None
10	GB/T 19587-2004	Determination of the specific surface area of solids by gas adsorption using the BET method	2004	ISO 9277:1995,NEQ Determination of the specific surface area of solids by gas adsorption using the BET method
11	GB/T 19627-2005	Particle size analysis-- Photon correlation spectroscopy	2005	ISO 13321:1996, IDT Particle size analysis -- Photon correlation spectroscopy
12	GB/T 20307-2006	General rules for nanometer-scale length measurement by SEM	2006	None
13	GB/T 20099-2006	Sample preparation-Dispersing procedures for powders in liquids	2006	ISO 14887:2000,IDT Sample preparation -- Dispersing procedures for powders in liquids

Other Chinese Standards Related to Nanotechnology				
Serial Number	Number	Title	Published	Identical or Modified to ISO (IEC)
1	GB 11847-1989	Determination of specific surface area of uranium dioxide powder by multipoint BET method	1989	None
2	GB/T 13390-1992	Metallic powder—Determination of the specific surface area—Method of nitrogen adsorption	1992	None
3	GB/T 17507-1998	General specification of thin biological standards for X-ray EDS microanalysis in electron microscope	1998	None
4	GB/T 12334-2001	Metallic and other inorganic coatings--Definitions and conventions concerning the measurement of thickness	2001	ISO 2064:1996 IDT Metallic and other inorganic coatings -- Definitions and conventions concerning the measurement of thickness
5	GB/T 18873-2002	General specification of transmission electron microscope(TEM)-X-ray energy dispersive spectrum(EDS) quantitative microanalysis for thin biological specimens	2002	None
6	GB/T 18907-2002	Method of selected area electron diffraction for transmission electron microscopes	2002	None

Other Chinese Standards Related to Nanotechnology				
Serial Number	Number	Title	Published	Identical or Modified to ISO (IEC)
7	GB/T 10722-2003	Carbon black—Determination of total and external surface area by nitrogen adsorption	2003	None
8	GB/T 19921-2005	Test method of particles on silicon wafer surfaces	2005	None
9	GB/T 19922-2005	Standard test methods for measuring site flatness on silicon wafers by noncontact scanning	2005	None
10	GB/T 19077.1-2005	Particle size analysis-Laser diffraction method	2005	ISO 13320-1:1999,MOD Particle size analysis -- Laser diffraction methods -- Part 1: General principles
11	GB/T 6524-2003	Metallic powders—Determination of particle size distribution by gravitational sedimentation in a liquid and attenuation measurement	2003	None
12	GB/T 20170.1-2006	Test methods for physical characters of rare earth metals and their compounds--Determination for particle size distribution of rare earth compounds	2006	None
13	GB/T 20170.2-2006	Test method of physical characters of rare earth metals and compounds—Determination on specific surface area of rare earth compounds	2006	None

Involvements of International Standardization Activities



Chinese proposals of nano-standards to following ISO/TCs

- **ISO/TC201/SC9**
- **ISO/TC229**
- **ISO/TC229/WG2**
- **ISO TC24/SC4**

Activity of International Standardization in China and International Collaborations

- **ISO/TC229 Prof. Dianhong Shen, member of the Chairman's Advisory Group (CAG) Task Group (TG) on materials specifications**
- **ISO/TC229/WG4 NWI Prof. Liming Wang, on specifications for nanoTiO₂ and nano CaCO₃**
- **ISO/TC201/SC9 Prof. Huang Wenhao to prepare a final WD on “Standards on the definition and measurement methods of drift rates of SPMs” by 2008-08-31**

Activity of International Standardization in China and International Collaborations

- **ISO/TC229/WG2 NWIP Dr. Chunying Chen Technical Specification; Use of neutron activation analysis (NAA) and inductively coupled plasma-Mass Spectroscopy (ICP-MS) in the Elemental analysis of Carbon Nanotubes (CNTs)**
- **ISO/TC24/SC4(Committee - Particle Sizing by Methods other than Sieving) WG10 Small angle X-ray scattering method.**
 - Dr.Weiguo Chu attend ISO/TC24 meeting in New Orleans, Louisiana, USA on 6, 7 March, 2008 to modify ISO/TS 13762:2001)Nanometer power-Determination of particle size distribution-Small angle X-ray scattering method.

Japan NEDO Grant

- Japan NEDO Grant Project
- "INDUSTRIAL STANDARD DEVELOPMENT" 05IS128.
- Title is "ISO Standardization for precise morphology measurement of nano-materials by AFM"

Outline



1. Research Framework and Policy
2. Research Activities in Environment, Health, and Safety (EHS)
3. Progress of Nanostandardization in China
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Main activities:



- Organized academic conferences on nanotechnology and nanoscience
- Held nano-technology and products exhibition
- Open Day for nanotechnology research laboratory

NCNST 中国科学院纳米科学中心
International Conference on Nanoscience & Technology,
ChinaNANO 2005

Over 660 registered representatives attended the convention, above 300 attendees from more than 40 countries and regions participating in this conference, and conduct academic exchange on 9 dedicated topics.

Topic: Nanomaterials and preparation, self-assembly technology, nanoelectronics devices and nanophotonics devices, nanobiotechnology and nanomedicine, characterization and measurement of nanostructures, computation and modeling at nanoscale, consumer nanotechnologies and applications, converging technologies-NBC, nanocomposites and nanomechanics.

ChinaNANO2007
June 4-6, 2007, Beijing, China

ChinaNANO2007
International Conference on
Nanoscience & Technology, China 2007
June 4-6, 2007, Beijing, China

Organized by:
NCNST
Sponsored by
National Steering Committee for Nanotechnology

Supported by:
Ministry of Science and Technology of China
Ministry of Education of China
National Natural Science Foundation of China
Chinese Academy of Sciences
China Association for Science and Technology

Website:
<http://www.chinanano.org>
<http://www.nansctr.cn>

● Sub conferences:

- nanoscale materials and structures
- self-assembly and growth on surfaces
- nano-optics and nanophotonics
- nanoelectronics and NEMS
- nanobiology and nanomedicine, computation and modeling,
- Nanometrology

Conference participates:

Over 1000 registered representatives coming from more than 40 countries attended this meeting, with 5 plenary speeches, 33 invited speeches and over 1000 posters.



- Nano-technology exhibition–communication with industry - academia - public

National nano-materials technology products exhibition (2004-05-15-22)

-Organized by the Ministry of Science and Technology and National Nanotechnology Science Center.

It is one of the biggest exhibition of Nano-technology development in China, is also the first time a nationwide nano-materials technology products exhibition. A total of more than 100 exhibitors.



Exhibition content

- nano-electronic materials
- bio-nano-materials
- nano-materials
- nano-energy materials
- nano-structural materials
- special functional materials



Other Nationwide Nano- exhibitions

- 2005 China (Shanghai) International Nanotechnology and Application Exhibition and Seminar 2005-06-13-15 Shanghai
- Fourth National Nanomaterials and Technology exhibition 2005-09-18 Shangdong, Yantai
- 2005 China (Zhejiang) Nano-technology and New Materials Application Expo Dec.07-11,2005, Hangzhou
- 2007 The 6th China International Nanotechnology (Chengdu) Seminar and Exhibition of Nano-technology Nov. 20-22, 2007, Chengdu



●Open Day for Nanotechnology Research Laboratory



- National Center for Nanoscience and Technology and other research laboratory in Chinese Academy of Sciences have OPEN DAY program.
- Every year, laboratories will open one day for public, specially for university students, secondary school students and primary school students.
- Public and students will be invited to visit laboratories and can communicate with scientists in the laboratories.

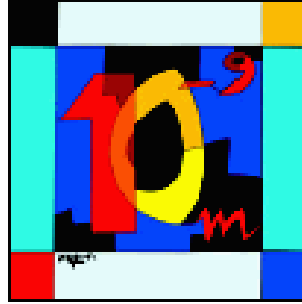


Facilitate public understanding and education to young people



Thank you for your attention!

And welcome to Beijing!



ROUND TABLE 3

WHAT WE HAVE LEARNT FROM THE DIALOGUE WITH THE PUBLIC

Evonik, IRGC, L'Oréal, NIA.

Dialogue as integral part of responsible nanotechnology

Dr. Markus Pridöhl
Coordinator Nanotechnology

markus.pridoehl@evonik.com
www.evonik.com/nanotechnology



Evonik's strategy to Safe, Integrated and Responsible Nanotechnology



Safe products are the foundation for our success



1. **Business Task Force** Nanotechnology
2. Precautionary **measurement program** of nanoparticles at the workplaces
3. **Research projects** and health studies, i. e. disintegration of agglomerates in lung fluids, size in-dependent health effects of zinc oxide
4. Engagement in publicly **funded research projects** on safety in Germany, EU and USA
5. Involvement in national and international **committees and programs**, e. g. VCI, CEFIC, ACC, SUSCHEM, BIAC, OECD, DIN, ISO, ASTM, ANSI, EPA....
6. **Information** for employees, stakeholders and society
7. **Dialogue** with stakeholders
8. **Dedicated resources**
9. Comprehensive **web site** on responsible nanotechnology
10. **Company policy** on nanotechnology

Measures for safe, integrated and responsible nanotechnology



- **Financial support**
 - EuroNanoForum 2005, Nanotechnology and the Health of EU citizens in 2020; Study
 - "Sustainability effects of nanotechnology", IöW Berlin
 - conference ISO TC 229 Berlin 2007
- **ECOSENSE Nanotechnology— small big future**, Apr 05, Berlin
- Evonik's **Policy Workshops** on Nanomaterials, Brussels, 2006, 2007
- VCI **stakeholder dialogue** on „workplace safety“, 2005 and 2007, Frankfurt
- German **consumer conference**
- VCI **stakeholder dialogue** on safety data sheets 2008
- Brochures **Risk communication in Nanotechnology**
- **BMU NanoDialogue** of the German Ministry for Environment
- **NanoCap**
- www.evonik.com/nanotechnology and related **brochure**

Nano-Dialogue of the German Ministry for Environment (BMU)



Objective

- Rationale discourse through information and involvement

Structure

- **Steering group**, Chairman former State Secretary Catenhusen
- **3 working groups with 18 stakeholders from industry, science, governmental bodies, NGOs**
 - **Chances for Environment and Health**, chair Dr. Buller, Fraunhofer Friends of the earth, consumer association Germany, ...
 - **Risks and safety research**, chair Prof. Gleich, Uni Bremen Friends of the earth, consumer association NRW, BBU,
 - **Guideline for responsible handling of nanomaterials**, chair Dr. Wiegand, Evonik Friends of the earth, consumer counsel DIN, NanoCap,

Status

- Kick-Off March 2007
- Interims report Feb 21st, 2008
- Final results Nov 2008





Technology

Evonik's specialist knowledge in the field of nanotechnology focuses on nanostructured materials. Building on many years of experience with such materials, we are now working to utilize nano-technology-driven processes, products, processes and business activities. [More](#)



Research

However, studies and research projects throughout Evonik are dedicated to developing new products and efficient system solutions based on nanotechnology. That is part of our contribution to sustainable development. [More](#)



Responsibility

Evonik gives top priority to responsible handling of new technologies. Our policy on nanomaterials therefore sets out how we protect employees, customers and consumers in the production and use of nanotechnology materials. [More](#)



Ethics

Evonik actively encourages open dialogue about the risks as well as the benefits of nanotechnology. We intend to help society understand this new technology. [More](#)

Launched Jan 2007



Foreword

Evonik Industries is pleased to welcome you to the foreword of the brochure 'Dialogue and Information' on nanotechnology. This brochure is a result of our commitment to transparency and open communication with our stakeholders. It is a result of our commitment to responsible handling of new technologies. We intend to help society understand this new technology. [More](#)

What is Nanotechnology?

Nanotechnology is a general term for a wide range of very different technologies and materials. This document focuses on the opportunities and benefits of nanotechnology in the areas of medicine, agriculture, energy and information technology.

Opportunities And Benefits

Evonik actively encourages open dialogue about the risks as well as the benefits of nanotechnology. We intend to help society understand this new technology. [More](#)

Nanotechnology In Everyday Life

Nanotechnology is already being used in a variety of ways. Evonik is committed to responsible handling of new technologies. We intend to help society understand this new technology. [More](#)

Dialogue And Responsibility

Protecting the health of its employees and customers and a responsible attitude to the environment are integral to Evonik's business. Evonik Industries only produces and markets nanomaterials if the latest available research shows they can be manufactured and applied in a safe and environmentally compatible manner.



Questions show high interest and urgent need for basic information

NanoCap

- **Acronym**



Capacity Building
for NGO's in Nanotechnology

- **Granted by**



Directorate General Research
European FP6 programme Science and Society

- **Objective**

Discuss and deepen the understanding of NGOs and trade unions on

- - Environmental issues
- Occupational health and safety issues
- Ethical issues
- Critical assessment of benefits

Period Sept 2006 – August 2009

*Visit at Evonik production site
Feb 27th 2008*

„We like to thank you again for an excellent organisation of our visit to Evonik.

For all of us the presentations and the visit to the Aerosil production site had different important learning moments, which will get a place in the formulation of the positioning on nanotechnology of the NGOs and trade unions.

We will report about our visit to the rest of the NanoCap group and of course we will mention it in our report to the European Commission.“

Conclusions from Nanologue

Frame the dialogue (vision)

Inform the dialogue (feed in new results)

Open up the dialogue (transparency)


Check the societal impact of NT products

Focus dialogue (not generic)

Communicate the dialogue

- Internet
- Museums
- target journalist and media with benefits and risks






Dr. Antje Grobe, University of Stuttgart
Scientific Adviser
International Risk Governance Council,
Geneva

Disclaimer: The views expressed in this presentation are personal and may not necessarily reflect those of the IRGC


Nanotechnology Risk Governance



1. Framing The Applications And Issues Of Nanotechnologies
2. The IRGC Risk Governance Model
3. Conclusions For Stakeholder Dialogues and Public Participation

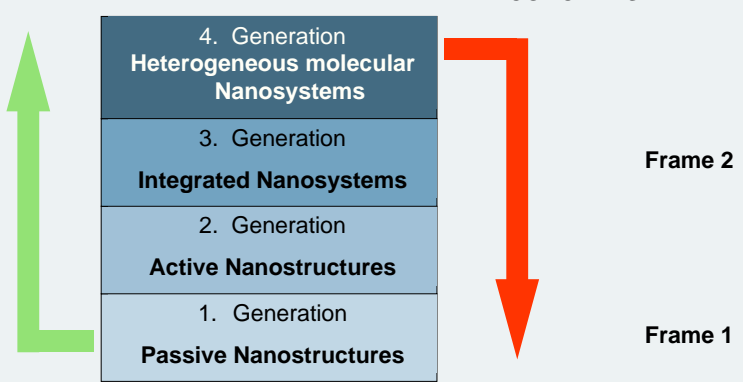
3rd International Dialogue on Responsible Research and Development of Nanotechnology, Brussels, 12 March 2008 Dr. Antje Grobe Nr. 2

4 Generations of Nanotechnology



IN PUBLIC PERCEPTION


EXPECTATIONS **CONCERNS**



4. Generation Heterogeneous molecular Nanosystems	Frame 2 Frame 1
3. Generation Integrated Nanosystems	
2. Generation Active Nanostructures	
1. Generation Passive Nanostructures	

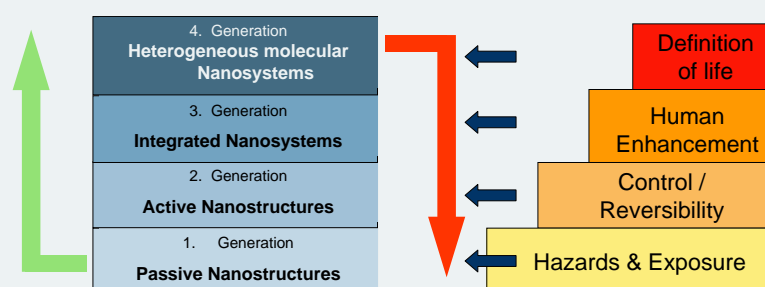
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4 Generations of Nanotechnology ...



and the need for risk assessment and risk communication

EXPECTATIONS **CONCERNS**

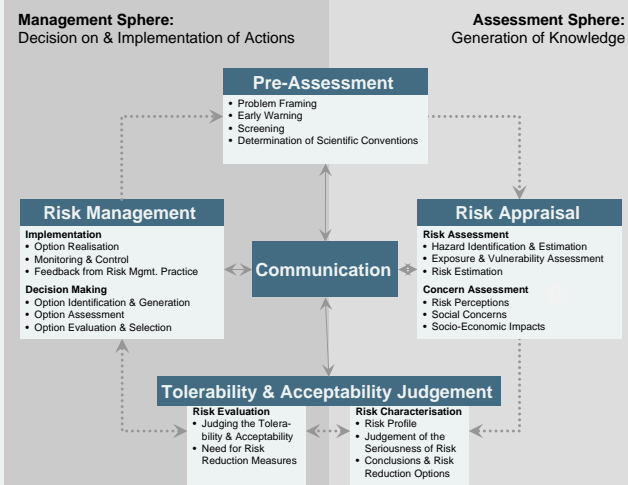


4. Generation Heterogeneous molecular Nanosystems	←	Definition of life
3. Generation Integrated Nanosystems	←	Human Enhancement
2. Generation Active Nanostructures	←	Control / Reversibility
1. Generation Passive Nanostructures	←	Hazards & Exposure

Good Governance: Transparency, Efficiency, Accountability, Sustainability, Equity and Fairness, Legal Feasibility, Ethical Acceptability

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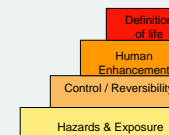
Risk Governance Model (White Paper 2006)



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Conclusions

- Necessities for a Step-by-Step Dialogue Approach on:
 - Different applications
 - Different issue frames and levels
 - Different time frames between stakeholders
 - ... with a “need for speed”
- Strengthen Stakeholder Dialogues and Public Participation
 - Create transparency on benefits and risks
 - Reflect Diversity: on international, national and local level
 - Listen!
- IRGC: International, neutral stakeholder platform with expertise in risk governance and participation on nanotechnologies



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Outlook

- IRGC Workshop on Nanotechnologies in Food & Cosmetics 28/29 April, Zurich

international risk governance council

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Geneva - Switzerland
tel +41 (0)22 795 17 30
fax +41 (0)22 795 17 39
info@irgc.org
www.irgc.org

Thank you!

antje.grobe@sowi.uni-stuttgart.de

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NANOTECHNOLOGY : TAKING CARE OF THE PUBLIC'S CONCERNS AND EXPECTATIONS

Francis Quinn

L'Oréal

12 March 2008

WHO IS THE PUBLIC ?

- ❑ Many claim to be the voice of the Public:
 - Politicians
 - Public Authorities
 - Media
 - Consumer Associations
 - Ngo's and Advocacy Groups
 - Unions....

- ❑ The Public is multi-faceted with conflicting voices:
 - Consumers
 - Customers
 - Employees
 - Citizens....

A MULTI-FACETED PUBLIC IN A GLOBAL SOCIETY

- ❑ L'Oréal operates not only in markets, but in societies in 125 countries all over the world.

- ❑ In cosmetics, there are no "Global Consumers"...



- Different needs
- Different expectations
- Cultural differences
- Various traditions
- Natural diversity

EXCHANGING WITH THIS PUBLIC

- ❑ At L'Oréal we are engaged every day in a constant dialogue with our public. It's a two-way information channel...

- ❑ Indeed, we must understand the needs of our public if we want to be responsive — more innovative — and answer their demands.

For example: in Germany the BfR (Federal Risk Evaluation Office) recently published a survey in which the large majority are in favour of nanotechnology in sunscreens and 53% believe that nanos are "good for cosmetics".

- ❑ Nanotechnology is for L'Oréal just another way to innovate... And just like many other innovations throughout history it creates over-expectations and over-concerns, and even sometimes over-statements... such as "*Nanotech is Godzilla !*"

EXCHANGING WITH THIS PUBLIC

- ❑ In addition, the challenging issue is that various stakeholders in the nanotechnology debate speak with different voices — for different reasons — which ultimately leads to confusion within the Public.
- ❑ The Public does not have the expert knowledge required to evaluate the different points of view.
- ❑ Up-to-date, validated, relevant scientific information made accessible to the Public by credible sources is urgently needed.

Balanced and common sense dialogue between the various stakeholders is crucial for informed decision making by the Public

DECISION MADE BY THE PUBLIC WHEN PROPERLY INFORMED

The value of informing public to build trust and acceptance *

Expectations: Will Benefits Exceed Risks?

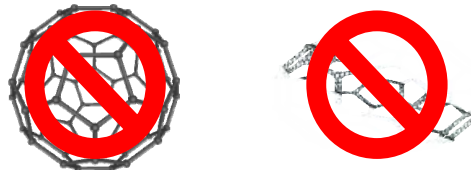
	Pre-Study	Post-Test
Benefits Will Exceed Risks	15.8	40.7
Risks Will Exceed Benefits	5.1	15.3
Risks & Benefits Equal	13.6	29.9
Don't Know	65	14.1
Total	100	100

Trust is a fundamental pillar of L'Oréal brands' promises

* Informed Public Perceptions of Nanotechnology and Trust in Government
Jane Macoubrie, Senior Adviser, Project on Emerging Nanotechnologies,
Woodrow Wilson International Center for Scholars, June-September 2005

CASE STUDY : NANOTECHNOLOGY IN COSMETICS

- ❑ The debate on nanos in cosmetics is a good case study of how misunderstandings and misperceptions can obscure reality as to both the nature of the products and the nature of the risks. Reality is actually much more simple and reassuring...
- ❑ Firstly, the types of products developed on the nanometric scale in cosmetology are different from nanomaterials used in other industrial sectors.

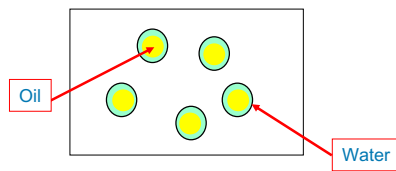


- ❑ Secondly, they differ by their form and their molecular structure, their mode of use and the way they interact with the environment. In essence, they are **nanoemulsions** and **nanopigments**.

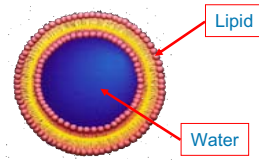
NANOEMULSIONS, LIPOSOMES & NANOCAPSULES

- ❑ Nanoemulsions are found widespread in nature, such as milk.
- ❑ In cosmetics, they are in fact macroscopic preparations containing oil and water droplets reduced to nanometric size to increase the content of nutritious oils while preserving the transparency and the lightness of the formulas.
- ❑ Sometimes fragile active ingredients, like vitamins, are protected from air inside nanometre sized vesicles called nanocapsules™ or liposome's that release the ingredient upon contact with the skin at the time of application.
- ❑ Nanoemulsions therefore do not cross the skin barrier.
- ❑ Public health agencies worldwide acknowledge their innocuity.

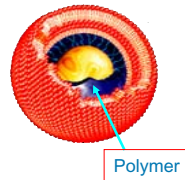
NANOEMULSIONS, LIPOSOMES & NANOCAPSULES



Nanoemulsion
50-80 nm
(Nourishing oils, unique texture & transparency)



Liposome
150-300 nm
(Caffeine)



Nanocapsule™
150-600 nm
(Vitamin A,E)

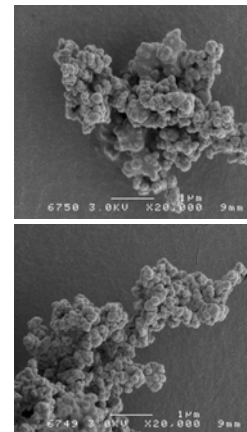
TITANIUM DIOXIDE NANOPIGMENTS

- Nanopigments are minerals already present in our natural environment, in the form of clay for example.
- Titanium dioxide is the best known and is renowned for its capacity to absorb UV light thus protecting the skin from cancers induced by over exposure to the sun.
- Moreover, titanium dioxide is an insoluble, inert material and a reference of non toxicity. This is why it is largely used in food (colouring agent E171), in consumer goods, and in dental and oral hygiene products, like toothpaste.

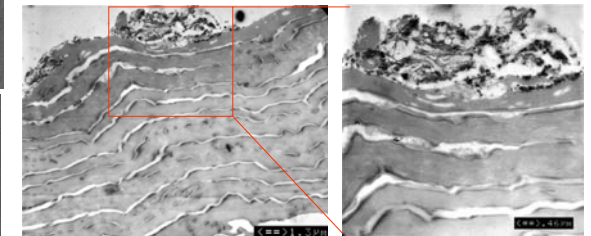
TITANIUM DIOXIDE NANOPIGMENTS

- In sunscreen lotions, nano titanium dioxide is present in large clusters ranging in size up to 30 000 nanometers that ensure optimal protection of the skin.
- Studies, including those undertaken within the framework of the European Union research program NANODERM, showed that nanopigments do not cross the skin barrier, even in cases where the skin is deteriorated, such as acne or psoriasis.
- Furthermore, studies carried out in the US by the FDA (2007) and in Europe (2008), have demonstrated that even in the case where titanium dioxide nanopigments are injected into the blood stream, no adverse effects are observed.

TITANIUM DIOXIDE NANOPIGMENTS

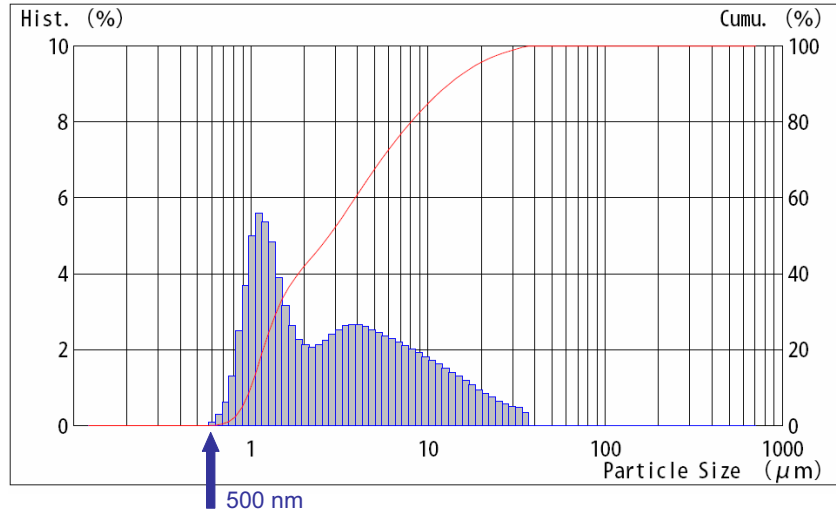


Nano titanium dioxide clumps



Nano titanium dioxide clumps from a sun cream on the skin surface

TITANIUM DIOXIDE NANOPIGMENT AS DELIVERED BY THE PIGMENT MANUFACTURER



L'OREAL'S ENGAGEMENT TO PUBLIC SAFETY

□ Safety Assessment is central to product development at L'Oréal. Of the 3000 researchers at L'Oréal several hundred are dedicated to the evaluation of the benefit / risk for the consumer and the environment.

□ L'Oréal researchers contribute actively to national and international initiatives on best practices for the use of nanos by consumers and in the natural environment.

L'Oréal is a founder member of International Council on Nanotechnology (ICON) of which the US FDA and EPA are stakeholders, and a partner in the European project NANOINTERACT that studies the interactions between nanotechnologies and the living world.

L'OREAL'S ENGAGEMENT TO PUBLIC SAFETY

□ L'Oreal was the first cosmetics company in the 1970's to set up a network for **cosmeto-vigilance** based on the model of pharmaco-vigilance.

□ This network collects, centralizes and analyzes undesirable side-effects using an on-line database.

The objective is to **protect our consumers within the framework of a monitoring and alert system**. In addition, it helps improve the formulation of our future products.

L'Oréal has been using nanotechnology in its products safely for over 25 years — nano titanium dioxide in sun creams and nanocapsules were first commercialized in early 1980's.

LESSONS LEARNED FROM THE DEBATE ON NANOTECHNOLOGY IN COSMETICS

One cannot overstate the need to take into account:

□ **The most relevant, up-to-date scientific studies** before forming and publicising an opinion to avoid misleading the Public.

□ **The importance of an international consensus** that includes civil society participation for the development of **standards** for nanotechnologies that are relevant and adapted to the various industrial sectors.

□ **The utility of the final product** — for example, nanotechnology applied to sunscreens provides the best protection against UV radiation that is a major source of skin cancers.

CONCLUDING REMARKS

- ❑ L'Oreal's engagement as a Corporate Citizenship Company means that our top priority is to provide consumers with products of scientifically proven utility and guaranteed safety — including nanotechnology-based products.
- ❑ L'Oreal believes that while any new technology must be developed and applied taking all the precautions necessary to minimize the possible risks, one must also allow researchers to optimize the benefit of scientific innovation in the interest of the Public and the environment.

3rd International Dialogue
on Responsible Research & Development of Nanotechnology

Societal Engagement

NIA – The Membership

Unique Features:

- providing a purely industry-led perspective, derived from the views of the collective membership (companies at different stages of their life-cycle and with a variety of interests).

Corporate Members:

Apaclara	MaterialsSolutions	Solvay
Applied Nanodetectors	MacDermid	Sun Chemical
AWE	Naneum	Surrey Nano Systems
BASF	NanoCentral	Tata Chemicals
BP	NanoForce	Tamil Nadu Technology Development & Promotion Centre
Buchi	NanoGap	TechniTex Faraday Limited
Buehler	NanoLake	Teer Coatings
CEMMNT	NanoSight	The Technology Partnership
Cenamaps	Nanopartner	Thomas Swan & Co.
Centrum fur Angewandte Nanotechnologie	NanoTEC Industrial Coatings	Unilever
Ciba	Nanotec NI	Visteon Customer and Technical Centre
Croda International	Nanotechnology	Xennia Technologies
Datum Alloys	Nano-X	
Eminate	National Physical Laboratory	
Endor Nanotechnologies	Orchid Chemicals and Pharmaceuticals	
Epson	Orla Protein Technologies	
Exilia	Oxford Biosensors	
Gems Sensors	Oxford Instruments	
Hosokawa Micron	Oxonica	
I-CanNano	Pall Europe	
Intertek MSG	PERA	
ICI	Procter & Gamble Technical Centres	
Ilford Photo	O-Flo	
IMERYS Minerals	QinetiQ	
Innos	QinetiQ Nanomaterials	
Innovia Films	Rolls-Royce	
Ionbond	Scott Bader	
JEOL UK	SEA Solutions	
Johnson & Johnson	Semfab	
Johnson Matthey	Shell	
L'Oreal	Smith & Nephew	
Lubrizol		
Maelstrom		

Associate Members:

Bergeson & Campbell
Beveridge & Diamond
Bond Pearce
Dickinson Dees
FirstVentures
Harrison Goddard Foote
Ian Silcock, Barrister
Neville Craddock Associates
Nanotech Risk Management
NoMo-ir
TechnesiumTC
The Acta Group EU

Affiliate Members:

Australian Nano Business Forum
Association of the British Healthcare Industry
British Healthcare Trade Association
Canadian High Commission
Chemical Industries Association
Chemistry Innovation KTN
DEFRA
Display & Lighting KTN
Materials UK
Nanotechnology KTN
NEPIC
UK Trade & Investment

(list not complete)

Societal Engagement Round Table

3rd International Dialogue, 11th - 12th March 2008

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The UK Nanotechnology Engagement Group

- Established in 2005

General History:

- Response to a growing concern about the lack of trust between science and society (*cf* BSE, GM)
- New approach to risk communication
- Build trust in science policy and policy making
- 'upstream engagement'

Nanohistory:

- RS/RAEng report
- August 2005: UK Government published *Outline Programme for Public Engagement on Nanotechnologies (OPPEN)*

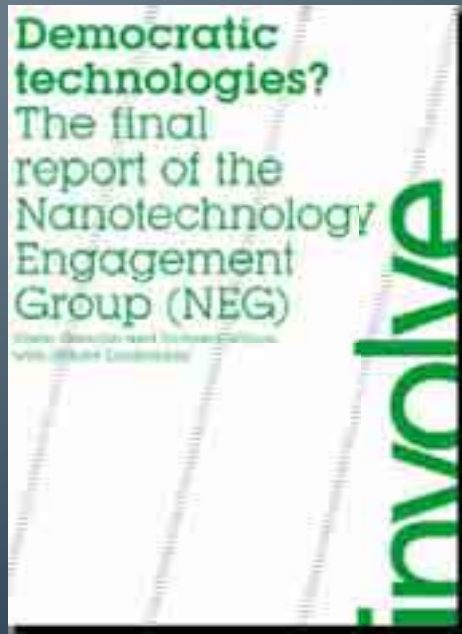
The UK Nanotechnology Engagement Group

Official government aspirations as outlined in OPPEN:

- Enable citizens to understand and reflect on issues related to nanoscience and nanotechnologies, both personally and through inclusive processes involving citizens, policy-makers, and researchers.
- Enable the science community and the public to explore together both aspirations and concerns around the development of nanotechnologies.
- Enable institutions who work in nanotechnologies to understand, reflect on, and respond to public aspirations and concerns.
- Establish and maintain public confidence in the development of technologies by understanding the public's concerns and showing their impact on government regulation.
- Contribute to wider government initiatives to improve the general trustworthiness of science-and-technology-related institutions.
- Support wider government initiatives to support citizen participation in public policy and service delivery.

The UK Nanotechnology Engagement Group

- Research different stakeholders' expectations of public engagement with nanotechnologies.
- Map current public engagement activities related to nanotechnologies in the UK and internationally.
- Identify lessons from other engagement activities.
- Analyse how the lessons learned relate back to the range of interested audiences and the spectrum of engagement activities undertaken.
- Communicate the learning to government, other stakeholders, nanoscience researchers, and the wider public.



The UK Nanotechnology Engagement Group

- Established in 2005
- General History:
- Response to a growing concern about the lack of trust between science and society (cfBSE, GM)
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 - 'upstream engagement'
- Nanohistory:
- RS/RAEng report
 - August 2005: UK Government published *Outline Programme for Public Engagement on Nanotechnologies (OPPEN)*



NEG – The Team



NEG – The main Results

Recommendations for science policy:

- Government should spend money on nanotechnologies provided that priority is given to funding research and developments that contribute to a wider social good, such as new medical innovations and sustainable technologies.
- Government should continue to identify the potential risks of nanotechnologies and nanomaterials, and create new regulation and laws for labelling based on such research.
- Government should take steps to ensure that the governance and funding of nanotechnologies is made more transparent



NEG – The main Results

Recommendations for public engagement policy:

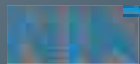
- A comprehensive Impacts Assessment Framework for public engagement in science and technology to be agreed by authorities and other stakeholders.
- Establish clarity among funders, organisers and participants on the purpose of a public engagement initiative, and create strategies to meet those needs.
- Institutional staff involved in funding or responding to public engagement activities to allocate sufficient time and resources to engage directly with the activities at every stage of the process.
- Institutions to respond formally to public engagement processes to explain what they are, and are not, taking forward and why.
- Decision-making institutions to offer tailored support such as training, coaching, and mentoring of staff who are involved in, or affected by, public engagement activities.



NEG – The main Results

Recommendations for public engagement policy (continued):

- Decision-making institutions to pilot action-learning networks to share and maintain capacity internally.
- Public engagement to be included as a course at the civil-service college.
- Scientific institutions to formally recognise public engagement.
- Science-funding bodies to stress the importance of dialogue-focused public engagement, alongside one-way engagement approaches such as public lectures.
- Organisations funding or delivering public engagement to explore new tools for communication of public engagement outputs and outcomes to large and diverse audiences.
- Organisations funding or delivering public engagement to explore options for involving larger numbers of people in deliberations about science and technology.



NEG – The main Results

Recommendations for public engagement policy (continued):

- Organisations funding or delivering public engagement to actively support innovation in public engagement through a focus on desired outcomes, not processes.
- Encourage collaborative innovation by formation of project teams that include public engagement practitioners, scientists, and policy makers to maximise innovation and build institutional capacity.



NEG ... one year on

Planned action by the UK Government

- Establish *Expert Resource Centre for Public Dialogue in Science and Innovation (ERC)*
- Create a 'one-stop-shop' for information, advice, guidance on public dialogue in S&T ('good practice')
- Provide financial and practical resources
- Develop learning-networks and communities of interest among policy makers

Proposed ERC Activities

Virtual online source of information, including:

- Helpline
- Training and mentoring
- Development of practitioner and policy maker networks
- Events and workshops
- Provision of dialogue tools
- Evaluation network to measure impact



Societal Engagement Round Table
3rd International Dialogue, 11th - 12th March 2008

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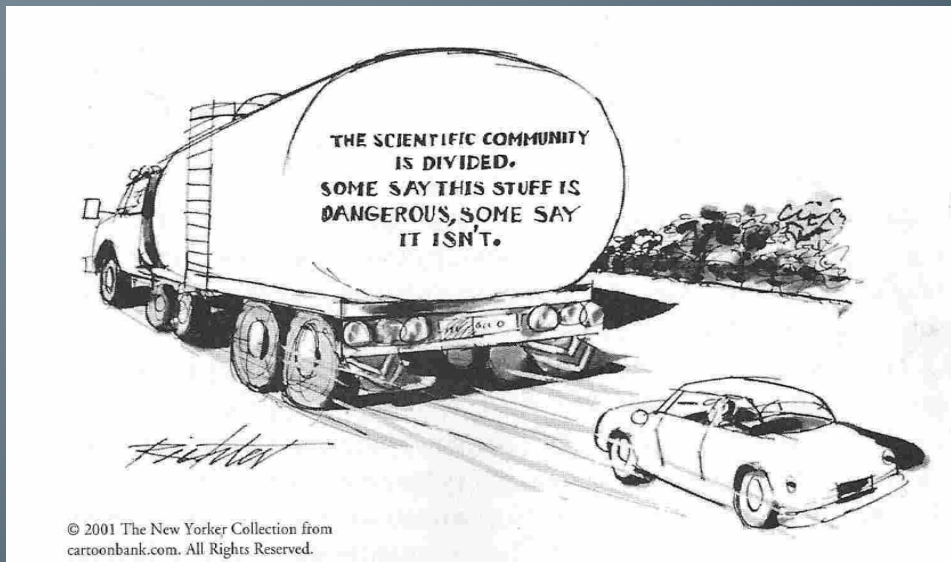


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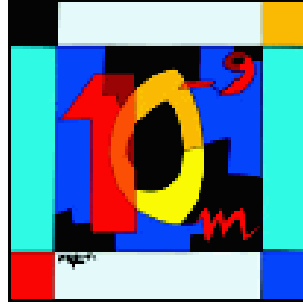
Thank you!

How to break the news?



Societal Engagement Round Table
3rd International Dialogue, 11th - 12th March 2008

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PARTICIPANTS CONTRIBUTIONS

Contribution from dr. Dag Høvik, Research Council of Norway

The Norwegian Programme on "Nanotechnology and new materials - nanoscience and integration - NANOMAT" started very slowly in 2002 and have today a programme plan covering the period until the end of 2016:

<http://www.forskningsradet.no/servlet/Satellite?cid=1088796688084&pagename=nanomat%2FPage%2FHovedSideEng>

The key documents can be found on:

<http://www.forskningsradet.no/servlet/Satellite?cid=1187636539224&pageid=1187636539224&pageame=nanomat%2FPage%2FHovedSideEng&site=nanomat>

1. ELSA and HSA

In 2004 The Research Council of Norway initiated a study conducted by an independent working group appointed jointly by us, the National Research Ethics Committee for Science and Technology (NENT) and the Norwegian Board of Technology:

Nanotechnologies and new materials: Health, the environment, ethics and society
National research and competency requirements

This report is only in Norwegian, but an English summary is enclosed! After this report was issued, we had our first call for projects in 2005. Today the ELSA and HSE related projects count for 3 % of the total NANOMAT project budget (spent and allocated). The projects cover ethical issues related to nanotechnology, governance of nanotechnology in the risk society, HSE aspects of nanocarbons...

In 2008 The Research Council launched a new programme for research into ethical, legal and social aspects of new technologies. With its focus on biotechnology, nanotechnology and cognitive science, the programme represents an exciting avenue of study, with some highly significant challenges. This programme is a continuation of a similar previous programme, focusing on ELSA and biotech/functional genomics.

2. Outreach activity

NANOMAT has since the beginning in 2002 focused on outreach activities, giving balanced information about nanotechnology to the public. Since 2003 NANOMAT has participated at the National Science Week since September 2003, mostly aiming at children and young people.

In 2005 NANOMAT together with the other strategic programmes on ICT and functional genomics in the Research Council financed a new mobile laboratory. This mobile lab has since then been touring Norway, and explaining to children and youngsters about the new technologies and how they can influence their lives. All schools got information about nanotechnology in a special newsletter and could learn more in a computer play available on the Internet.

In 2006 the Research Council checked the public perception of the new technologies. - A positive result (see pdf-file forventing)!

Now in 2008 we have just launched an enquiry asking children and young people about their knowledge and perception of natural sciences. This enquiry is done on a regular basis; - this year also covering nanotechnology!

In addition to this we have been promoting nanotechnology in programmes on the Norwegian television and in the radio, in newspapers and magazines, in meetings with industrial associations and in meetings with politicians (on national and local arenas), schoolteachers, Rotary Clubs and similar venues....

In 2006 NANOMAT was one of the partners for a training course for journalists and scientists, where nanotechnology was the only subject.

At the The Norwegian University of Science and Technology (NTNU) in Trondheim the MSc-degree study was in 2006 and 2007 the most preferred, where approximately 240 applicants had this study as their first choice. 30 students are accepted each year!

Every second year NANOMAT is arranging a large international conference. In 2007 in Bergen we had 280 participants and speakers, both national and international . Now in 2008 we will have a more industry and financing related seminar, - where we are taking one step forward compared with the more industry related seminar in 2006, with 100 participants.

As a result, we now see an increased understanding about nanotechnology and what could be achieved, but there is still a way to go.

Dag Høvik, PhD
Norges forskningsråd / The Research Council of Norway
Programleder / Program Manager NANOMAT

Contribution from dr. Steve Morgan, UK.

Environmentally Beneficial Nanotechnologies

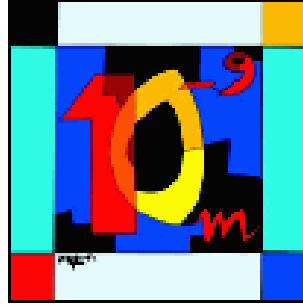
As is in health care, electronics, construction, leisure, IT, clothing and so many aspects of our everyday lives, indications are that nanoscience could be an enabler to the environmental agenda. At a time when humanity faces its greatest environmental challenges, Discoveries in the field of nanoscience field are bringing the possibility of a cleaner, greener and more sustainable future.

The UK Department for Environment, Food and Rural Affairs (Defra) has undertaken a study of nanotechnology applications which could contribute to the reduction of greenhouse gas emissions. Leading UK consultants, Oakdene Hollins Limited (OHL), were tasked to consider both the feasibility of these applications, and any obstacles which might impede or prevent their adoption. Defra also asked OHL for policy recommendations to foster further advances in these areas and encourage implementation.

“Environmentally Beneficial Nanotechnologies: Barriers and Opportunities” provides a detailed examination of current and foreseen applications of nanoscience in the areas of photovoltaics, insulation, electricity storage, engine efficiency and hydrogen use. The report is available at: <http://www.defra.gov.uk/environment/nanotech/policy/index.htm>

STEVE MORGAN

Chemicals and Nanotechnologies Division,
Department for Environment, Food and Rural Affairs,



PARTICIPANTS LIST

PARTICIPANTS LIST

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