

ETHICS AND NANOTECHNOLOGY AT THE INTERFACE

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Fear of Nanotechnology

(Friends of the Earth webpage)

- ▣ Nanoparticles cause DNA damage – without even entering cells
- ▣ Will nano enabled super-rich people become a different species?
- ▣ German authority warns consumers to avoid nano products
- ▣ A link between nanoparticles and Alzheimer's disease?

Optimism about Nanotechnology

(Nano Magazine webpage)

- ▣ Better and safer sunscreens
- ▣ Nanosensors; the future
- ▣ Nanotechnology: The 21st century catalyst for sustainability
- ▣ Nano helps win gold
- ▣ Nanotechnology and miracle materials
- ▣ Cars of the future: smarter, stronger, smoother - greener

Fear and Optimism

- ▣ Fear
 - Some research should not be done
 - Decisions on research agenda should not be solely in the hands of scientists
 - Those who do it are responsible for harms
- ▣ Optimism
 - The research has value to society
 - Will help solve serious problems

Scientific Research

- ▣ Two models
 - The linear model
 - The social model

The Linear Model

- ▣ Dates back to Francis Bacon
- ▣ Pure science ->
 - Applied science-technology ->
 - ▣ Products
- ▣ Science progresses best when scientists given free reign
- ▣ This leads to the best results for society

Vannevar Bush (1945)

- ▣ Scientific progress on a broad front results from the free play of free intellects, working on subjects of their own choice, in the manner dictated by their curiosity for exploration of the unknown. Freedom of inquiry must be preserved under any plan for Government support of science ...

Sir Gustav Nossal (2007)

- ▣ To free the human spirit from ignorance and superstition must be good, no boundaries should be placed around such a search
- ▣ This is why the distinction between science (which seeks to know) and technology (which seeks to apply knowledge) is so crucially important. Of course technology must be subjected to societal and democratic norms

The Social Model

- Two important differences from linear model
 - Society should have a role in deciding on what research should be undertaken
 - No sharp distinction between pure science and applied science/technology
- Common to talk of *technoscience*
- We focus on both fundamental research and real-world applications. It's the ability to explore new realms to create knowledge, and then turn those ideas into effective industrial outcomes (The Wark).

European Commission (2008)

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 (Code of Conduct for Responsible Nanosciences and Nanotechnologies Research)

Australia

- ▣ An environmentally sustainable Australia
- ▣ Promoting and maintaining good health
- ▣ Frontier technologies for building and transforming Australian industries
- ▣ Safeguarding Australia

Values in Research

- ▣ Is research value-neutral?
- ▣ I have always believed that scientific research is richly value-laden, that the search for new knowledge gives expression to a deep human yearning, that seeking to know more about the natural world is an unalloyed good (Nossal)
- ▣ Others see broader set of values (eg. EU)

Ethics at the Interface

- ▣ Interface 1
 - Internal to the research, eg. Harm to human or animal subjects, researcher safety, IP.
- ▣ Interface 2
 - What research should be undertaken?
 - What are the priorities?
- ▣ Interface 3
 - Scientific responsibility
 - If no sharp distinction between pure and applied research, responsibility a larger issue

Ethical Tension Points

- ▣ Responsibility
 - Scientists' sphere of responsibility
- ▣ Risk and nanoparticles
 - Acceptable level of risk - who is at risk
- ▣ Intellectual property rights
 - Potential disadvantage to developing countries
- ▣ Industry funding for research
 - Conflict of interest
- ▣ Selection of research projects
 - Criteria for selecting projects

Conclusion

- ▣ Emphasis on the material benefits of science should not prevent recognition that it is just as essential a part of human culture as painting, literature or music (Sir Ian Wark)
- ▣ Perhaps the relation between science and ethics is closer than merely an *interface*