



# New technologies, why bother?

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Nanotechnology and synthetic  
biology



# What is it?

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- Nanotechnology
  - Ultimate miniaturisation
  
- Synthetic biology
  - New organisms from scratch



# Nanotechnology, what is it?

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1. Newly designed molecular 'machines', chips, drug delivery systems etc
2. New materials, due to new configurations, not occurring in nature
3. Application of known substances in very small particulate form



# Nanoparticles

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- Size 1-100 nm in at least 1 dimension
- Intended production
  - Chemical or physical engineering
  - Biosynthesis
- Accidental production
  - Combustion processes (UF particles)
  - Waste from designed nanomaterials



# Nanodimensions

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- Water molecule 0.3 nm
- DNA-strand 2.5 nm
- Ribosome 20-30 nm
- Pneumonia virus 80-120 nm
- Visible light 400-700 nm
- Cell nucleus > 5000 nm



# Issues

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- Socio-economic disruption
- Human health
- Ethical concerns
- Ecological effects
- Security
- Privacy



# Toxicology

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- 'Inert' materials become reactive on nanoscale
- Toxicity depends on size, chemistry and form
- Mostly limited to insoluble substances
- Knowledge gap
- No legislation
- >300,000 essentially new materials



# Synthetic Biology

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- Marriage between biotechnology and engineering principles
- Assembly of biologic 'machines' from elementary building blocks
- From artisanal craft to mass industry
- Interconnections between nano and synthetic biology
- Similar issues as in nano



# Why bother?

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- Products spread like wildfire
- Huge government investments, facilitating decision-making, lots of economic opportunities
- Fair warning mostly from concerned scientists
- Little or no NGO-involvement so far
- How can citizens participate if they have no idea what it is?