



## Anticipating Technological Change

Office of Science and Innovation  
24<sup>th</sup> May 2006

Sir David King

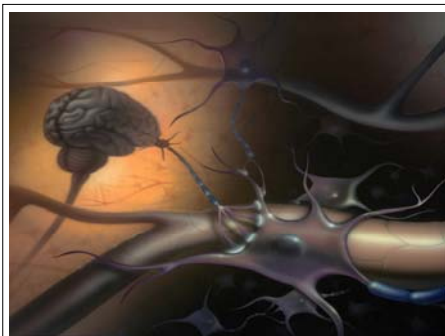


## The need for Anticipation

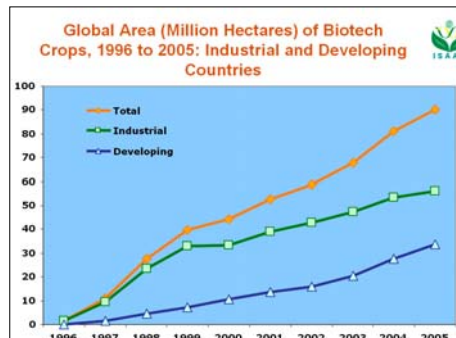
**Stem Cells**

vs.

**GM crops**



e.g. *Bioindustry Association*  
(case 7)



e.g. *Defra*  
(case 1)



## CSA's Guidelines on scientific analysis in policymaking

(revised October 2005)

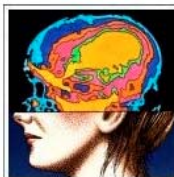
Aim is that departments develop Foresight / Horizon Scanning activities that –

- spot early indications of trends, issues, or other emerging phenomena that may create significant impacts (including priorities for public dialogue)
- are appropriately considered in strategy and policy
- where necessary, are acted upon.

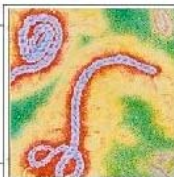
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## Foresight projects so far



Brain Science,  
Addiction and  
Drugs



Detection and  
Identification of  
Infectious  
Diseases



Intelligent  
Infrastructure  
Systems



Tackling  
Obesities

### Sponsoring Ministers

Lord Warner  
Jane Kennedy  
Caroline Flint  
(Dept. of Health)

Lord Bach  
Lord Rooker  
(DEFRA)

Dr Stephen Ladyman  
(Dept. for Transport)

Caroline Flint  
(Dept. of Health)

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## Foresight projects so far



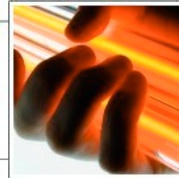
**Cognitive Systems**



**Flooding and Coastal Defence**



**Cyber Trust and Crime Prevention**



**Exploiting the Electromagnetic Spectrum**

### Sponsoring Ministers

**Lord Sainsbury**

*(DTI, OSI)*

**Elliot Morley**

*(Defra)*

**Hazel Blears  
Andy Burnham**

*(Home Office)*

**Stephen Timms  
Alun Michael**

*(DTI)*

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## Brain science and related disciplines are advancing fast

Over the next 20 years these advances could:

- revolutionise treatment for mental disorders
- deliver new treatments for addiction.
- offer new recreational psychoactive substances with fewer harms.

And

- offer a new category of drug that would improve the cognitive performance of healthy people, so they:
  - o think faster
  - o remember more
  - o stay awake longer etc

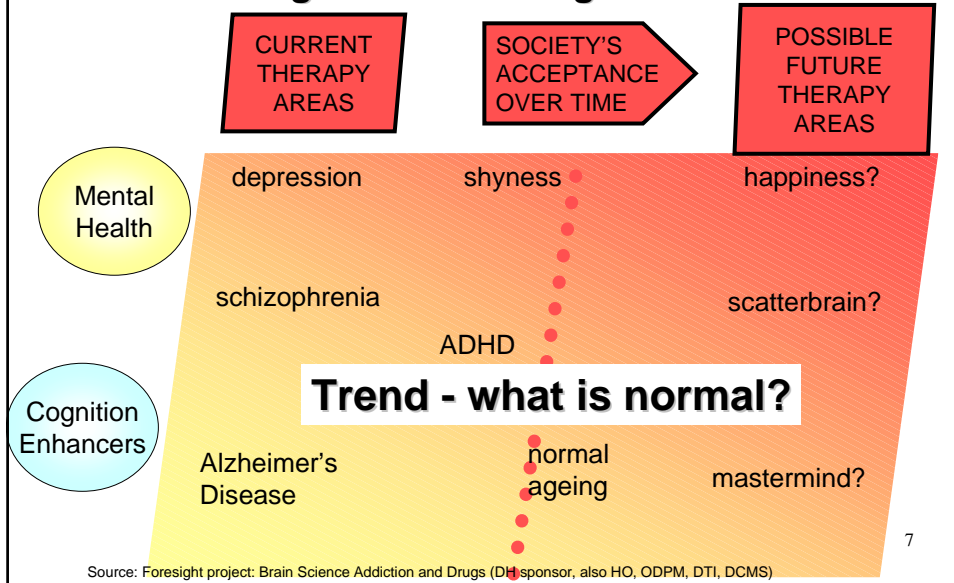
So we need to exploit the benefits and manage the risks:

For example....

- what should we do about increasing knowledge of individuals' vulnerability to addiction?
- should we change regulatory structures to enable new procedures in non-medical psychoactive substances?
- are 'cognitive enhancers' a great market and social opportunity or destabilising and divisive?
- how do we manage market disincentives which threaten withdrawal from R&D in mental health treatments?



### How might values change over time?



### The role of technology in managing disruptions – *Infectious Diseases*



Foresight – *Detection and Identification of Infectious Diseases* 8



## *Detection and Identification of Infectious Diseases* - future technology and systems

### **Areas for development:**

- 1. International sharing of infectious diseases data to better spot new outbreaks;**
- 2. Genomic and post-genomic systems for the rapid characterisation of newly emerging pathogens;**
- 3. Hand-held and portable devices that would revolutionise diagnostic and monitoring; and**
- 4. New technologies and systems for high-throughput screening at ports and airports.**

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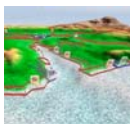
## ***We are building tools to help strategy development....***

### **Cyber trust and crime prevention**



- Scenarios to test
  - ID Cards
  - Road user charging
  - Data Protection etc

### **Flood and Coastal Defence**



- Impact on HMT spend
- Global debate on climate change disorders

### **Intelligent Infrastructure Systems**



- Fed in to ....
  - Eddington Review
  - Stern Review

### **Now working on.....**



- Detection and Identification of Infectious Diseases (plants, animals, humans)**
  - Road maps



- Tackling obesity**
  - Systems models

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**...by considering science in context**

**Sigma**  
“scan of scans”

- Global courting : the supremacy of international law
- UK rules OK : isolationist Britain
- Decreasing potable water
- Oil peak
- Ghettoisation of minority populations
- Landfill capacity limits reached
- Economic impact of ageing
- Corrupting aid flows

**Emergent Themes**

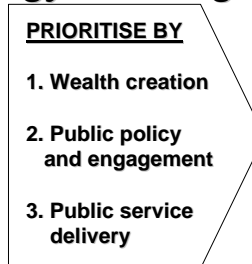
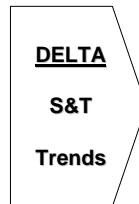
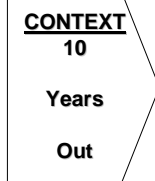
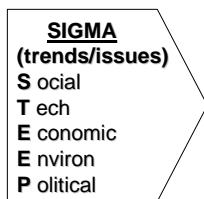
- Identity
- Values
- Small World
- Intentional Biology
- Mathematical World
- Extended Self
- Lightweight Infrastructures
- Globalisation
- Sense and Sensibility

**Delta**  
“S&T scan”

- Active biomaterials for regenerative medicine
- Quantum chemistry for pollution abatement.
- From ink-jet printing to personal fabrication
- Brazil's expanding technology sector
- Complexity theory as a tool in social relations
- More accurate modelling of complex economic systems 11



**...science in context - CSR Technology Challenge**



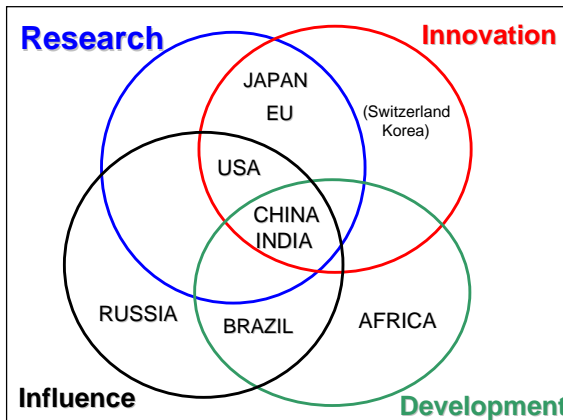
**WORKSHOP – 14 DEPTS**

- Energy Technologies
- Smart Materials
- Nanotechnologies
- Sensors and tracking

- Body and Mind Sciences
- Information handling and KM
- Network Interactions
- Security (Info and behaviour)



**...science in context ...Global change?**  
**International Science Strategy**  
**Embedding flexibility with Globalisation Scenarios**



Impacts of different futures on balance of -

- Priorities
- Resources
- Partners



**Whilst you can't predict the future,  
it is possible to prepare for some uncertain futures**

**Spotting impacts of technology**

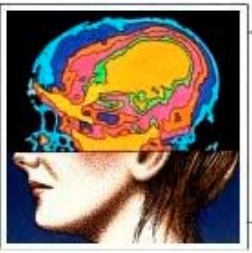
BBC internet vs. mobile phone theft

**Engaging the public**

Stem cells (UK advantage) vs. GM debate

**Planning for long trends**

Thames Barrier vs. Foot and Mouth Disease



## Key Findings

### Management of recreational drugs

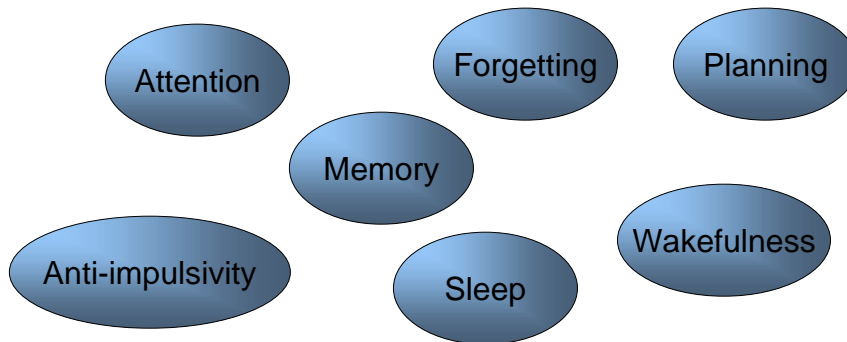
- Susceptibility of brains of young
- Mode of delivery has impact on harm
- Early identification and response can reduce impact of harmful behaviour
- Need to understand cultural context of any change in management





## Key Finding - We will see new cognition enhancers - Implications?

It is likely they will be used as treatments for mental health and treatments for addiction



Maybe significant future market opportunity for the healthy - but regulations limit UK development of these drugs