

e-science: a frontier technology for achieving the National Research Priorities



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The National Research Priorities

(5 Dec 2002)

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

Their characteristics ...

- ❑ clear pathway for Australian research
- ❑ thematic and outcome oriented
- ❑ they maintain a diversified research portfolio
- ❑ visible
- ❑ pillars of strength

An environmentally sustainable Australia

Transforming the way we use our land, water, mineral and energy resources through a better understanding of environmental systems and using new technologies.

- ❑ Developing deep earth resources
- ❑ Transforming existing industries



Promoting and maintaining good health

Promoting good health and preventing disease, particularly among young and older Australians.



Frontier technologies

Stimulating the growth of world-class Australian industries using innovative technologies developed from cutting-edge research.

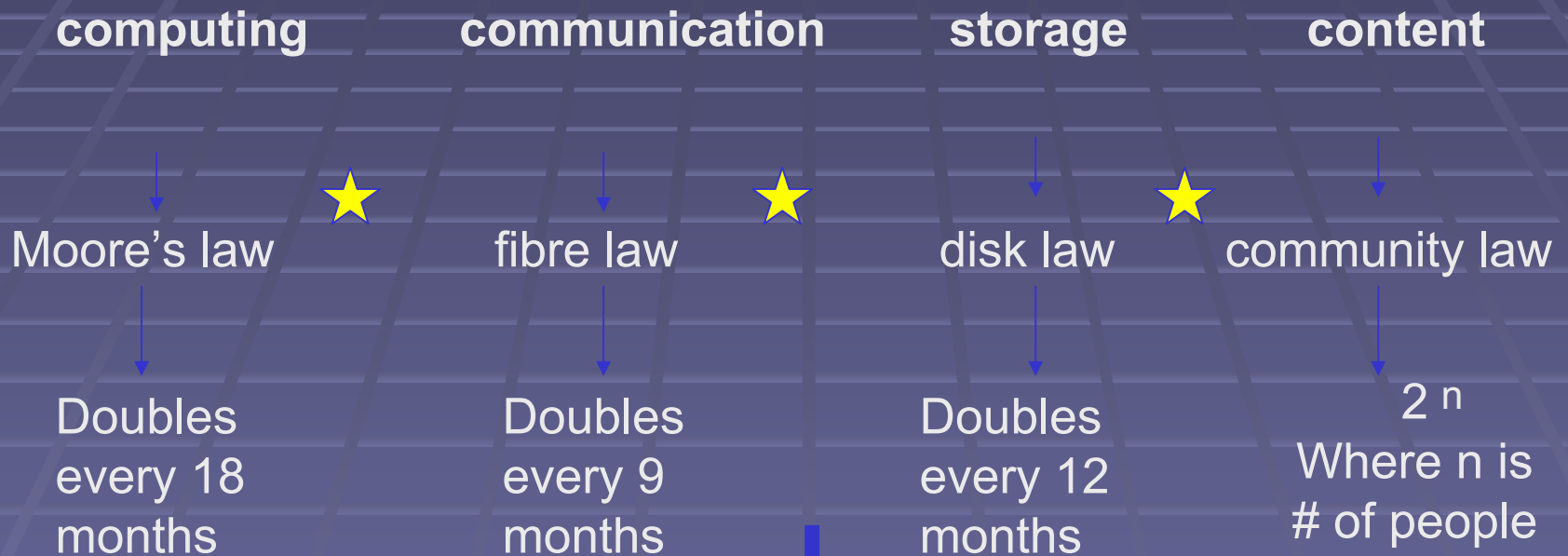


Safeguarding Australia

Safeguarding Australia from terrorism, crime, invasive diseases and pests, and securing our infrastructure, particularly with respect to our digital systems.



The driver for e-science

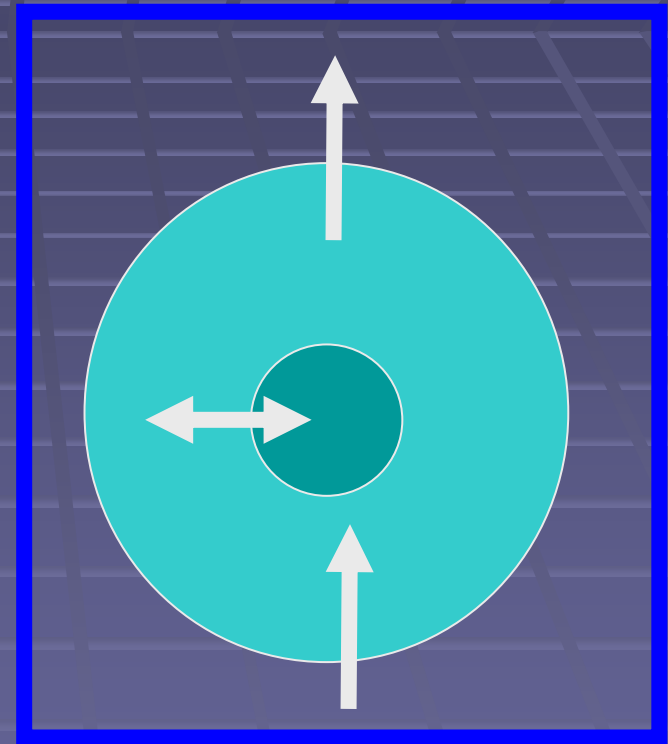
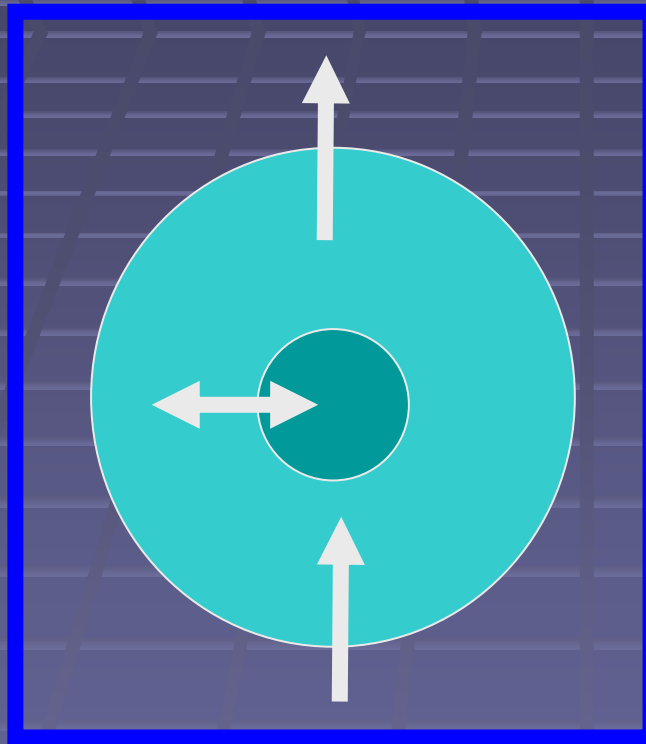
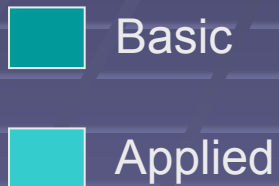


Continuous innovation at amazing speeds
through the creative recombination of crafts.
(The exponential pace will continue throughout this decade)

R&D mode of delivery has changed

Physics, perhaps

Biology, perhaps



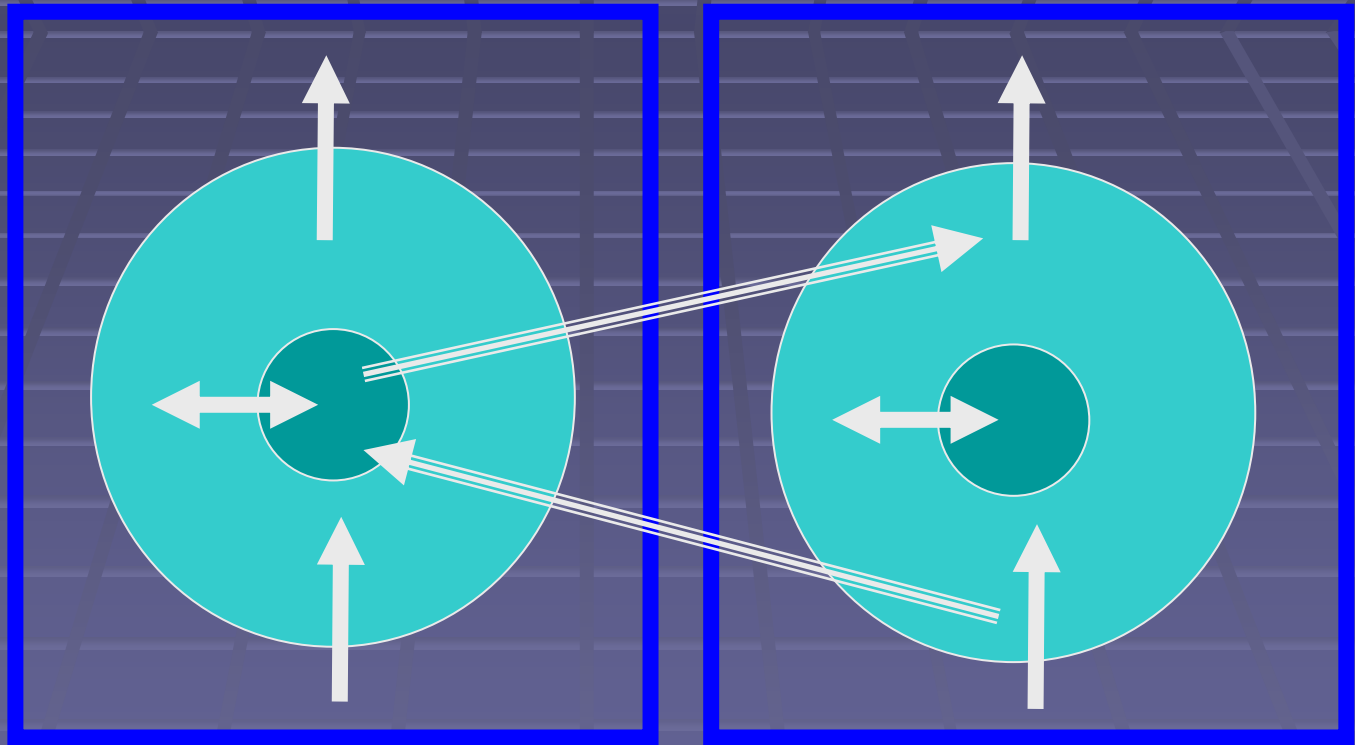
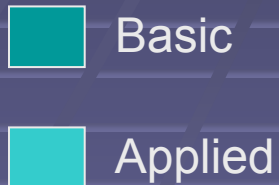
Mode 1

- discipline based
- distinguishes between theoretical core and its conversion to applications

R&D mode of delivery has changed

Physics, perhaps

Biology, perhaps



Mode 2

- multidisciplinary, team based
- constant flow between basic and applied
- discovery occurs where knowledge is developed and put to use

Collaboration

- ❑ Success of **Mode 2** over **Mode 1**
- ❑ Innovation demands effective interaction of science base and the business sector
- ❑ Networking and collaboration produce more opportunities

Clear forces collaboration

“Appropriability” of R&D is higher in critical mass, cross-cutting cluster



Business / research linkages



Clear role for e-science

Seize the opportunity

- ❑ 'Route to market' needs to be seen as a key performance indicator
- ❑ The multiple sources of funding make for complex reporting and governance, and lack of clear title for IP
- ❑ Who pays for infrastructure for e-science?

Quantum technology

Photon science

- Lasers
- Photonics
- Spectroscopies
- Synchrotron
- Wireless

- Instrumentation & sensor
 - Medical
 - Environmental
 - Scientific
- Communications equipment & systems
- Computer components

Matter waves

- Bose-Einstein condensation
- Atom laser
- Matter-wave interferometer
- Quantum dots

Quantum computing

- Cryptography
- Silicon Q.C.
- Photon Q.C.
- Algorithms

“Thinking” systems

Neuro- science

- Cellular neuroscience
- Brain function
- Clinical

Cognitive psychology

- Mind-brain science
- Behaviour
- Clinical

Autonomous Systems

- Cybernetics
- Mechatronics
- Robotics
- Artificial intelligence

- Medical advances
 - Disease
 - Aging
 - Public health
- Smarter industrial & domestic machines
- Software assurance & new information technologies

New networks of excellence needed

Precursor to Mode 2 R&D

Trial for early stage collaborations

More effective bidding for competitive funds for 'pillars of strength'

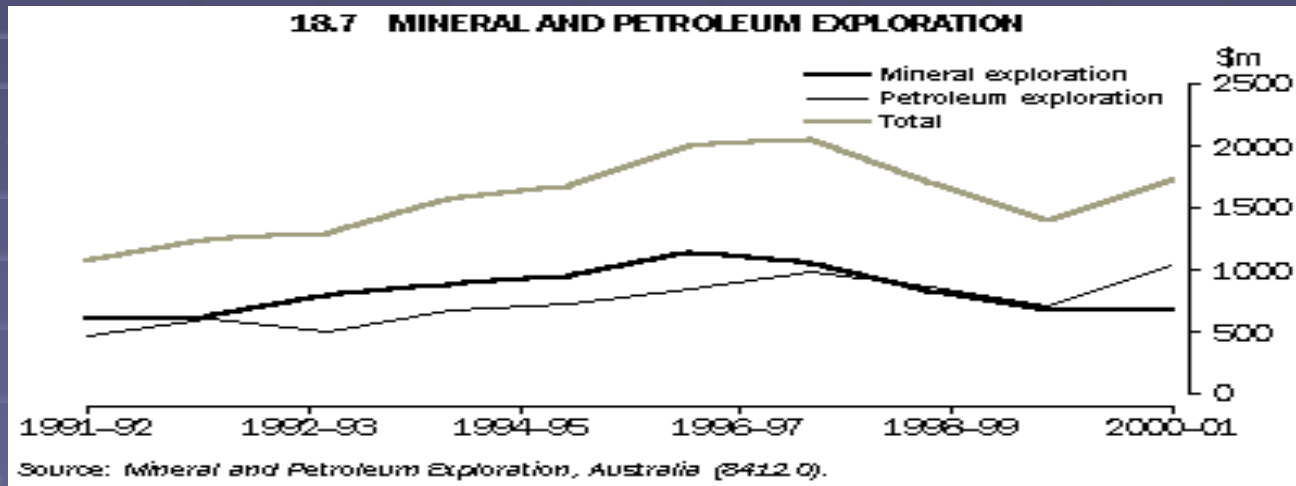
Affects NHMRC, ARC, CSIRO etc

e-science push

- Quantum technology
- Biological programming
- “Thinking “ systems
- Information and communication technology
- Energy technologies
- Materials technologies

e-science demand - geoscience

- Mineral and petroleum exploration expenditure over the past 10 years



- Potential or actual benefits (\$?) from the use of e-science

e-science and research

- ❑ Boosts research outcomes.
- ❑ Facilitates the National Research Priorities.

