Frontiers of the Future

Methods, Madmen and Massive Change

A Presentation for the National Intelligence Council

by
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The Millennium Project

- American Council for the United Nations University
- Established in 1996, after a 3 year feasibility study
- Accumulative study of change, identification of global issues, therapies, methodologies
- 19 Nodes, 1500 participants from 50 countries
- Used by and funded by a broad range of institutions for new insights into global challenges

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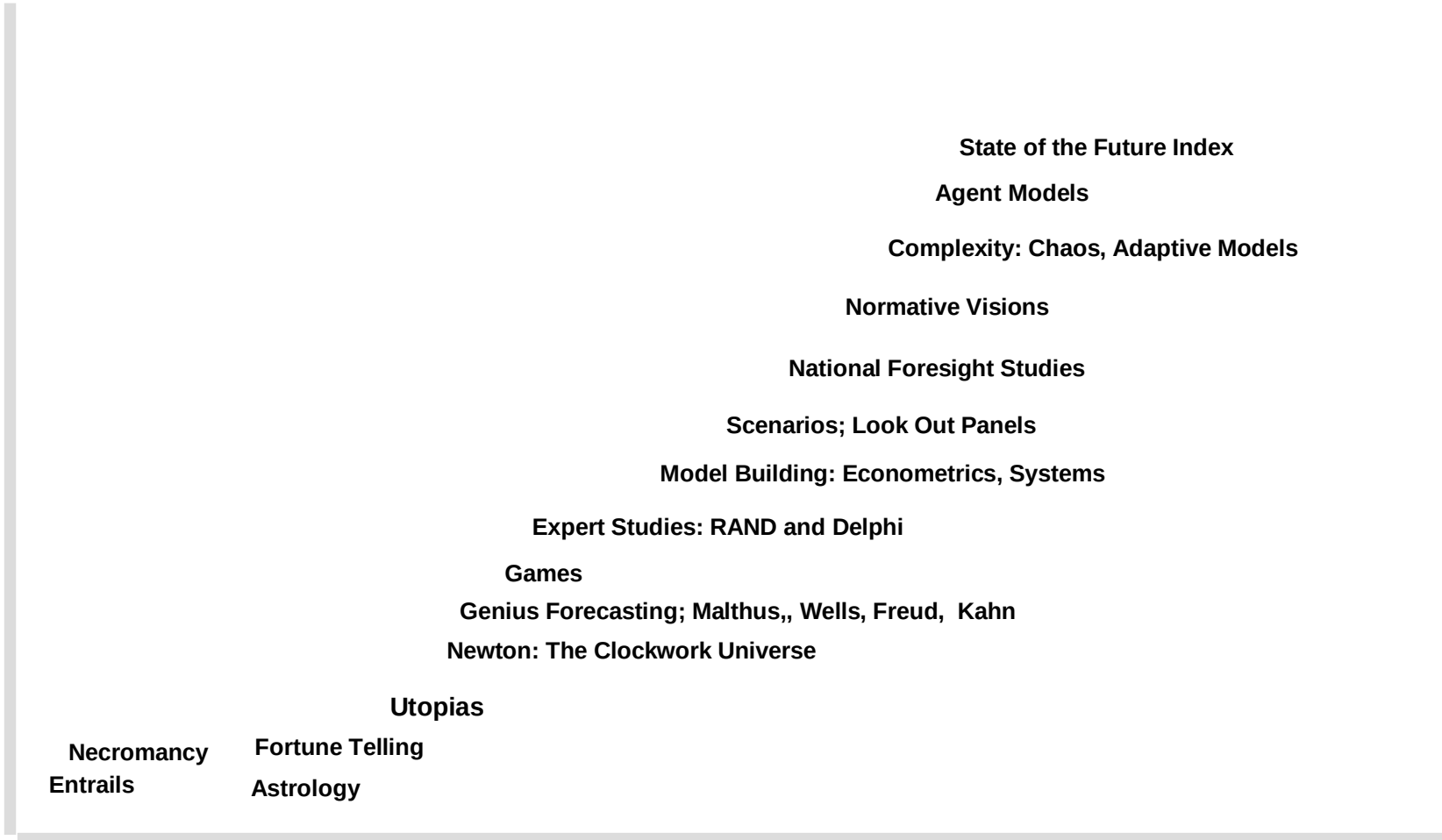
The Evolution of Future Studies



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The S&T Management Study

- ***Year 1: What are the important science questions? What are some answers?***
  - Method: Attaché meetings and 2 round questionnaires
- ***Year 2: Implications of the first year's results for S&T management.***
  - Method: Policy-maker interviews
- ***Year 3: Create scenarios to make the policy consequences explicit.***
  - Method: Scenarios; 2 round questionnaires

Some Key S&T Questions

- How can S&T help improve the human condition?
- What research has the greatest potential risks?
- What are some seminal scientific developments?
- What catastrophes can science help avoid?
- How can science become a more important part of decision process?
- How can interdisciplinary research be strengthened?

- How can ethical consequences be more thoroughly considered in S&T management?

How can S&T help improve the human condition?

	Importance	Likelihood
Cheap, efficient, benign, non-nuclear fission and non-fossil fuel.	4.38	2.98
Simple, inexpensive, effective medicines and delivery systems	4.27	3.48
Improving the efficiency of water use in agriculture by 75%.	4.21	3.44
Climate change - understanding and solutions.	4.18	3.12
Improvements in early detection and tracking of pandemics.	4.07	3.78
Cheap, efficient, means for providing potable water from salt water	4.01	3.31
Techniques for improving waste water treatment, village sanitation.	3.91	3.54
Preserving biological and cultural diversity.	3.90	2.86
Techniques for improving agriculture, foods, forestry, and livestock	3.84	3.58
Providing inexpensive medical treatment for poor people.	3.81	2.97
Advanced computation and artificial intelligence.	3.62	3.93

What research has the greatest potential risks?

	Importance	Likelihood
Released genetically modified organisms .	4.28	3.31
Use of biotechnology to build new kinds of biological WMD	4.16	3.61
Nanotechnology weapons for killing large numbers of people.	3.88	3.04
Loss of biodiversity from marketing strategies that encourage genetically altered varieties.	3.83	3.51
Intelligent nanotechnology evolving beyond human control.	3.74	2.36
Release of substances with long-term hormonal or genetic effects.	3.74	3.38
More sophisticated military weaponry.	3.70	3.84
Internet dissemination of potentially dangerous technologies.	3.70	4.16
Commercial use of human genome information in preconception modification of somatic cells to achieve certain physical or behavioral characteristics of the child and adult.	3.63	3.41
Super intelligent and potent computer viruses/ Cyber terrorism.	3.59	3.70

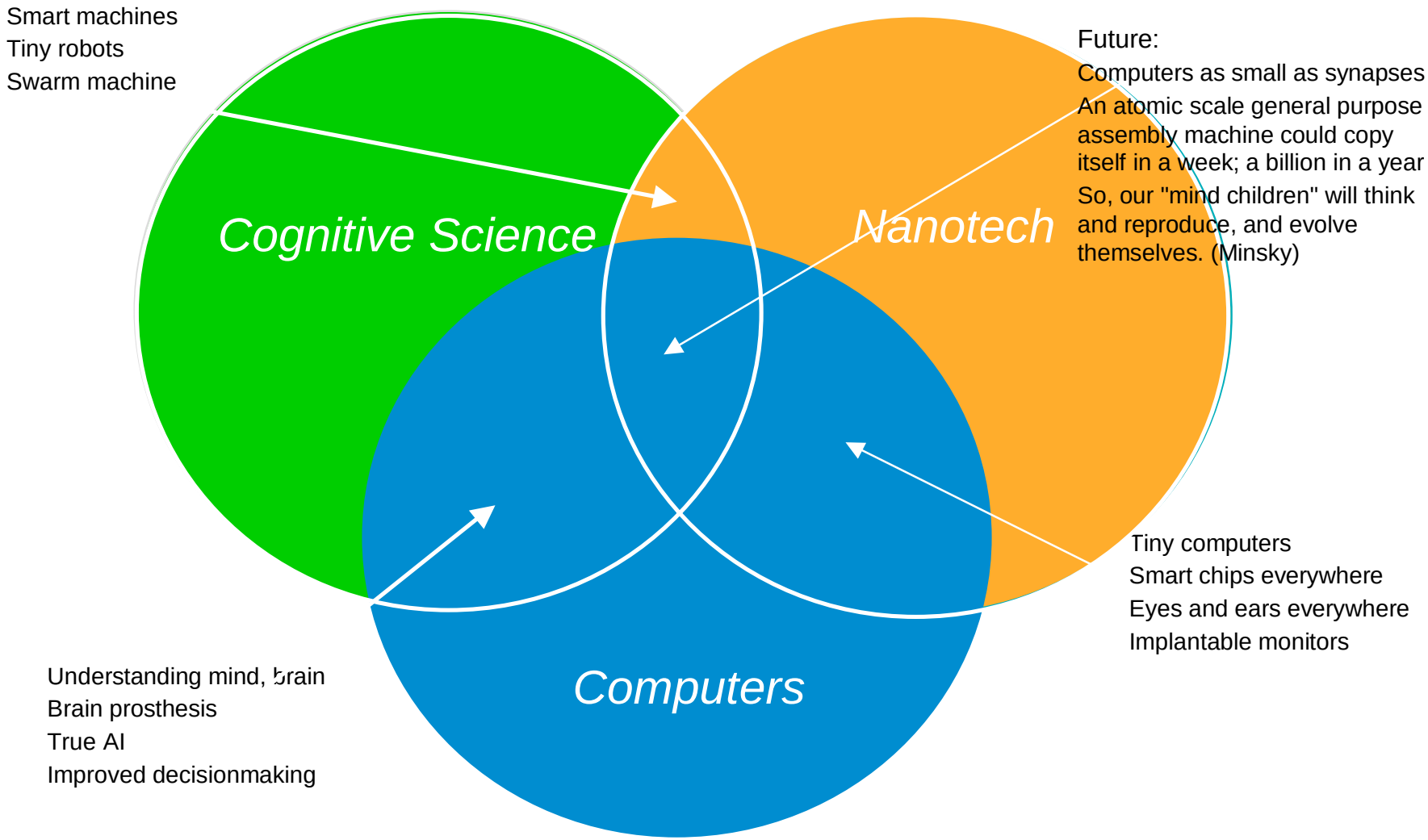
Below Some Radars

- Improving collective intelligence and reducing anti-social behavior.
- Psychological /sociobiological research on violent behavior
- Developing a science and technology of governance.
- Tailored psychotropes.
- Increased private sector control of research and development.
- Radically better understanding of quantum phenomena.
- Human appendage regeneration.
- The "final theory" linking quantum physics and relativity.
- Human-computer symbiosis, brain boosters.
- Microprobes that can be deployed in extreme environments.
- Increased use of non-rocket means of low cost space propulsion.
- Altering genomes to create new or revive old species.

Sources of Acceleration

- ***Building on prior work***
- ***Communications***
- ***Synergy***
- ***Instrumentation***
- ***Globalization***

Synergy



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Controlling S&T Risks: Two Schools of Thought

Regulations drives research underground or other countries.
Regulators cannot keep up with advances.
Educate and train scientists in ethics and self-manage risks.

Scale of impacts requires global systems to assess risks
Design regulations and enforce agreements
Dangers are global; control must be global.
Some threats should be banned, others, controlled

Four Scenarios

Scenario	Speed	Centralization Of Regulation	Public Support Of Science	Functioning of Regulation	S&T
	High	Low	Pro	Anti	Works	Fails	Accel	As now
1. S&T Develops a Mind of Its Own		X	X		X		X	
2. The World Wakes Up	X		X		X		X	
3 Please Turn off the Spigot.	X			X	X		X	
4. Backlash		X		X		X	X	

Scenario 1:

S&T Develops a Mind of its Own:

The rate of scientific discoveries and advanced technological applications explodes. A global science/ social feedback system is at work: science makes people smarter- smarter people make better and faster science. Better and faster science opens new doors to discovery- new doors lead to synergies and solving of old roadblocks. Removing the roadblocks creates new science that makes people smarter. S&T moves so fast government and international regulations are left in the dust. And so it goes.

Scenario 2

The World Wakes Up

The murder of 25 million people in the mid-2010s by the self-proclaimed Agent of God who created the genetically modified Congo virus, finally woke up the world to the realization that an individual acting alone could create and use a weapon of mass destruction. This phenomenon became known as SIMAD- Single Individual, Massively Destructive Regulatory agencies and mechanisms were put into place to control the science and technology related dangers that became apparent. Education was a big part of the answer, but connecting the educational systems with the security systems is disturbing to some people. Nevertheless, individual acts of mass destruction thus far have been prevented. International and government regulations have managed to manage the S&T enterprise.

Scenario 3

Please Turn off the Spigot

Science is attacked as pompous and self-aggrandizing, as encouraging excesses in consumption, raising false hopes, and worst unexpected consequences that can destroy us all. Particularly worrisome was accidentally or intentionally released genetically modified organisms and the potential for weapons of mass destruction. The poor were ignored. A science guru arose to galvanize the public. A global commission was established but failed because of corruption. But a new commission seems to be working. Global regulation ultimately works.

Scenario 4

Backlash

Control is low and science moves fast, but negative consequences cause public alarm. The golden age of science is hyped by the media, but it all proves to be a chimera. Some of the most valued discoveries and new capabilities have a downside and surprises abound. Terrorists take advantage of some of these shortcomings. The level of concern rises and the media, once the friend of science, now attack it. Mobs form in front of university and government research labs, as they once did in protest over globalization. Regulation fails. Progress stalls, poverty continues growing. Cost benefit and quantitative analysis fails to bring logic to regulation.

Novel Scenario Concepts

- Agent of God (AOG) (a SIMAD)
- "Unplug-and-Relax" movement
- Connecting education with security
- Corruption in S&T regulatory agency
- Early detection of intolerance
- Electronic psychotropes: escape but entrapping
- Entertainment/ education systems including "You Were There"
- International focus: human security
- Global projects for energy, water, and diseases
- Memes (influential contagious ideas) for tolerance and to stamp out stupidity
- Rise of neo- McCarthyism in science
- Scientist's Oath
- Nanotech viruses
- "Off switches": nano and genome
- Policies for control of publication of dangerous research findings
- Principles of Inviolability of Science autonomy
- Telomerase dispersal as a weapon
- Public participation in S&T debates
- UN Security Council intervenes in S&T
- Uneasy relationship between SIMAD prevention and transnational organized crime.
- Utilizing artificial intelligence programs to minimize corruption in organizations

Key Scenario Questions

Question
Are increases in collective human-machine intelligence plausible?
Will regulatory organizations fail to keep pace with advances?
Is it plausible that WMD will be available to single individuals?
Is it plausible that advances in cognitive science, information technology, and new educational systems will improve tolerance?
Is it plausible that international systems will be established to monitor and regulate, with enforcement powers?
Is it plausible that international S&T treaties and regulations will have provisions for police enforcement or military intervention?
Can S&T regulators and commissions be virtually corruption free?
Is it plausible that an anti-science movement will be as or more powerful than the environmental movement?
When extreme consequences are involved, can cost-benefit tradeoffs be logically made?
Might scientists in the future unite into a global labor organization?
Can science disciplines effectively self-regulate?

Good Bet Science Policies

- Consider SIMAD
- Make unintended consequences explicit
- Develop mitigation strategies in parallel
- Each level of management should take responsibility
- High level organizations should engage in risk analysis
- Include public participation in priority setting
- Explore alternative institutional forms to minimize the chances of impeding innovation, promote sharing the benefits globally, minimize risks, operate without corruption and with wisdom
- Teach science ethics

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Methods Frontiers

- ***On the Horizon***
  - Questioning Reductionism
  - Social Epidemiology
  - Computaria
  - Analysis of Systems Near Chaos
  - Decisionmaking in Uncertainty
  - Probing the Depths of the Unknown

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