

The Debate over Synthetic Biology

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Center for International and Security Studies at Maryland
Biosecurity Workshop
Marriott Inn and Conference Center
College Park, Maryland – October 1-3, 2010

www.synbiosafe.eu

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Editors

Synthetic Biology

*The technoscience and
its societal consequences*




 Springer

◎ Chapters on:

- History
- Subfields
- Ethics
- Safety
- Security
- Governance
- IPR
- Role of CSOs

www.dual-usebioethics.net


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Dual-Use Bioethics


Dual-Use Bioethics

The advance of the life sciences and biotechnology has the potential to bring great benefits to humankind through responding to societal challenges. However, it is also possible that such advances could be exploited for hostile purposes, something evidenced in a small number of incidents of bioterrorism, but more particularly by the series of large-scale offensive biological warfare programmes carried out by major states in the last century. Dealing with this challenge, which has been labelled the 'dual-use' dilemma requires a number of different activities. However, one of the essential ingredients in ensuring that the life sciences continue to generate great benefits and do not become subject to misuse for hostile purposes is a process of engagement between scientists and the security community and the development of strong ethical and normative frameworks to compliment legal and regulatory measures that are being developed by states.

This website is tied to the collaborative, interdisciplinary project on building a sustainable capacity in dual-use bioethics, which has been funded by the Wellcome Trust. The project brings together a number of leading experts from different fields, including Professor Malcolm Dando and colleagues at the University of Bradford's Department of Peace Studies, Dr Brian Rappert in the Department of Sociology and Philosophy, University of Exeter, Dr Alexander Kelle in the Department of European Studies, University of Bath and Dr Michael Selgelid of the Australian National University. The website provides a wealth of material related to dual-use bioethics, 'biosecurity' and biological weapons control. Specifically, the website includes the following:


- Academic Publications related to dual-use bioethics;
- Policy material and presentations related to dual-use bioethics;

Latest Activities



Posters and Presentations to the Biological and Toxin Weapons Convention Meeting of Experts, Geneva, August 2010.

Latest Event



Dual-Use Education for Life Scientists: Mapping the Current Global Landscape and Developments
ESRC-JSPS Collaborative Seminar
Thursday 15 - Friday 16 July, 2010

Overview

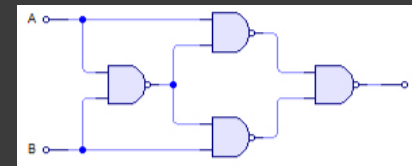
- Synthetic Biology sub-fields
- Sources of SynBio biosecurity concerns
- Bio-security debate in SynBio
- 5P governance matrix
- Precaution as guiding principle
- Conclusion

Subfields of contemporary SynBio

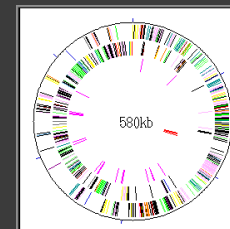
1. DNA Synthesis



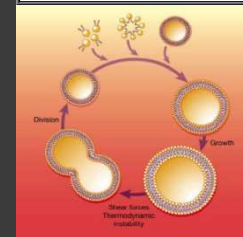
2. DNA based bio-circuits



3. Minimal genome



4. Protocells



5. Chemical SB



Why worry about SynBio?

Scientific Breakthroughs in ...	When	Misuse
Bacteriology	1890s	Offensive BW sabotage programmes during WW-I
Aerobiology	1940s-1960s	Mid-century offensive BW programmes
Virology	1960s-1980s	Late Cold War offensive BW programmes
Genetic engineering	1980s onwards	Post Cold War Soviet offensive BW programme
Synthetic Biology	2010 onwards	????

Biosecurity Risks of SynBio

- ⦿ Synthesis of known pathogenic viruses
- ⦿ Design of “super-pathogen”
- ⦿ Synthesis/attribute modification of living cells
- ⦿ Synthesis of modular transporters for targeted delivery of threat agents
- ⦿ Bioengineered production of toxic agents

Source: UNICRI experts group report, 2010

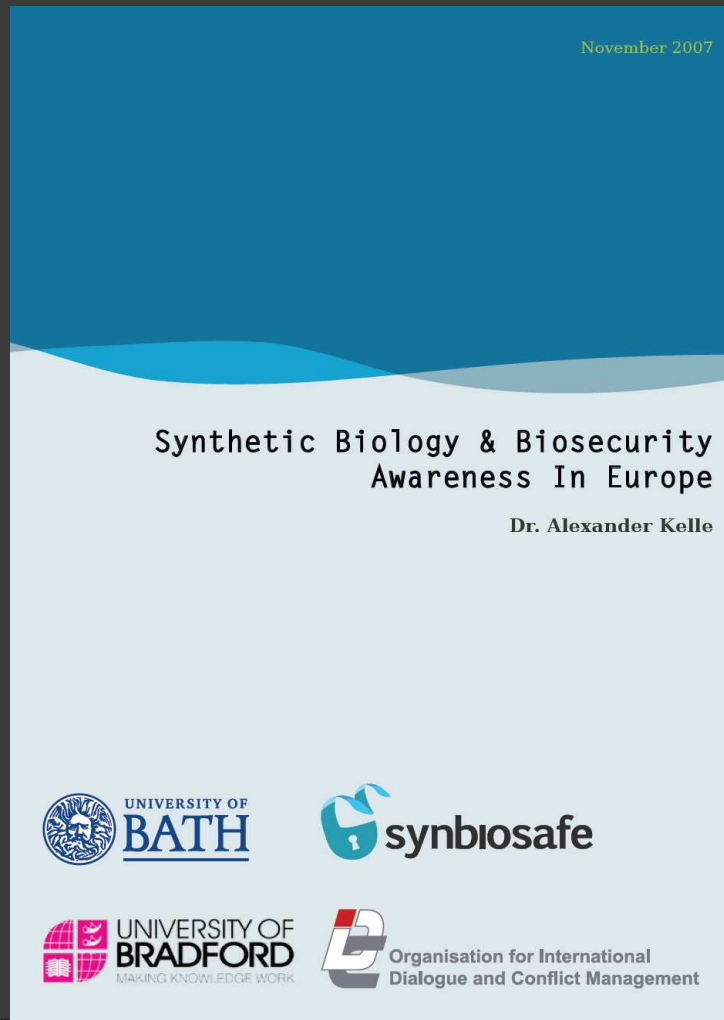
Biosecurity Debate in SynBio - 1

- ◎ George Church (2004)
 - Proposes DNA order screening and DNA sequencer licensing
- ◎ Synthetic Biology 2.0 (May 2006)
 - draft declaration, attacked by CSOs
 - attempt to establish DNA order screening
- ◎ Lemon-Relman Committee report (2006)
 - Defines four categories of research
 - Identifies SynBio as area of concern

Biosecurity Debate in SynBio - 2

- ◎ CSIS-MIT-Venter report (2006)
 - Focus on synthetic genomics, not synthetic biology
 - Mixed aims incl. environmental protection, costs, ...
- ◎ ICPS (paper by Bügl et.al. 2007)
 - Proposes a “tiered DNA synthesis order screening process”
 - Companies to interface with government agencies
- ◎ IASB code of conduct (2009)
 - Defines screening of orders and customers as good business practice

Establishing dual-use bio-security awareness



- Question:
What is the level of bio-security awareness of SynBio practitioners in Europe?
- Answer:
Low level of awareness of relevant milestones in bio-security discourse

5P governance matrix

Dual-use governance measures	Policy intervention points				
	Principal investigator	Project	Premise	Provider / Purchaser	Public
Awareness raising					
Education / training					
Codes of conduct					
Regulation					
National laws					
International treaties					

Precaution as guiding principle

- PP for dual-use life-sciences research:
“When and where serious and credible concern exists that legitimately intended biological material, technology or knowledge in the life sciences pose threats of harm to human health and security, the scientific community is obliged to develop, implement and adhere to precautionary measures to meet the concern.”

Kuhlau et.al. 2009, 8

Summary

- Dual-use potential of SynBio is not limited to DNA synthesis
- Dual-use awareness in SynBio community needs to be improved.
- Most SynBio governance proposals / activities addressing potential misuse are guided by precautionary reasoning.
- Precautionary principle not yet applied in conscious or systematic manner.

Scientific Uncertainty

‘Science thrives on uncertainty. The uncertainty of how genetic traits were replicated led eventually to discovery of the double helix molecular configuration. Indeed, one might argue that it is *certainty*, rather than uncertainty, that impedes science...

The normal state of affairs in science is unsettled and uncertain, and no amount of new research will completely eliminate uncertainty. As earlier questions are answered, new questions appear.’

Pollack, *Uncertain Science ... Uncertain World*, 2003