

* **Synthetic Biology: Scientific Progress or Ethical Dilemma?**

A symposium presented by the IUPS Ethics Committee

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* “The engineering of biology: the deliberate (re)design and construction of novel biological and biologically based systems to perform new functions for useful purposes, that draws on principles elucidated from biology and engineering.”¹.

* Synthetic Biology

1. ERASynBio: <http://www.erasynbio.eu/index.php?index=32>

- * Merges disciplines: mathematics, biology, engineering, chemistry, physics and computer science
- * Tackles challenging medical problems providing both health and economic benefits
- * Targets biotechnologies with specific and less expensive approaches
- * Creates applications in diagnostics, therapeutics, vaccines, biomaterials, biofuels, etc.



Dr. Francois Kepes, Research Director
Systems & Synthetic Biology, CNRS
Epigenomics Project, Genopole®

*The Science

- * Synthetic biology will be
 - * a rational approach for engineering tissues and nano-technology
 - * the basis for constructing non-invasive or permanently implanted biomolecular sensors coupled to biomolecular calculators and curative technologies that will be able to synthesize desired remedies on the spot
- * Gene sequencing will be routine

* Vision for the 21st Century

- * How should these new technologies be regulated and managed?
- * What are the appropriate governance structures that will advance the benefits and safeguard society?
- * Who should be involved in developing oversight?

* Ethical Considerations

- * The technology:
 - * A means of studying very bad diseases and disorders in less complex organisms therefore potentially reducing the use of whole animal research by conducting studies in simpler systems
- * The concerns:
 - * 'Humanizing' animals in the course of biomedical research
 - * Potential to increase animal suffering by transferring harmful human disorders to non-human animals
- * International Oversight and Guidance (International Council for Laboratory Animal Science):
 - * Assess the degree to which the level of harm inflicted on animals is mitigated by significant beneficial findings
 - * Animal research which adheres to the 3-Rs principle: reduce, refine and replace



Professor Tom Baldwin
Department of Philosophy,
University of York

* Animal Issues

International Concerns

- * Biosafety and biosecurity in access and ownership of biological materials and innovation
- * Synthetic biology being used for the benefit of humankind

* IP and Ownership

- * The products:
 - * Strings of nucleotide sequences; new drugs; biological scaffolding
- * The Challenge:
 - * Protectionism vs Enabling key technologies
- * The Approaches:
 - * IP protection to open-source
- * The Future:
 - * New legal entity(ies) to address new concepts in biology and biotechnology



* Intellectual Property

Dr. Djims Milius, Academic Associate
Department of Human Genetics,
Faculty of Medicine, McGill University

- * Defining the resource:
 - * Synthetic biology organisms as a form of genetic resource - International Convention of Biological Diversity
- * Ownership strategies:
 - * State sovereign rights based with national governments
 - * Free access approach favoring those with the ability to access
 - * Common heritage of mankind approach involving universal management
 - * IP rights based on patent law



Dr. Catherine Rhodes, Research Fellow,
Institute for Science, Ethics and Innovation,
University of Manchester

* Ownership

- * The important role of non-scientists in technoscientific decision-making bodies - a collective responsibility in oversight
- * Helping society understand new science
 - * Issues raised by synthetic biology have an impact on the entire biomass, from single cells to biofuels
 - * Projects have social, ecological and economic consequences
 - * Revolutionizing the science of biology itself



Dr. Dorothee Benoit-Browaeyns
Déléguee générale de VivAgora
Paris, France

* Society

- * The introduction of Synthetic Biology techniques in physiological studies offers -
 - * the excitement of innovation and discovery
 - * the challenges of providing safeguards for its impact in order to become a resource for all
- * Advancement of the science will require involvement at all levels of society and governance will include national and international participation

* Concluding Remarks



Speakers and members of the IUPS Ethics Committee in attendance (from left to right):

F. Kepes, T. Baldwin, P. Moody-Corbett, C. Rhodes, T. Godfraind, D. Browaeys-Benoit, D. Milius, A. Anand

Details of the symposium are available in the accompanying article