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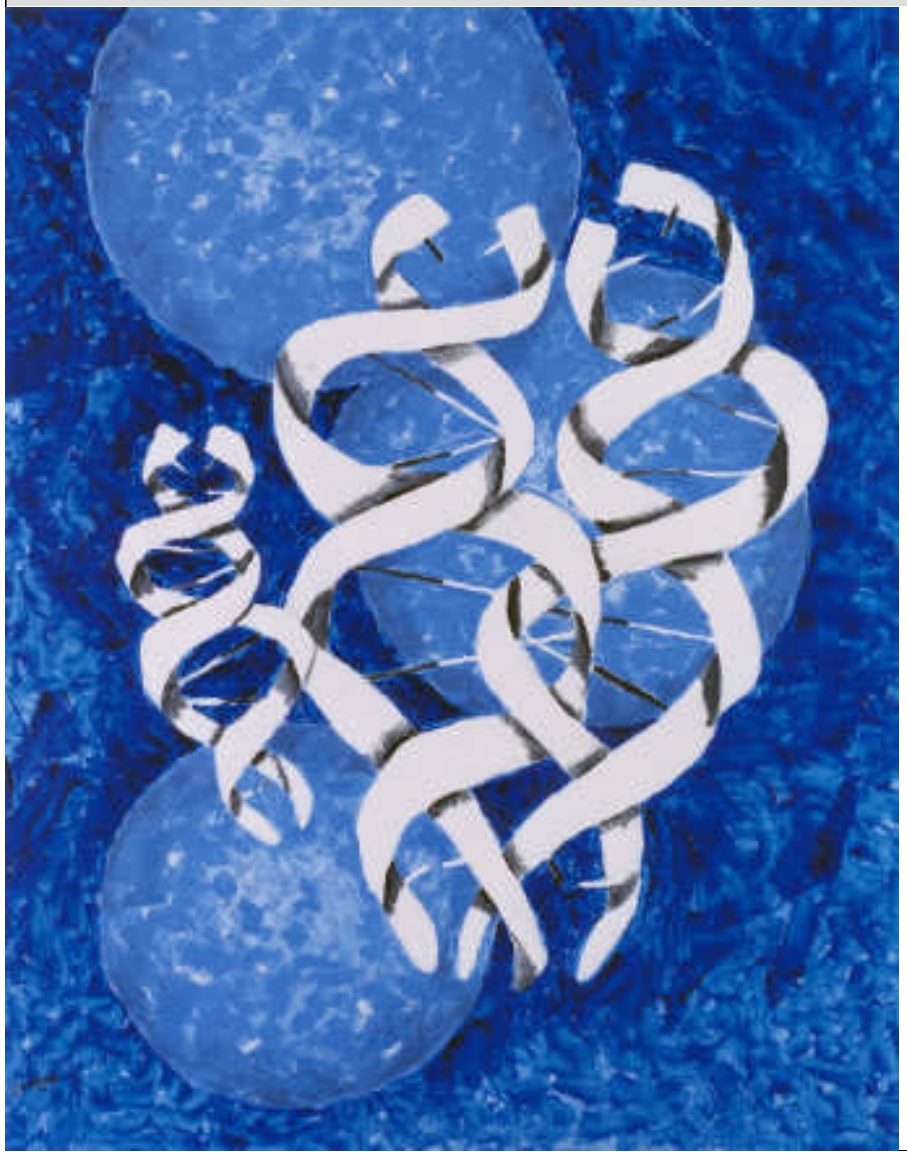

Moral obligations for synthetic biology research

Stefan Eriksson,

Associate Professor in research ethics

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The worry

- Dual use: malicious uses such as using a pathogen for terrorism. Cf. the Swedish security service is worried that foreign agents have too easy access to Swedish research (biosecurity)
- Unintended consequences from the environmental release of synthetic organisms (biosafety):
  - We lack experience
  - the results seem inherently rather unpredictable
  - mistakes couldn't be retracted
    (Gregory Kaebnick, Hastings Center for Bioethics)
- Novel technologies: a fear of future scientific possibilities to "create life" or transcend boundaries of man and nature (bioethics)
- Patent and IPR issues (justice, access, and morality clause)

Nothing inherently new!

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Two responses: 1) A proactionary framework (Parens et al. 2009)

- Enthusiasm for new technology and for seeking new knowledge
- Scientific freedom trumps other concerns
- Burden of proof on pessimists
- But runs the risk of having no control over the ‘over-enthusiastic’: ”After all, I am a warrior. Competitive and without compromise. My view is that I can do anything, and do it better than anyone. Every time.” *(Milena Penkowa)*

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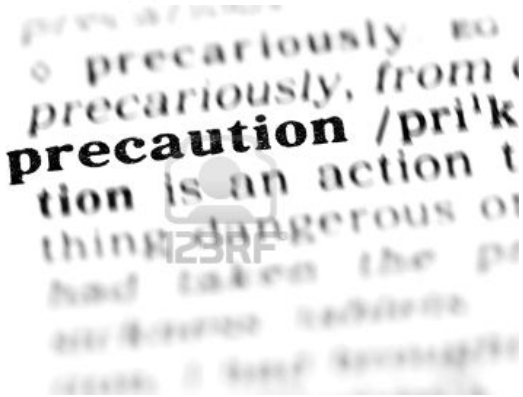
2) Precautionary framework



- Where an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically
- It is the proponent of an activity who bears the burden of proof
- Moratoriums, strict regulations, oversight mechanisms…
- Critics claim that the possible outcome of such procedures will be:
- a risk of overregulation,
- increased bureaucracy, and
- possible infringement on scientific freedom, including constraints on the dissemination of research results

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The ethical balance

- "We felt that, given the promise of synthetic biology to provide new vaccines, such as the artemisinin being developed that could save hundreds of thousands in Africa from malaria, the cost of waiting was just too high" (…) "over time research in synthetic biology may lead to new products for clean energy, pollution control, and more affordable agricultural products, vaccines, and other medicines." *(US Commission, 'New directions' report to the President)*

- And the promise might extend further…
- And - we already have a balancing system in place

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The recognition that..

”Responsible conduct of synthetic biology research, like all areas of biological research, rests heavily on the behavior of individual scientists. Creating a culture of responsibility in the synthetic biology community could do more to promote responsible stewardship in synthetic biology than any other single strategy.” *(US Commission)*

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Doesn't look promising…

"It has become obvious that most scientists in Sweden are unaware of existing regulations, are not accustomed to reflecting upon possible malicious uses of their results, and lack a readiness for assuming responsibility for their work"

(Helgesson & Eriksson: Four Themes in Recent Swedish Bioethics Debates, *Cambridge Quarterly of Healthcare Ethics* 2011, 20:409-417)

"Scientists have one overriding value, and that is the…pursuit of new knowledge"

"graduate students…don't stop to think about what's the potential impact of this particular set of experiments"

(Weir L, Selgelid, MJ: Professionalization as a governance strategy for synthetic biology, *Syst Synth Biol* 2009, 3:91-97)

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Codes outlining obligations, etc.

- Code of Ethics against Misuse of Scientific Knowledge, Research and Resources (International Union of Microbiological Societies)
- The IASB Code of Conduct for Best Practices in Gene Synthesis (International Association of Synthetic Biology)
- Statement on Biosecurity (InterAcademy Panel)
- Resnik & Shamoo: Bioterrorism and the Responsible Conduct of Biomedical Research, *Drug and Development Research* 63:121–133 (2005)

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What the codes say

- Prevent use of microorganisms as biological weapons, protect the public's health, and to promote world peace
- Preventing bioterrorism and the proliferation of bioweapons
- A duty to advocate for research to respond to bioterrorism

Surely these are too general in assigning responsibility and too non-specific in describing it..

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What we need:

- To distinguish kinds of obligations
- To distinguish the conditions for reasonable obligations
- To distinguish various duty bearers

This will make clear the basis for assigning obligations and give criteria for when they are reasonable

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Kinds of obligations

- Moral obligations: arises from universal moral norms
- Professional obligations: arises from the profession's ideals (duties as a function of having special knowledge)
- Employee obligations: arises from one's work assignments (duties as a function of having a particular position)

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Conditions for reasonable obligations

- Obligation is motivated by one's role
- Obligation is within one's capacity and ability (power to do it, freedom to do it, legality)
- Consequences of action are reasonably foreseeable
- To carry out obligation seems to promote more benefit than harm
- The desirable outcome is not more easily achieved by other means
- The non-desirable outcome is not more easily achieved by other means (anthrax)

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A need to assign the obligations to specific duty bearers

- You as a moral person (everyone should do x)
- You as a professional (*e.g.* all biologists should do x)
- Someone in the collective (someone belonging to group y should do x)
- The collective (y should do x)

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Possible obligations 1: moral

- To sound the alarm when confronting immediate hazard or risk
- To give up some integrity when precaution is motivated – when working on select agents (*e.g.* video supervision, background checks, not work alone)

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Possible obligations 2: Individual professional

- To (learn to) understand the issues
- To follow laws and guidelines, especially regarding biosafety & biosecurity
- To be prepared to blow the whistle when research might have bad consequences or be used for malicious purposes
- To actively consider whether “reliable containment and control mechanisms” should be created

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Possible obligations 3: Collective appointees

The scientific community should see to it that:

- Knowledgeable and moderate scientists engage with the public
- As well as participating in dialogue the authorities and policy makers
- That journals scan articles for potential dual-use

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Possible obligations 4: Collective

The scientific community should as a collective make sure that:

- Response research be performed
- Ethical deliberation and research accompany novel research areas
- Educational initiatives and programs for scientists are implemented
- An institutional framework for reviews is created and used

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To conclude: No use for novel measures

Even though SynBio is novel in respect to scope for scientific creativity, its open-ended nature and the potential for large-scale production (Newson 2011), we can use the existing framework:

- Common moral norms
- Bioethics education and deliberation
- Whistleblowing
- Biosafety & biosecurity measures
- Ethical review committees or IRBs

We just need to implement it!

There is, however, a need for additional measures from journals and commercial providers

Thank you!