Synthetic biology: the complexity of the policy implications

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Who am I?

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Part Types

Browse parts by projects:

iGEM 2007 | **iGEM 2006** | **iGEM 2005** | **Labs** | **Courses** | **Featured Parts**

Or browse parts by part categories:

Systems

- Measurement ?
- Measurement (Under Development) ?
- Projects(empty)

Devices

- Reporters ?
- Inverters ?
- Signalling ?
- Protein Generator ?
- Composite Devices ?
- Measurement ?

Parts

- Ribosome Binding Sites ?
- Regulatory ?
- RNA ?
- DNA ?
- Protein Coding ?
- Terminators ?
- Conjugation ?

Chassis

- E.coli Strains ?
- Cell-Free Systems ?

Mammalian

Vectors

- Plasmids ?

Other

- Yeast Parts ?
- Construction Intermediate ?
- PCR Primer ?
- Tags ?
- Other
- Deleted
- Bacteriophage T7

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The BioBricks Foundation (BBF) is a not-for-profit organization founded by engineers and scientists from MIT, Harvard, and UCSF with significant experience in both non-profit and commercial biotechnology research. BBF encourages the development and responsible use of technologies based on BioBrick™ standard DNA parts that encode basic biological functions.

Using BioBrick™ standard biological parts, a synthetic biologist or biological engineer can already, to some extent, program living organisms in the same way a computer scientist can program a computer. The DNA sequence information and other characteristics of BioBrick™ standard biological parts are made available to the public free of charge currently via MIT's Registry of Standard Biological Parts.

News

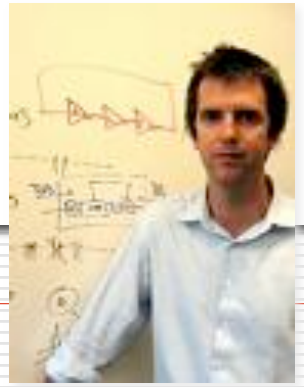
- **Technical Standards, Legal, SB4.0, and Volunteer Mailing Lists are open, sign up today!**
- **Technical & Legal Standards Workshop 2**, March 1, 2008, San Francisco, CA
- **SB4.0, Fourth International Meeting on Synthetic Biology,**

BioBricks vision

- make biology into engineering
- standard parts, plug and play, predictable behavior

"... Engineers hate complexity. I hate emergent properties. I like simplicity. I don't want the plane I take tomorrow to have some emergent properties while it is flying..."

(www.edge.org; Engineering Biology: a talk with Drew Endy, 2008)



limitations of BioBricks

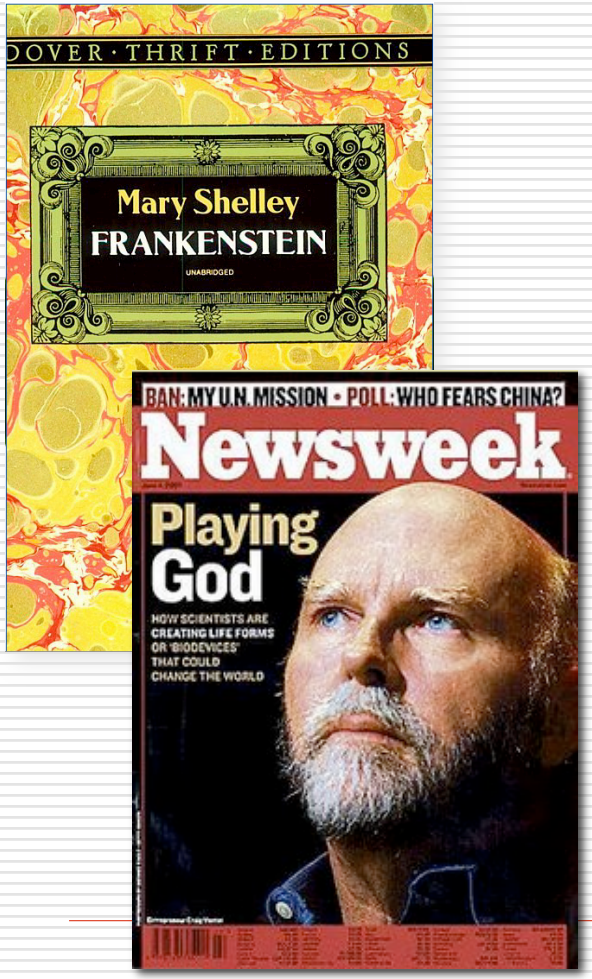
- even simple living systems are complex
  - molecules mixed together in a soup
  - nonlinearity, synergy
  - emergent properties abound

- need to remake engineering to fit biology
  - living beings are not like clocks or integrated circuits

powerful because life-like

risky because life-like

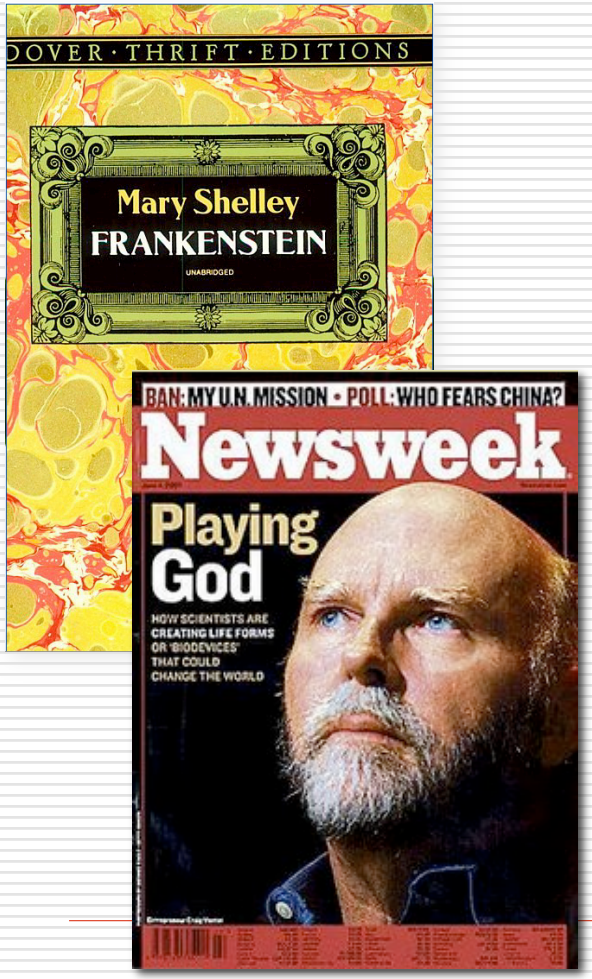
playing God



> *"We don't play."*
>
> — Hamilton Smith, responding to an interviewer asking if he and colleagues are playing God

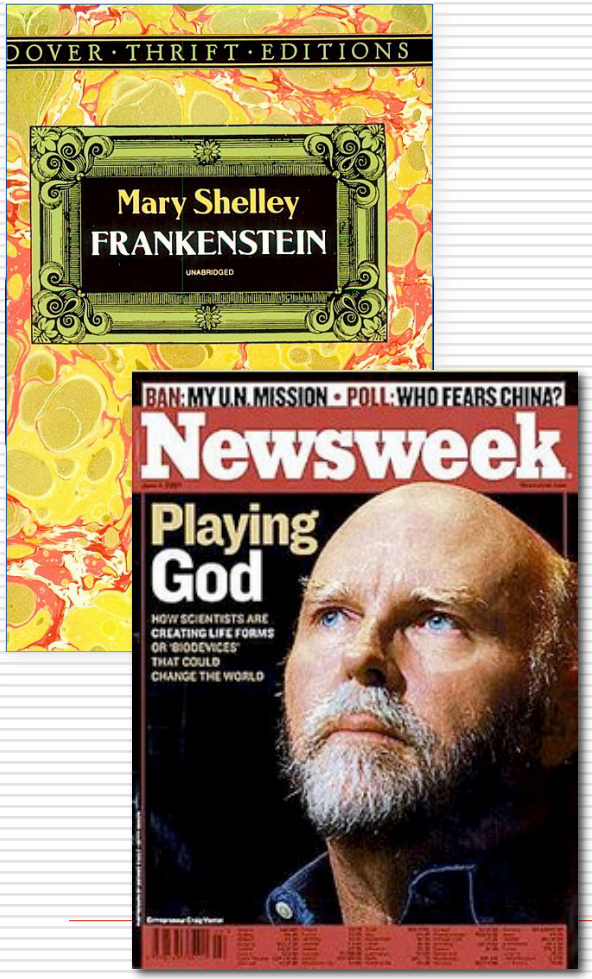
- many dismiss this worry
  - religions disagree
  - separate church and state
  - we *should* play God
  - "I don't believe in God"

playing God



- we should think twice
  - unpredictable and powerful consequences
- do we …
  - understand the consequences?
  - evaluate alternatives properly?
  - fix problems that arise?

playing God



- we should think twice
  - unpredictable and powerful consequences
- do we …
  - understand the consequences? (omniscient)
  - evaluate alternatives properly? (omnibenevolent)
  - fix problems that arise? (omnipotent)

“Don’t worry! We already know how to address any real worries!”

risk analysis

- weigh alternatives, assess uncertainties
  - maximize expected benefit/cost

risk analysis

- weigh alternatives, assess uncertainties
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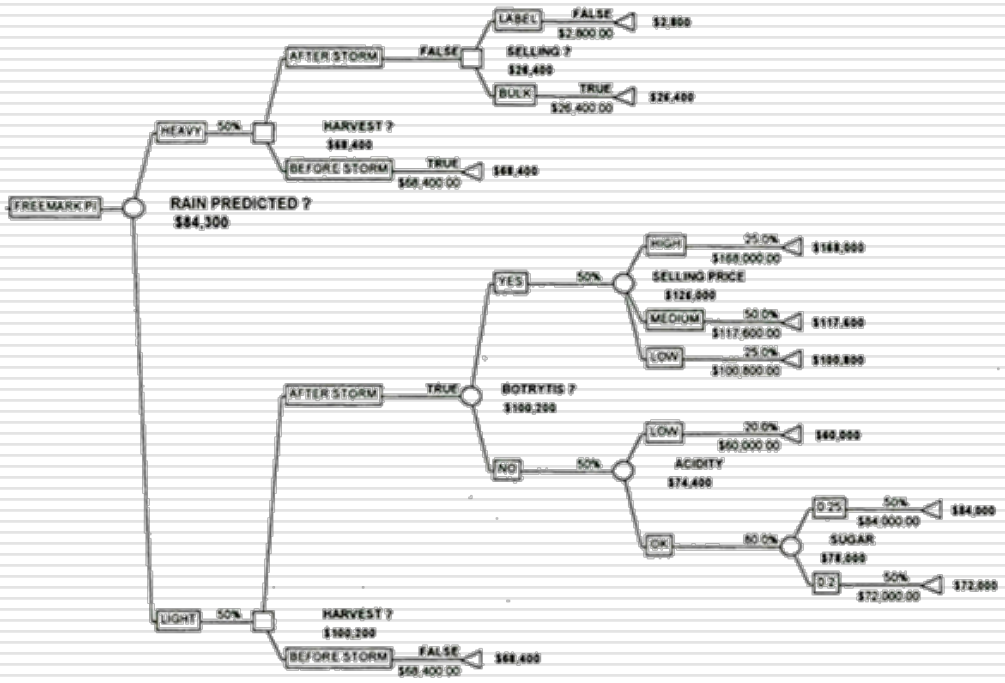
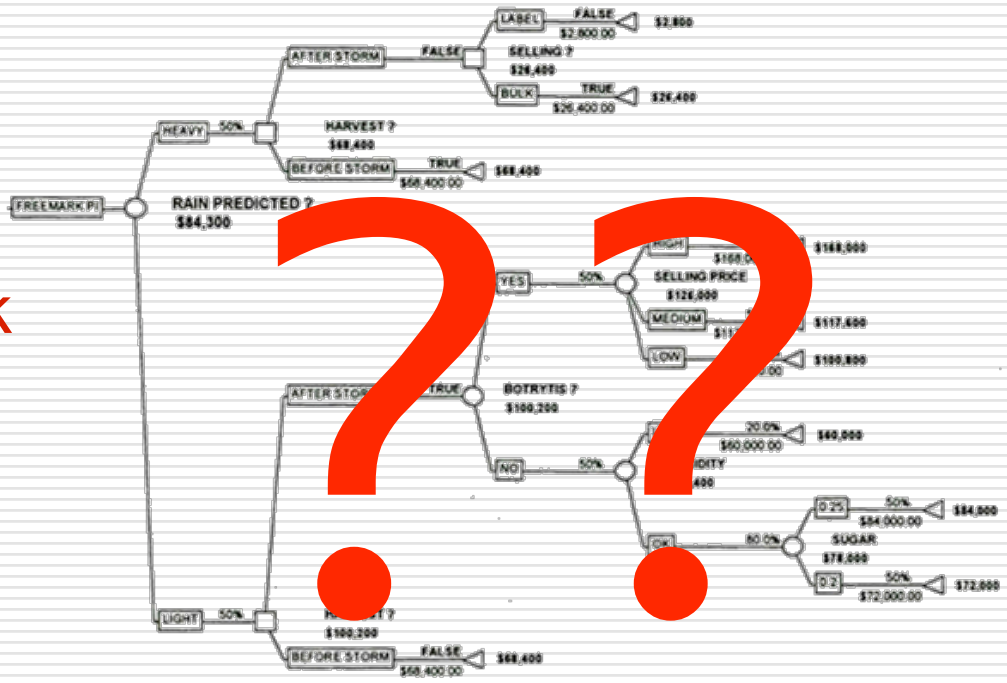


risk analysis

- weigh alternatives, assess uncertainties
  - maximize expected benefit/cost

problem

- deciding in the dark



coping with complexity

- scientists need to be engaged
  - engineering emergent systems
  - rethink risk analysis
- scientists have social responsibility
  - reform science education
  - promote informed discussion among stakeholders, policy makers, and general public