

SYNTHETIC BIOLOGY & INTELLECTUAL PROPERTY

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Introduction

Agenda

1. IP 101
2. Origins of IP
3. Engineering
4. Ethnography
5. Ethics

We took the MIT parts registry as our case study and looked at some of the justifications for development of the parts registry as well as some of the implications of the parts registry as a tool for innovation and development within the field synthetic biology.



Intellectual Property 101

Intellectual Property in the U.S.

- What is the difference between a **copyright** and a **patent**?
 - ▣ Functionality
- Who enforces copyright/patent laws?
- How long do copyrights/patents last?

Copyright

Patent

Trademark

U.S.P.T.O.

U.S.C.O.

Civil suits

IP Rights Management in Synthetic Biology

- ❑ Analogy to software industry
- ❑ Adoption of an “open culture”
- ❑ Possible strategies:
 - ❑ Copyleft licenses
 - ❑ Patents
 - ❑ Non-assertion statements
 - ❑ *Sui generis* legislation
- ❑ M.I.T.’s current strategy: Public Domain



A Brief History of Intellectual Property

- Patents as Privilege
 - “letters patent”- bestowed upon by the state
- IP and the Advent of Liberal Democracy
 - Property as the right of an individual
 - Patent as a method of protecting the IP of an individual
 - Protecting intellectual property as a way of doing business
- The Corporation as a Person
 - IP rights extended to corporations
 - Patent ownership
 - Legal protection against infringement similar those granted to individuals



ELIZABETH THE SECOND

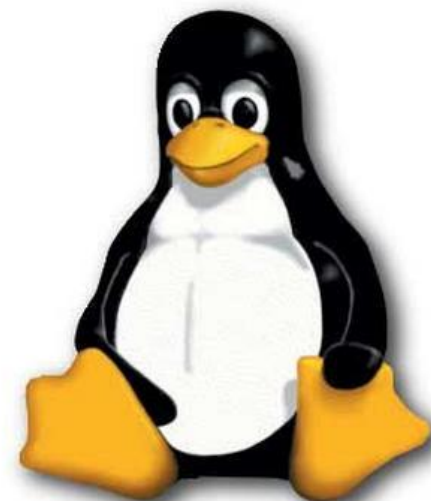
BY THE GRACE OF GOD of the United Kingdom of
Great Britain and Northern Ireland and of Our other Realms and
Territories Queen Head of the Commonwealth Defender of the Faith

To all to whom these Presents shall come greeting Wheras We did by Our Letters Patent under the Great Seal of Our Kingdom bearing date the twenty seventh day of May in the fifty first year of Our said Majesty and appointing the persons therein named to be Our Defence Council to exercise on Our behalf the functions of Our Privy Council do retain the said Statute in force and We are desirous of changing the constitution of Our said Defence Council Now therefore Knowe that We do hereby with effect from the thirtieth day of April in the fifty seventh year of Our said Majesty Our special Power bearing date the twenty seventh day of May in the fifty first year of Our said Majesty And Further Knowe that We do constitute and appoint as from the said thirtieth day of April the following persons in place of those constituted and appointed by Our Letters Patent aforesaid that is to say Our Principal Secretary of State for Defence the Minister of State for the Armed Forces the Minister of State for Defence Equipment and Support the Parliamentary Under Secretary of State for Defence and Minister for Veterans the Chief of the Defence Staff the Permanent Under Secretary of State of the Ministry of Defence the Chief of the Naval Staff and First Sea Lord the Chief of the General Staff the Chief of the Air Staff the Vice Chief of the Defence Staff the Second Permanent Under Secretary of State of the Ministry of Defence the Chief Scientific Advisor of the Ministry of Defence the Chief of Defence Materiel of the Ministry of Defence and the Finance Director of the Ministry of Defence to be Our Defence Council to decide on Our behalf the functions of Our Privy Council which have hitherto on Our behalf been exercised by Our Defence Council constituted and appointed by Our Letters Patent aforesaid and in particular to administer such matters pertaining to Our Naval Military and Air Forces as We shall through Our Principal Secretary of State for Defence direct them to execute and to have command under Us of all Officers and Ratings Soldiers and Sailors of Our Naval Military and Air Forces and for that purpose that Our Principal Secretary of State for Defence (or in the absence of Our Ministers of State aforesaid) shall be Chairman of Our Defence Council so constituted and for the business of which he shall be responsible to Us and to Parliament And the said Permanent Under Secretary of State of the Ministry of Defence shall be the Secretary of Our Defence Council Provided that Our Defence Council may appoint such other person or persons to act as Secretary or Secretaries in addition to the said Permanent



The Open Source Challenge

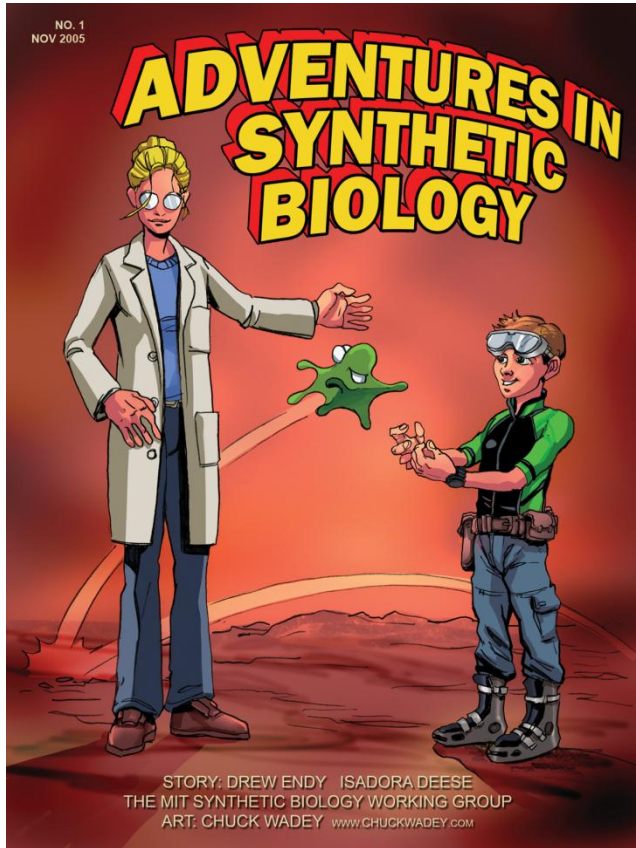
- Current practice *defeats* the original intent of patents
- Analogy to open source software as a means of encouraging innovation and competition
- Open source as a *business strategy*
 - Success of hardware companies:
 - IBM
 - Linksys
- The future of intellectual property?





Synthetic Biology as Engineering and Intellectual Property

Synthetic Biology as Engineering



Defining *synthetic biology*¹:

- I. design and construction of new biological **parts**, **devices**, and **systems**
- II. re-design of existing, natural biological systems for **useful purposes**

¹From syntheticbiology.org

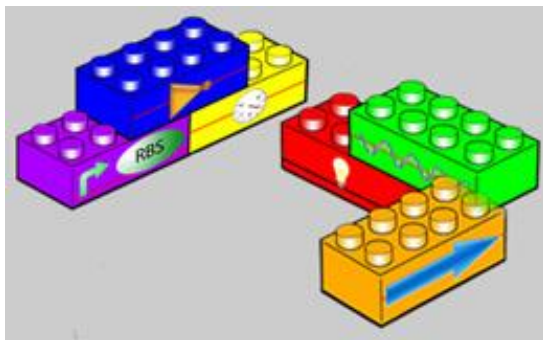
Modern Engineering Practices

PROBLEMS

- Professionalisation (Who is a synthetic biologist?)
- Language (How do you talk about synthetic biology?)
- Organization (How are decisions made?)
- Standardization (What/How/Why are standards defined?)

M.I.T.'s ANSWER

- Registry of Standard Biological Parts
- BioBricks Foundation



Registry of Standard Biological Parts

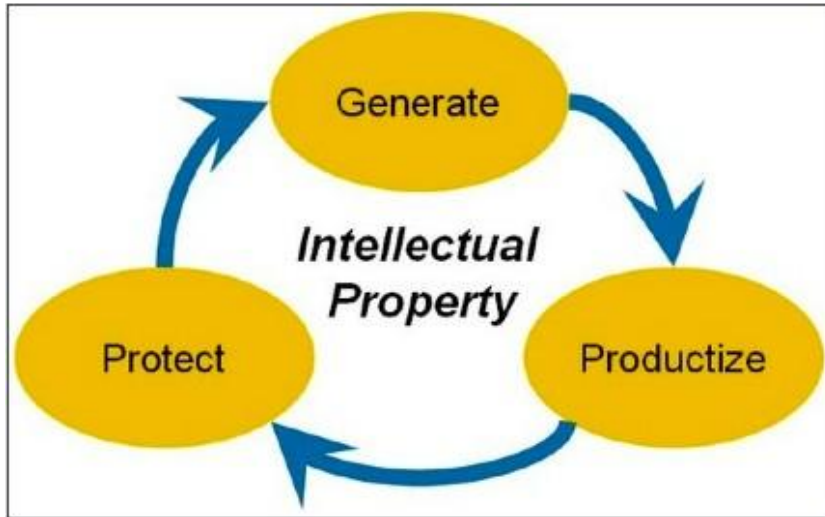
- ❑ Defines boundaries of what is synthetic biology outside of other defined areas of Molecular Biology & Biological Engineering
- ❑ As engineering, they can be successful while not fulfilling the requirements of scientific proof in the name of utility
- ❑ As a new science/engineering, they can de novo devise novel practices
- ❑ As an appeal to a modern engineering practice, it can blackbox the history and requirements of standardization



Registry of Standard
Biological Parts



IP Culture in Biotech





Interviews with the Experts

Procedure & Questionnaire

PROMPT: Please complete the background section. If you have time, please also complete as much of the Intellectual Property section as you can. If you decide to choose a few questions, please explain why you made the choice and include whether you have had direct experience or are just particularly passionate about it.

Questionnaire: Background

- 1) What is your background in science?
- 2) What is your current status as a student or professional (Graduate + Year or Post-Doc + Year or Professor + how many years have you been teaching)?
- 3) What project are you working on? Specifically which thrusts? Human practice? Parts? Devices? Chassis?
- 4) Where do you see the project in 5 years? Synthetic Biology?

Questionnaire: Intellectual Property

- 1) How are the P.I.s sharing knowledge amongst themselves within the university and outside of it?
- 2) Do you think that standardization and abstraction are the necessary steps toward building a common space for the parts registry?
- 3) Do you foresee any problems with such protocol?

Interview with Kevin Costa



Q: How are the PIs working within the center with respect to Intellectual Property?

A: *“The universities can do basic research and technological innovation in a way that companies cannot, but conversely, those same companies are much better versed at dealing with patents and intellectual property.”*

Q: How would you imagine human practices with respect to issues like intellectual property?

A: *“My thinking on this is in flux these days, and I'm coming to believe that Human Practices should not be so focused on IP. “*

Interview with Jonathan Goler



Q: Where do you see your project in 5 years?

A: *“Hopefully done and deployed.”*

Q: Where do you see synthetic biology heading?

A: *“Right now, into the dumpster, but hopefully it will work out and standardized parts and functional composability will work.”*



Interview with MaryAnne McCormick

Q: Would you say that the problem right now in framing the question of how synthetic biology is being formulated concerns the ethical standpoint of collaboration, or would the concerns be over whether such exchanges are actually feasible?

A: *“When you look at the universities structure: There are many things that scientists and technologists have to do because they are associated. Synthetic biology is very different but the same time very similar to other fields... basic research and certain structures are put in place...when a scientist signs up to be researcher they are obligated to release all of their intellectual properties. The open source registry is in alignment with the prevailing attitude that the registry is correct in confirming the humanitarian causes of the research.”*



Ethics & Business

Ethical Claim of Open Source

- ❑ Open Source and the BioBricks registry
- ❑ As a social movement (Chris Kelty)
- ❑ Merging two disciplines that are completely independent of one another as an avenue to create a new scientific discipline



Trademarking BioBricks

- What is value branding?
 - BioBricks as a value brand
 - Branding through iGEM



“A ‘biobrick’ is a type (brand) of standard biological part. The words “biobricks” and “biobrick” are adjectives, not nouns. The BBF [BioBricks Foundation] maintains the ‘biobrick(s)’ trademarks in order to enable and defend the set of BioBrick™ standard biological parts as an open and free-to-use collection of standard biological parts.”

International Genetically Engineered Machine Competition

© J. R. Brown, IGEN 2006

Global Distribution of Competing Teams





Conclusion: Great Concept...



Questions & Answers (maybe)