THE SOCIAL & CONCEPTUAL STRUCTURE OF SYNTHETIC BIOLOGY AND ITS ETHICAL DISCOURSE

Synthetic Biology

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Synthetic Biology Applications

- \circ Biological computation
- \circ Biosensors
- \circ Celltransformation
- \circ Synthetic proteins
- $\circ\,$ Designed DNA
- $\circ\,$ Space exploration
- \circ Synthetic life
- \circ Drug delivery platforms

Data

- $\circ~$ Corpus construction
 - Web of Science keyword-based query: synthetic biology and related terms (Shapira et al. 2017)
 - Synthetic biology: 15,720 publications
 - Synthetic biology ethics (synbioethics)
 - Within synthetic biology corpus, abstracts containing *ethic*, *security*, *safe*, and *dilemma*
 - 574 publications
- Networks

| Social | | Institutional | |
|-----------------|-------|-----------------|-------|
| Nodes | 2,227 | Nodes | 802 |
| Edges (coauth.) | 7,806 | Edges (coauth.) | 1,434 |



Number of Publications Per Year, 1900-2019 Source: Web of Science

Note: Vertical line denotes 1990; years without publications have no point.

SYNTHETIC BIOLOGY DOMAIN'S GROWTH

Bioethics in Synthetic Biology - Synbioethics

- Biosafety
- Biosecurity
- \circ Creation of new life forms
- \circ Regulation of new creations
- Patent management of new creations
- \circ Benefit Distribution
- \circ Research Integrity



Number of Ethics-Related Publications Per Year, 1900-2019

Note: Vertical line denotes 2007; years without publications have no point; These publications are a subset of the previous records whose abstract contains ethic*, security, safe*, or dilemma...

EMERGING SYNBIOETHICS DOMAIN



Note: Vertical line is at 2007, when the number of publications began exponential growth.

EMERGING SYNBIOETHICS DOMAIN









SYNBIOETHICS AUTHOR NETWORKS





Note: Vertical line is at 2007, when the number of publications began exponential growth.

EMERGING SYNBIOETHICS DOMAIN

Number of Unique Institutions per Year, 1900-2019

univ missouri 📃 🔵 hebrew univ jerusalem ben gurion univ negev tauri grp univ nacl autonoma mexico univ queensland univ zurich johns hopkins bloomberg sch pu biofact chonnam natl univ etc grp scripps res inst villanova univ icgeb nanjing tech univ inst adv chem catalonia iqac c european patent off natl phys lab swiss fed inst technol wuhan univ univ marburg univ lyon univ regensburg govt india blutspendedienst bayer roten k univ london imperial coll sci clin res inst montreal bundeswehrkrankenhaus hamburg borsalino hosp chulalongkorn univ anu law sch

meisei univ beijing inst biotechnol hiroshima univ univ waterloo northeastern univ karlsruhe inst technol karolinska inst baylor coll med chiba univ univ freiburg nibge cha univ_{riken} ea european acad technol & inn voto univ

> macquarie univ univ tec

univ alberta

usaamriid

caltech

mit

bist

univ bern

univ edinburgh

arizona state univ

univ manchester

chinese acad sci harvard univ

univ michigan

agroscope

univ illinois

univ washington

anim & plant hlth agcy

tech univ denmark

bgi shenzhen

SYNBIOETHICS AUTHOR INSTITUTION NETWORKS

SYNBIOETHICS AUTHOR INSTITUTION NETWORKS



Conclusions

• Noticeable lag between synbio publications and synbioethics publications

- Emerging network of author institutions
- $\circ\,$ More detailed investigations coming