



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

Synthetic Biology

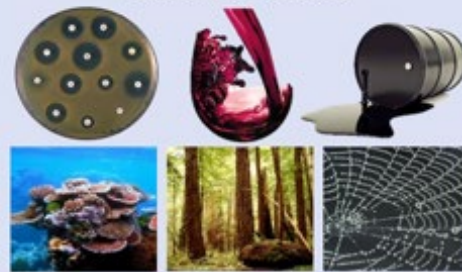
1

Biology

Organisms



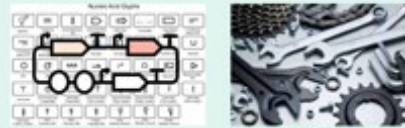
Biochemicals & Biomaterials



2

Engineering

Parts and Tools



Design Rules



Construction Standards



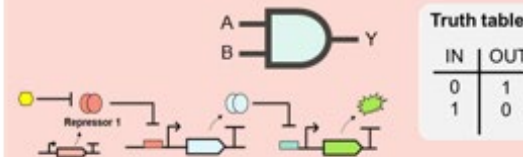
3

Applied Mathematics

Software & Automation



Computer Science



Optimization



Synthetic Biology Applications

- Biological computation
- Biosensors
- Cell transformation
- Synthetic proteins
- Designed DNA
- Space exploration
- Synthetic life
- Drug delivery platforms

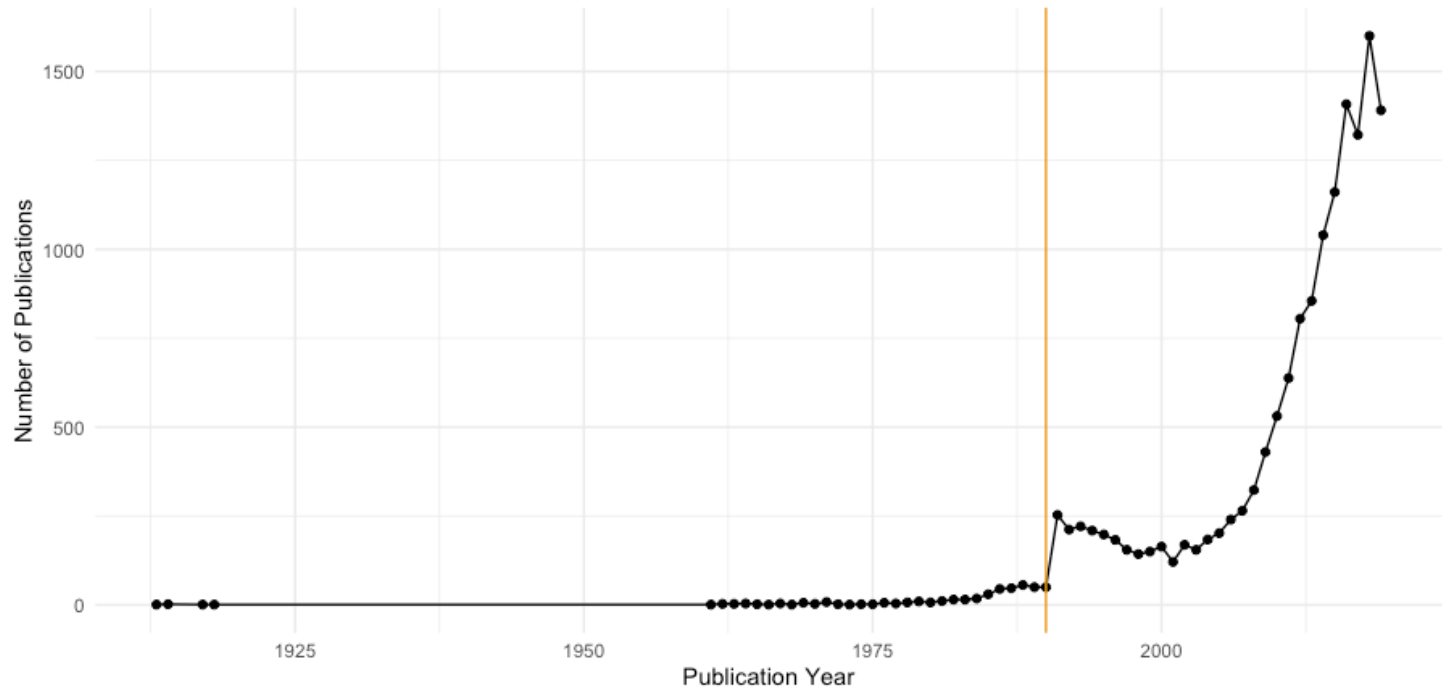
Data

- 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.

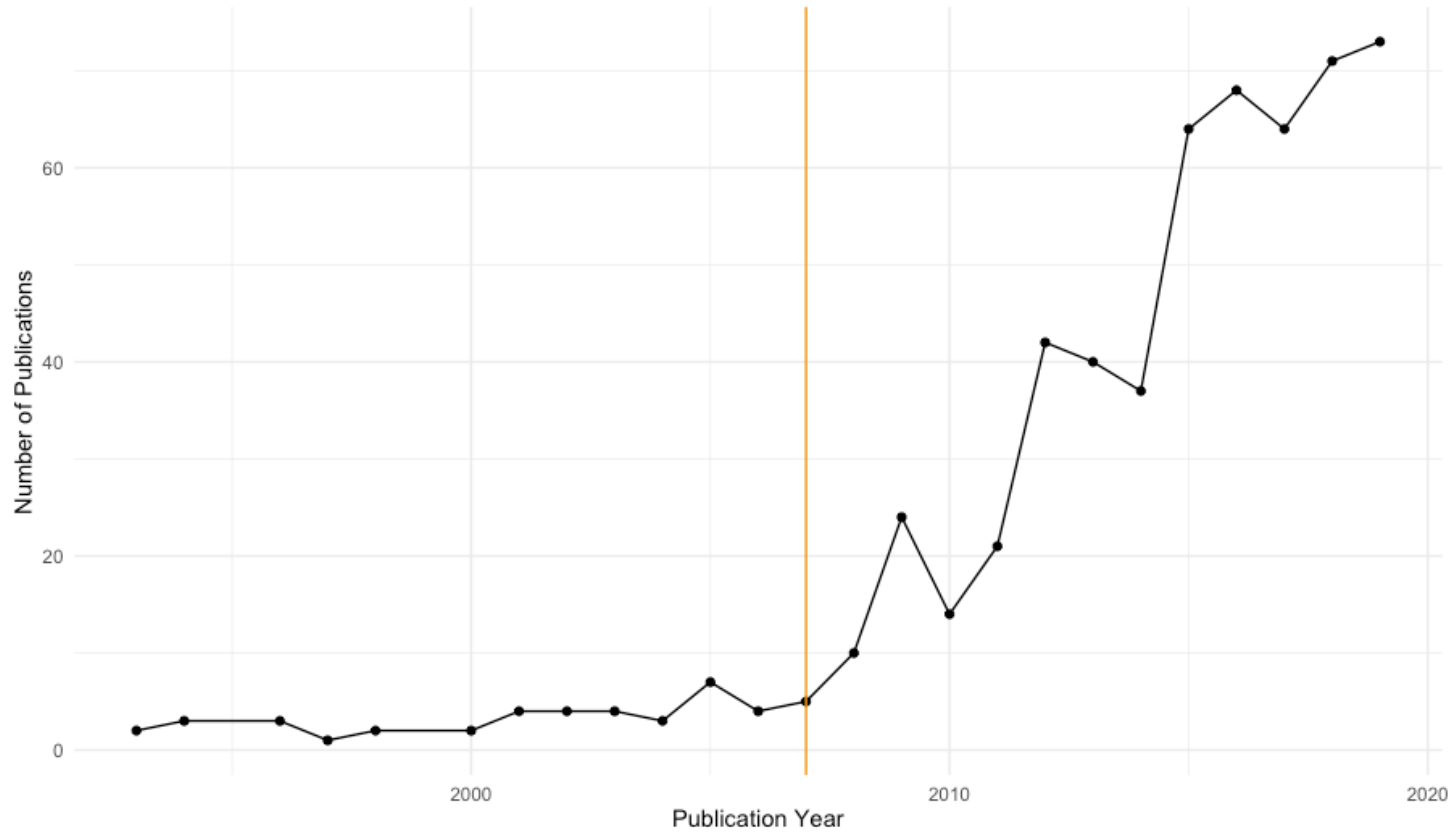
SYNTHETIC BIOLOGY DOMAIN'S GROWTH

Bioethics in Synthetic Biology – Synbioethics

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

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

Source: Web of Science



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..

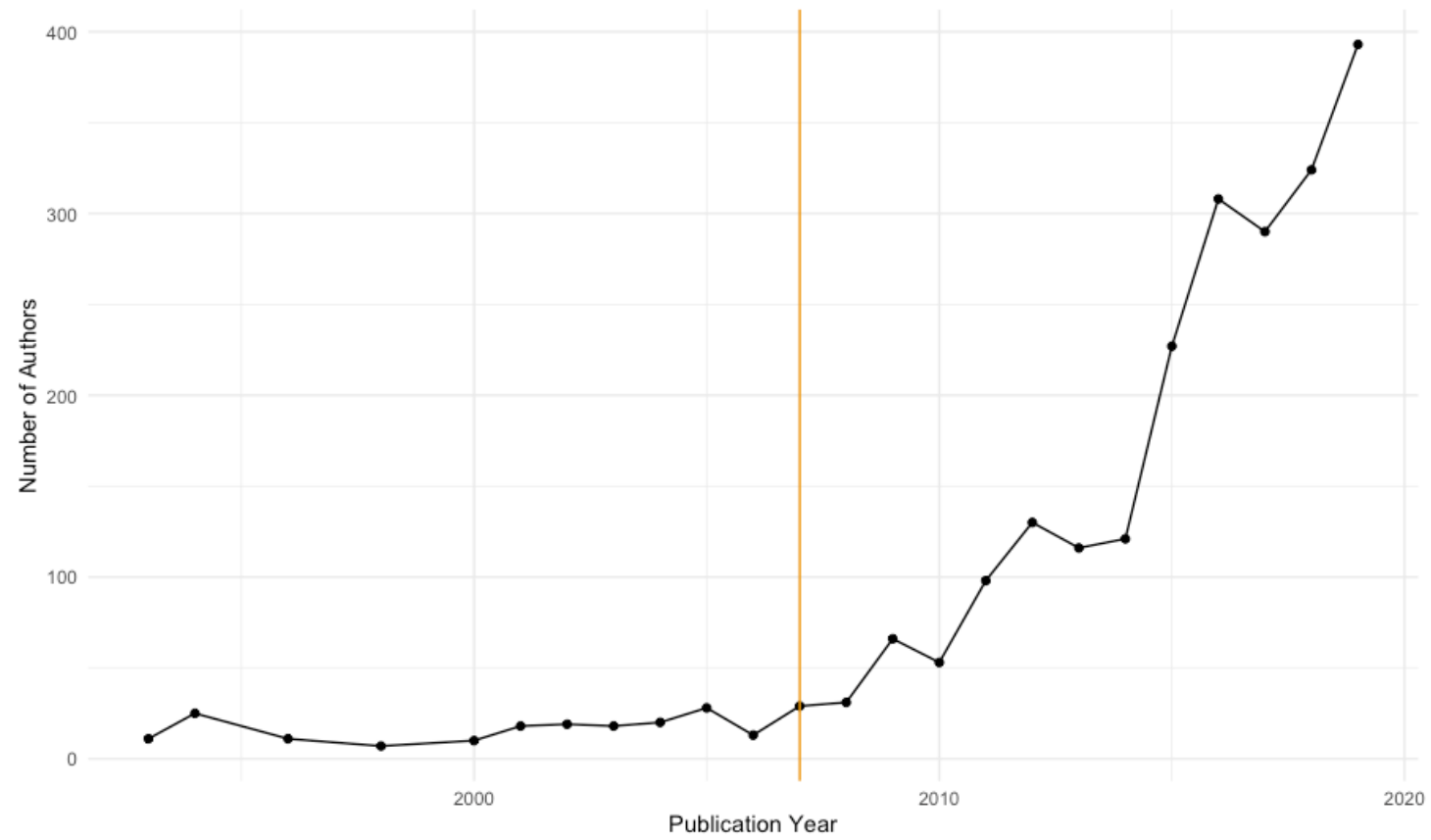
EMERGING SYNBIOETHICS DOMAIN



EMERGING SYNBIOETHICS DOMAIN

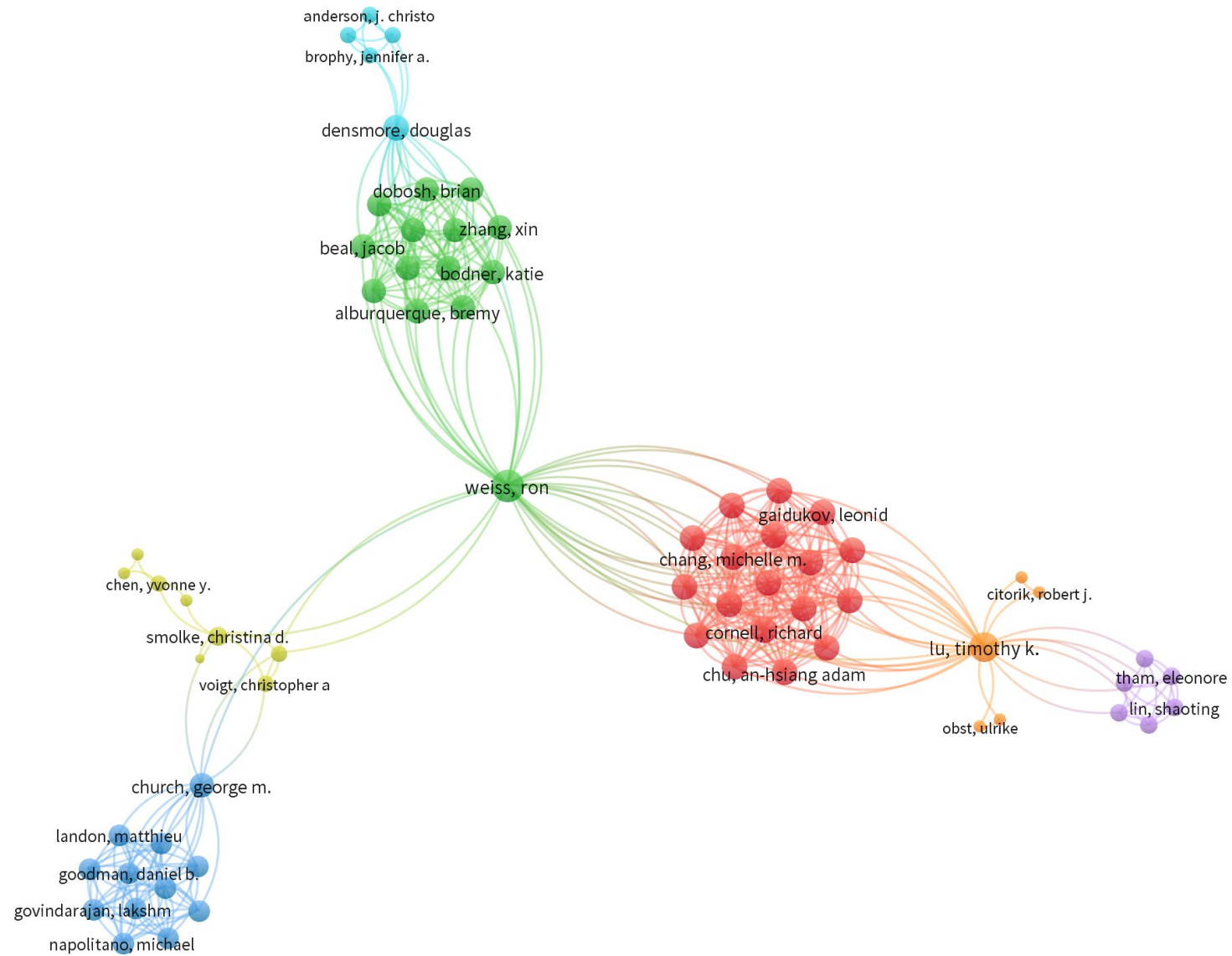
Number of Unique Authors per Year, 1900-2019

Source: Web of Science



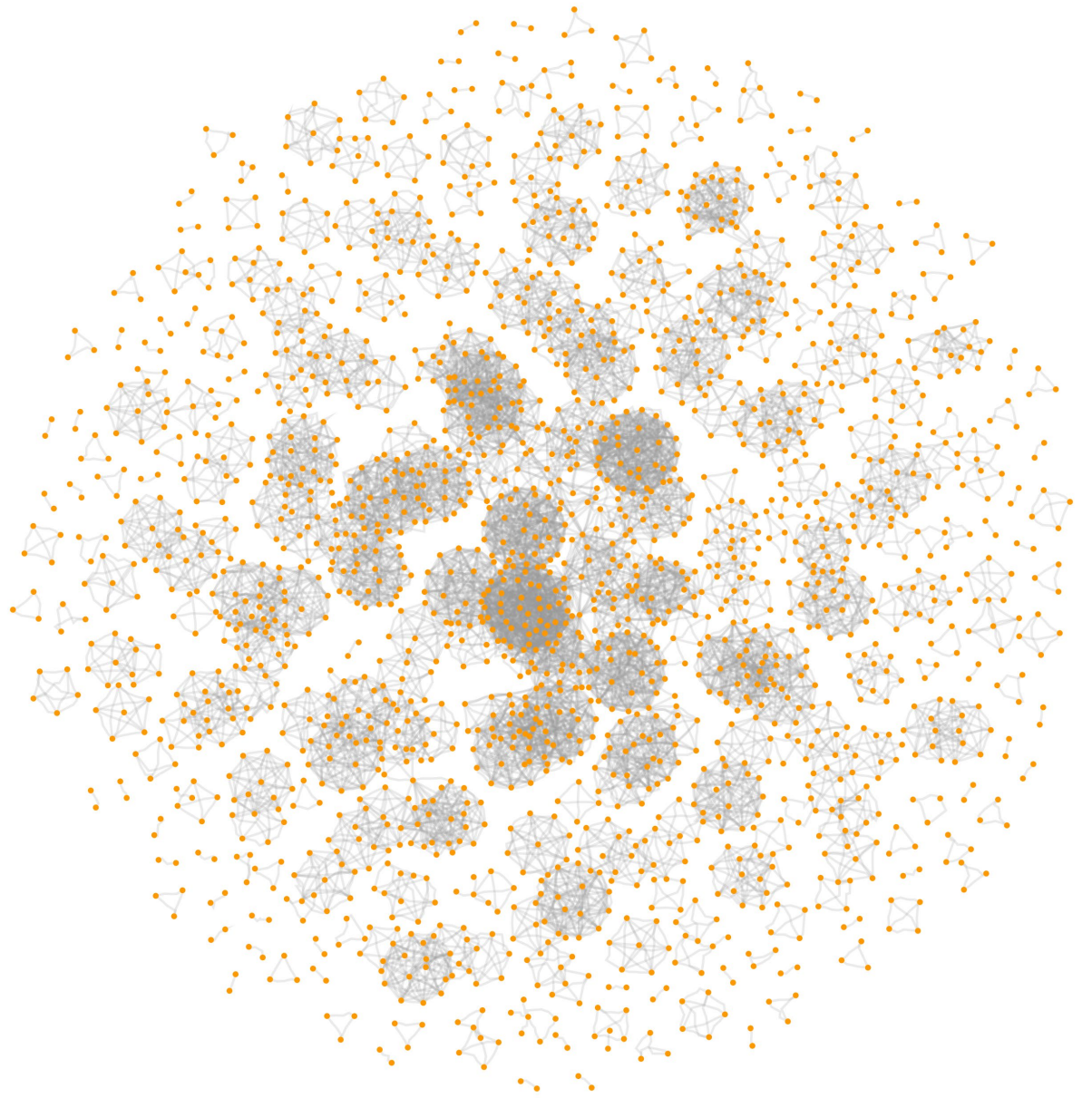
Note: Vertical line is at 2007, when the number of publications began exponential growth.

SYNBIOETHICS AUTHOR NETWORKS





SYNBIOETHICS
AUTHOR
NETWORKS

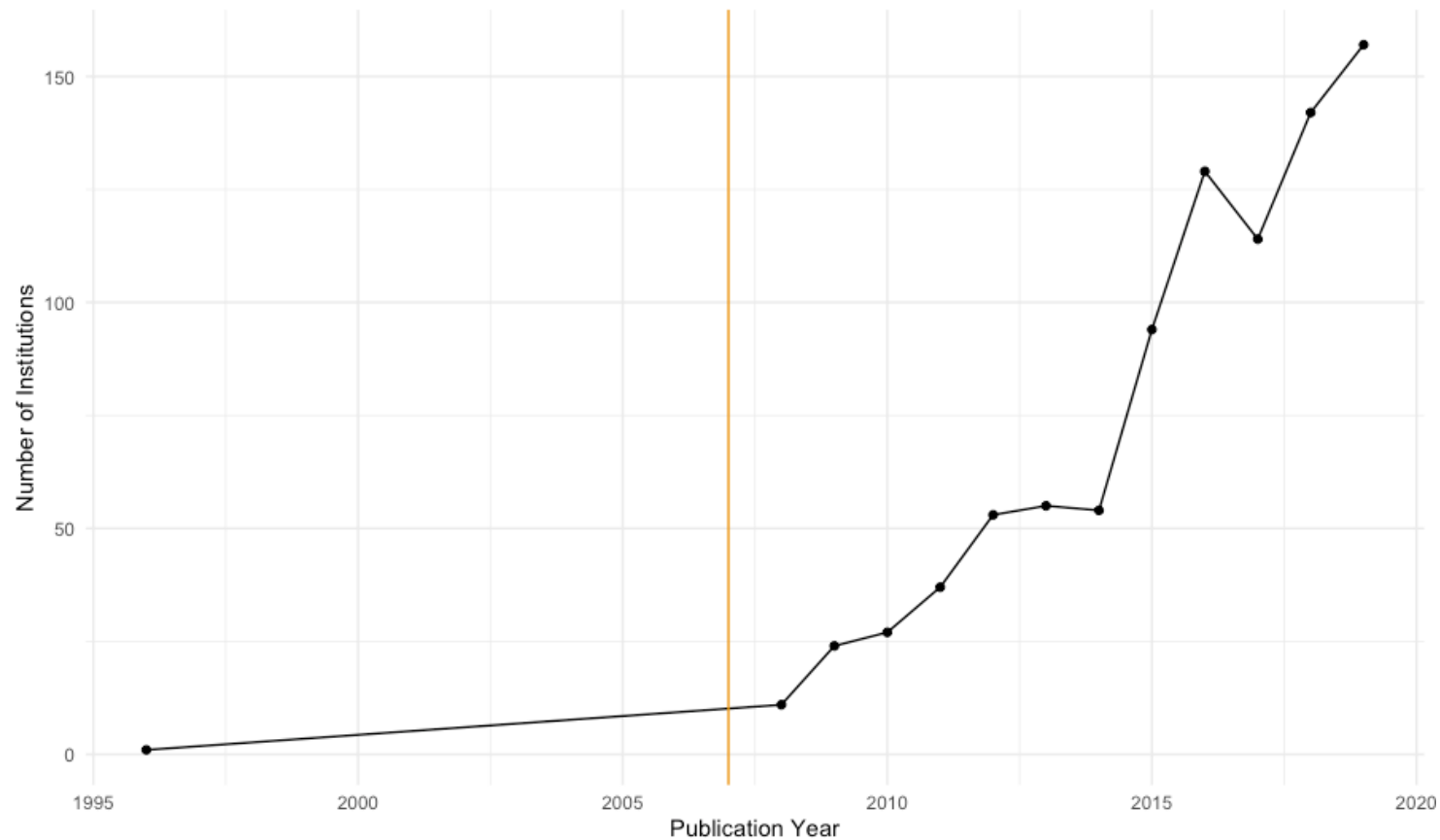




EMERGING SYNBIOETHICS DOMAIN

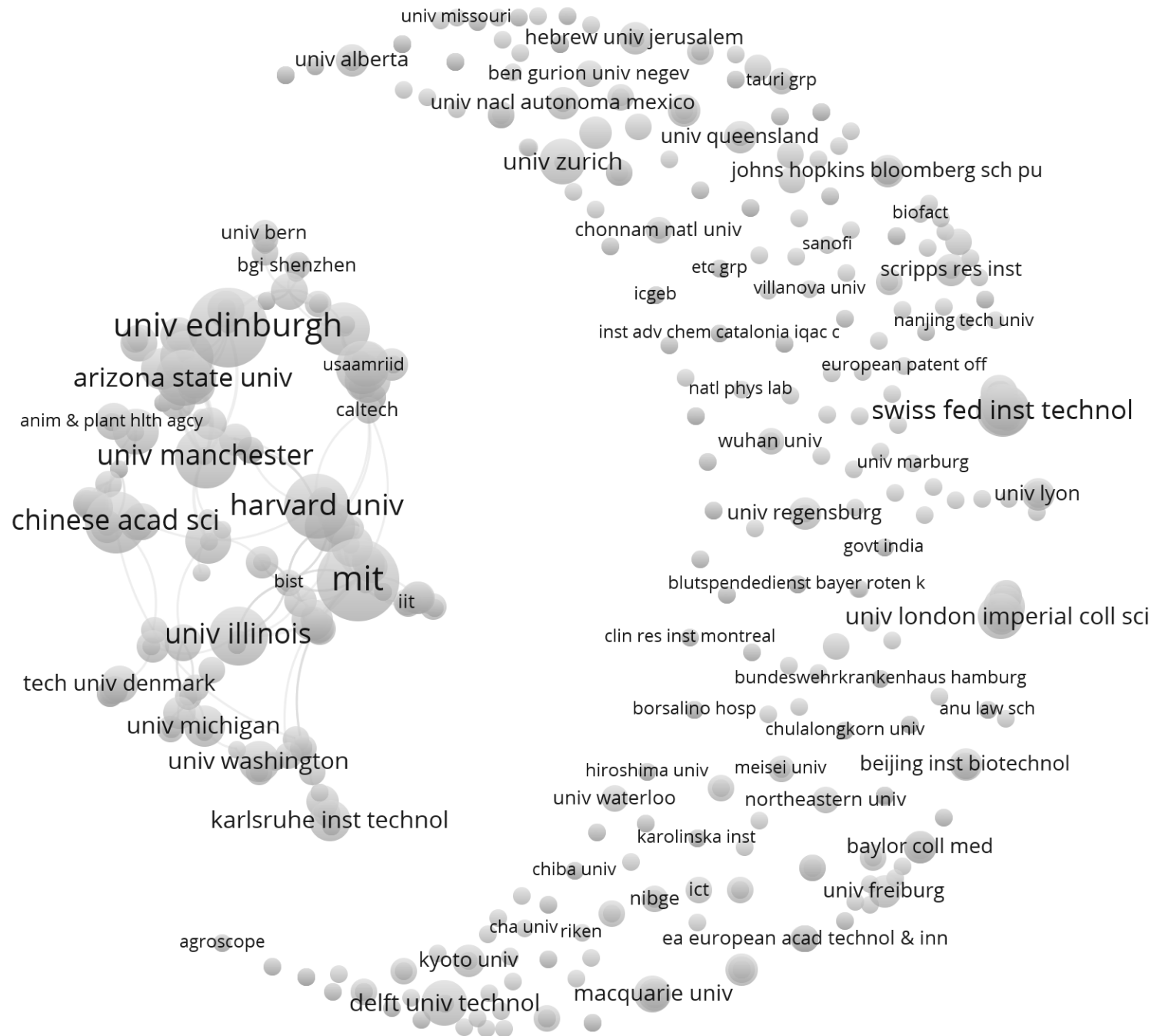
Number of Unique Institutions per Year, 1900-2019

Source: Web of Science

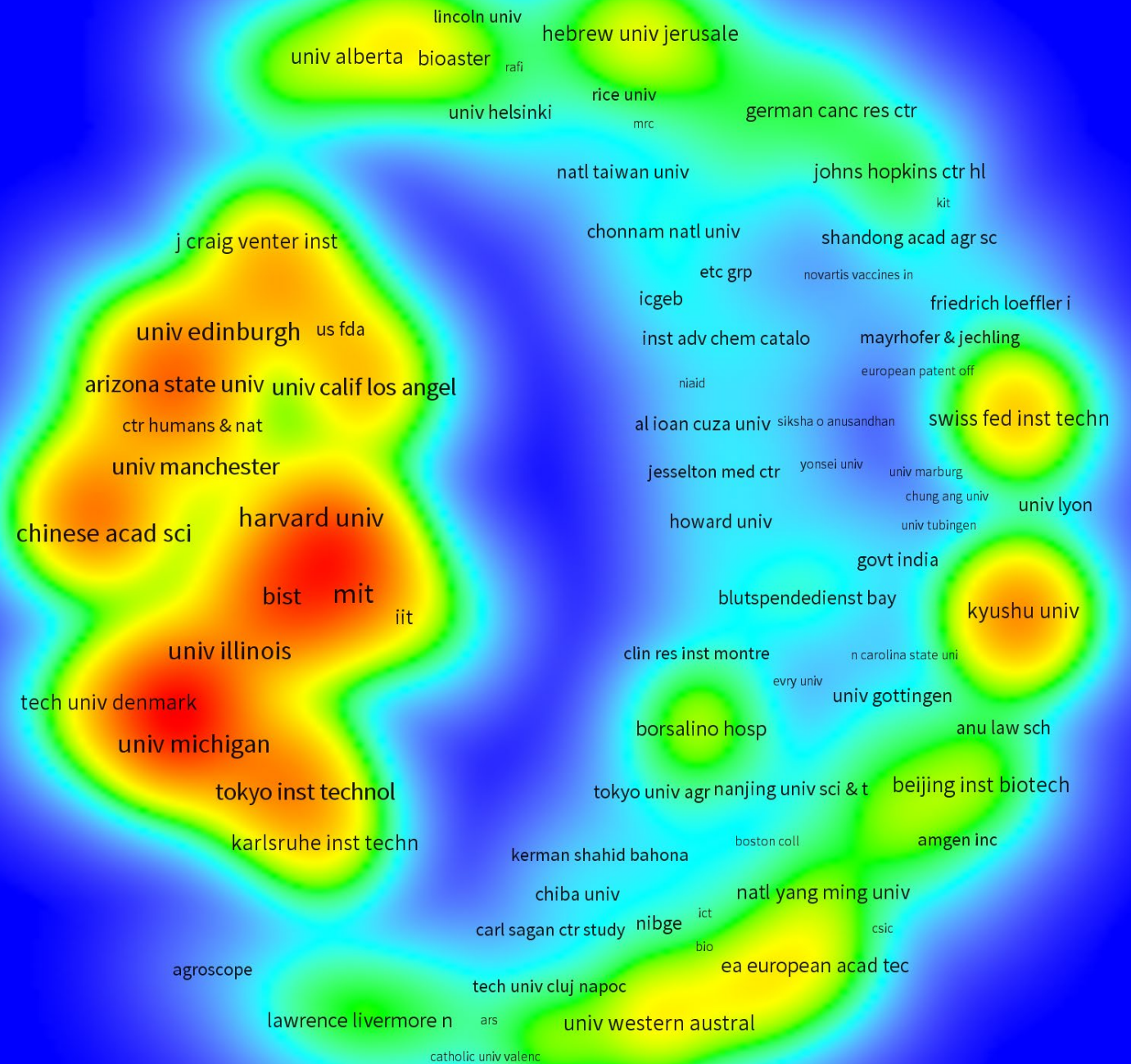


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SYNBIOETHICS AUTHOR INSTITUTION NETWORKS



SYNBIOETHICS AUTHOR INSTITUTION NETWORKS



Conclusions

- Noticeable lag between synbio publications and synbioethics publications
- Emerging network of author institutions
- More detailed investigations coming