

SYNTHETIC BIOLOGY

*Creating the next wave of biotechnology
innovation, and growth of the bio-economy*

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Synthetic Biology

SynBio

The central idea of synthetic biology is that living cells can be programmed in the same way that computers can, in order to make them do things and produce compounds that their natural counterparts do not.

Multidisciplinary Field

- Biomedicine
- New Materials and Fabrics
- AgriTech & Food
- Renewal Energy
- Environment

Timeline

- **First wave:** 2001 sequencing human genome
- **Second wave:** explosion of synthetic biology advances creating the new industry and the expansion of bioeconomy

Breakthroughs

Artemisin production as anti-malarian drug. Yeast containing bacterial and wormwood genes into a chemical factory to produce a precursor of artemisin



First synthetic life form the single-cell organism based on an existing bacterium, entirely synthetic genome from the lab. Created by researchers from JVCi in 2010

Ethics & Sustainable Goals

Bioethics

WHO foresight unit: The Global Summit of National Bioethics Committees independent guidance. WHO foresights to draw an expertise of ethicists and bioethicists to help drive impact.

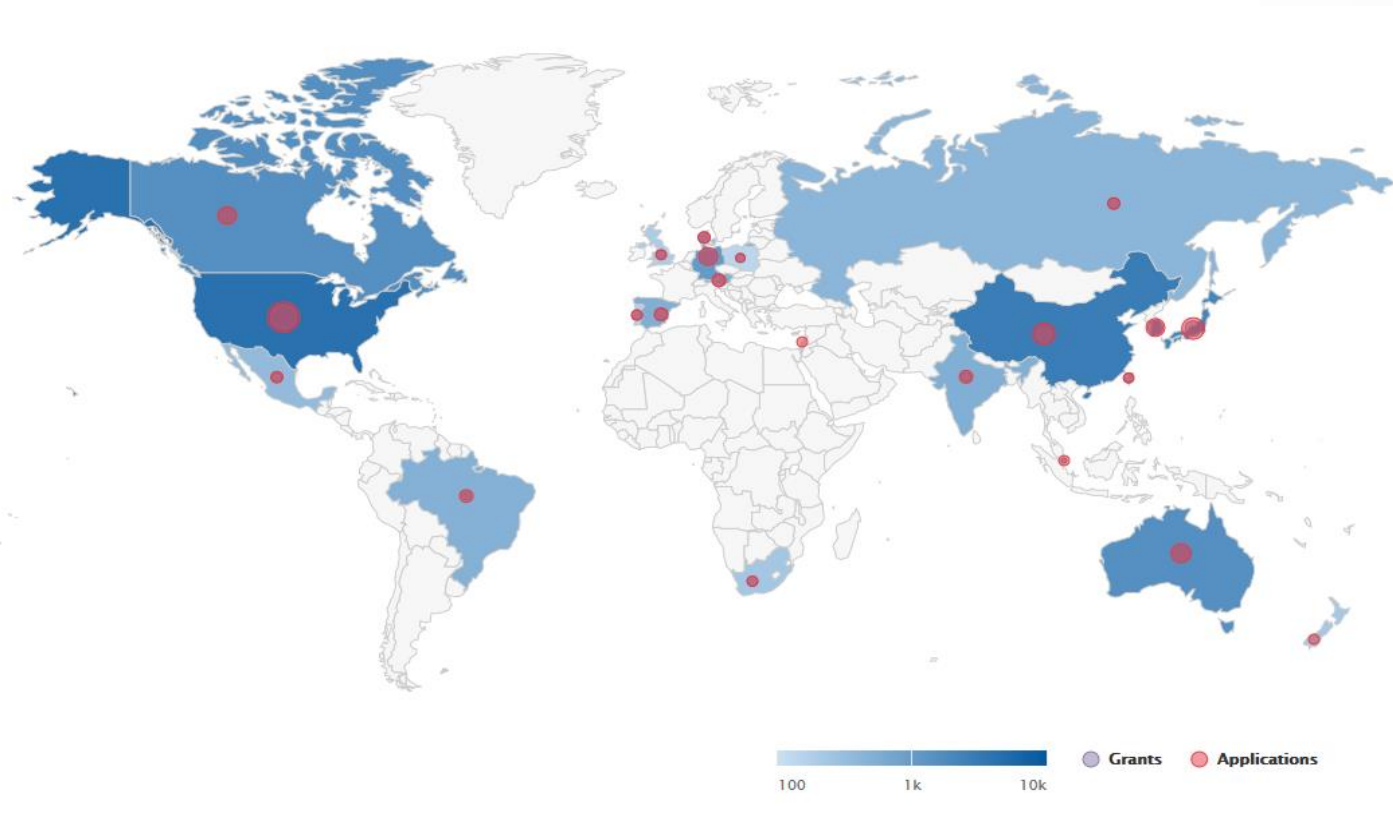
In 2010, **US Presidential Commission** issued *The Ethics of Synthetic Biology and Emerging Technologies* report and its committee monitors and attend careful potential risks of Synthetic Biology advances.



2030 UN Sustainable Development goals:

- environmental health
- energy shortages
- pollution
- hunger and disease control

Patent surveillance



with support from

Global Market and Investment



Required reading for the biological revolution.
Published by SynBioBeta, July 17, 2019

4

- Global SynBio market: **\$100 bn by 2030**
- The industry has raised **more than \$12.3bn in the last 10 years**
- **Outstanding 2018:** SynBio companies have raised **\$3.8 bn**
- In **2018, ModernaTherapeutics** and **Zymergen's** combined raised \$1 billion
- IPO Moderna- **\$604 milions**
- In **2019, Impossible Foods** raised a funding round of \$300 million

INDICATORS

- **Consistent** across early, mid, or late-stages
- All the sections of the **synbio stack** are receiving **attention**
- **New companies entering into** the industry at a healthy rate.
- SynBio companies grew **over 35% in 2109**
- Estimation of **700 Synbio companies**
- **IPO:** Precision Biosciences in 2019, raised \$126m, and grew over **9% on the first day**
- **Solid post-IPO performance:** Twist Bioscience and Beyond Meat maintaining valuations above their initial offering price.

Adquisitions:

 **zymergen** Faster Biomanufacturing



ultra-high-throughput technology to screen and select individual cells from among millions **in a single month**



Nucleotides X and Y generate a more efficient cancer drug

Sanofi acquired Synthorx to reinforce its immuno-oncology pipeline for **\$2,5B**

Investment

WHO'S INVESTING?

- **PE and VC** 40% of all the money raised
- **Over 500 investors**
- **New investors** coming to synthetic biology
 - Tech Venture Capital firms
 - Impact investors: Charities and Family Offices
 - Corporations
 - Tech Titans funders

Eric Schmidt ex-CEO google

 **zymergen**

Bill Gates

 **editas**
MEDICINE

**CRISPR to develop a robust
pipeline of medicines**

 **GINKGO BIOWORKS™**
THE ORGANISM COMPANY

**design custom organisms for
customers across multiple markets**

Investment



**Biotech infrastructures and
services**



FOOD MARKET



AGRI-TECH MARKET



PHARMACEUTICAL MARKET

More recent Applications



New clothing made by microbes



Renewable diesel



Bread for consuming off-earth



Innovation and knowledge transfer

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