# *In silico* Synthetic Biology: from research to the market

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# Industrial Biotechnology

**Feedstock**

**Renewable resources / Waste streams**

**Bio-process**

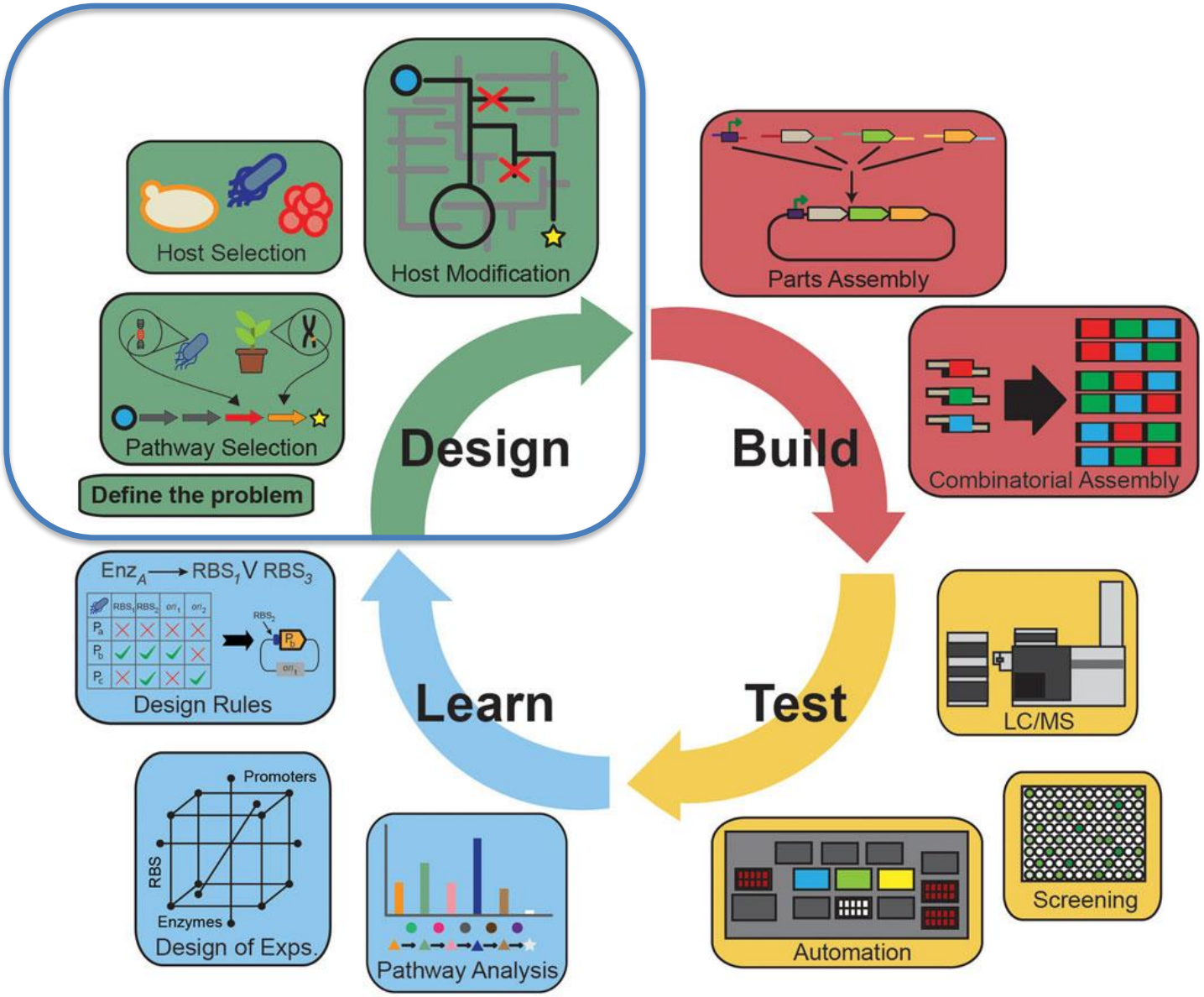
**in**

**Microorganisms**

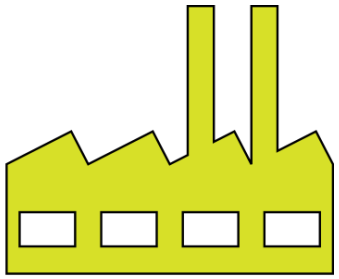
**Industrial process**

**Production of chemicals**

# The Synthetic Biology Cycle

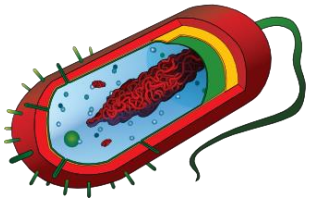


# Developments at the University (since 2004)



# *Starting a company*

# based on *in silico* Synthetic Biology



- **Focusing on services or proprietary microbial strain development?**
- Is there market for services?
- Who cares about the technology?
- Some answers provided by a market research performed by some of the founders within MIT-Portugal

MIT Portugal

bio teams
bio-innovation teams

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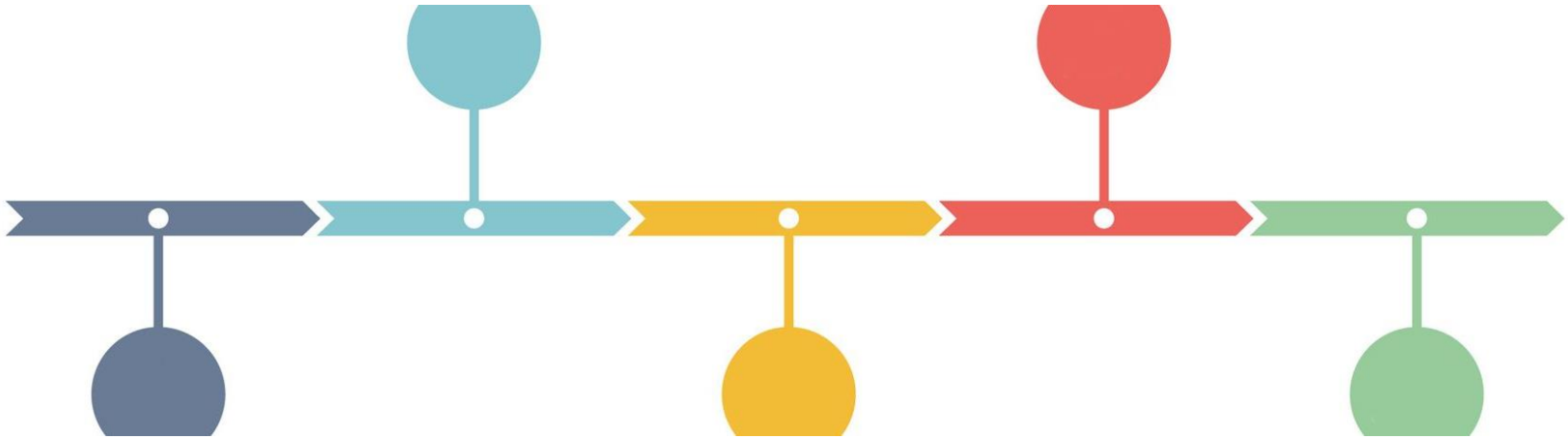
# Main Milestones

December 2010 – 1st prize in the national contest "atreve-te" – seed capital

December 2011 – First contract with INVISTA



2017/8 – First large-scale own Projects; Lab

April 2010 – Official birth

October 2011 – Participation in EFIB

2012 – First European Projects and 2 other contracts

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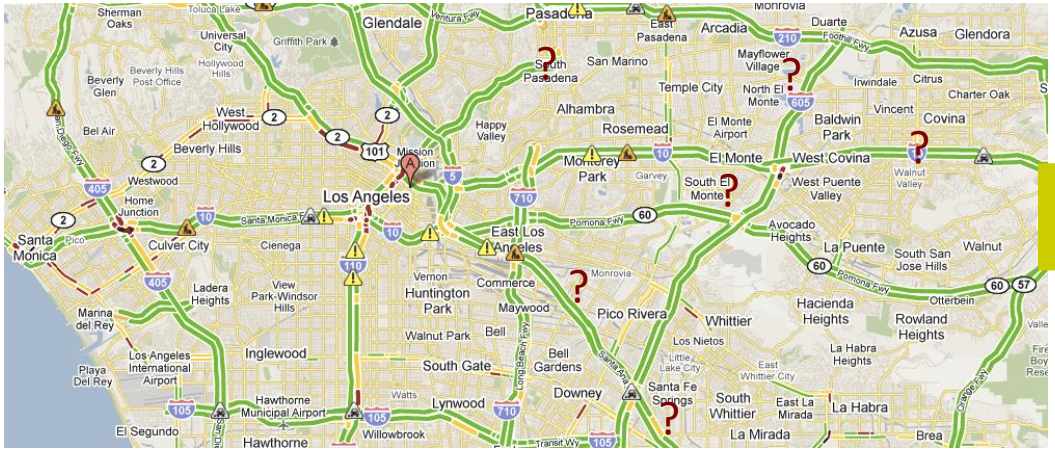
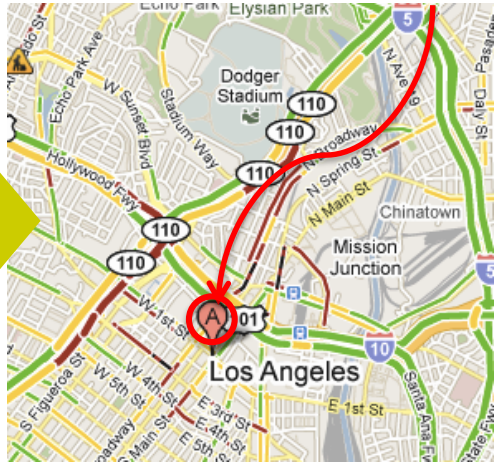
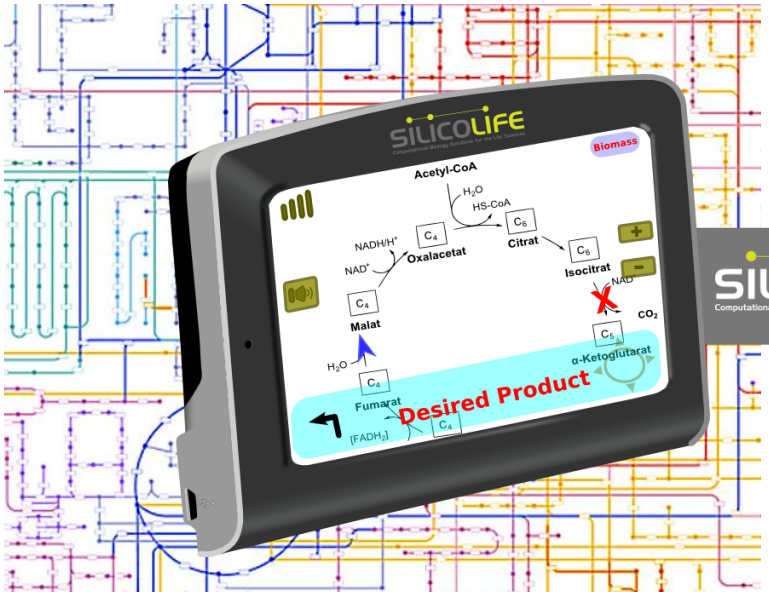
# The **GPS** analogy…




GPS

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## Models of Microbes

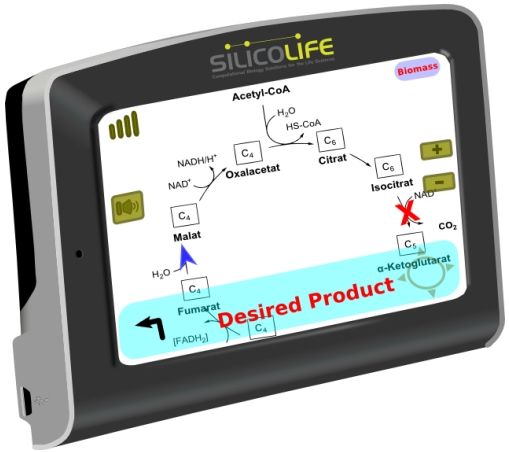
- Re-annotation of metabolic functions
- Homology search
- Transporters
- Compartment association
- Model validation
- Data integration
- Integration with available models
- Heterologous pathways database

## Artifical intelligence based **Algorithms**

- Selection
- Recombination of solutions
- Putative solutions

| | | |
|---|---|---|
| 1 | 75 | 237 |
| 8 | 56 | 261 |
| 64 | 75 | 534 |

- Decoding & Evaluating
- Stopping criteria?
- Best Solution: 33, 104, 345, 347




✓ **Rational design** supported by prediction of the strategy feasibility

✓ Model construction
✓ Pathway screening

✓ Cell simulation
✓ Product optimization

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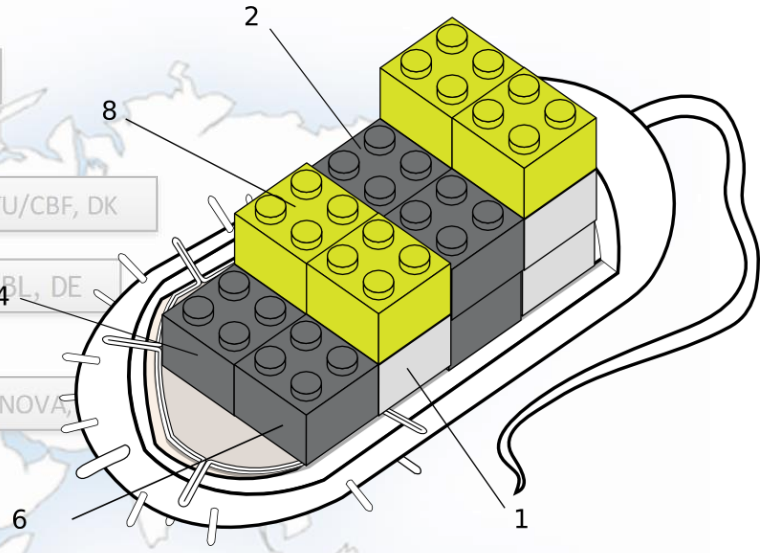
# Working with **leading chemical, materials and synthetic biology companies**

**Contracted projects** with:

- ✓ **Fortune 500** companies
- ✓ **Multinational conglomerates**
- ✓ **World leading agri-business** companies
- ✓ **Global leaders** in building block **chemicals, polymers and biosynthetic** development




SEVENTH FRAMEWORK PROGRAMME

ERA IB

BRIGIT

MIT Portugal

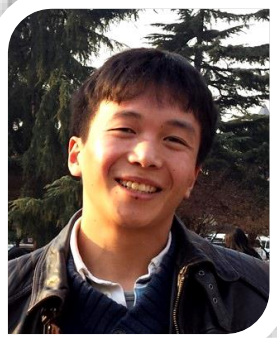
CLIB 2021 CLUSTER INDUSTRIELLE BIOTECHNOLOGIE

P-BIO

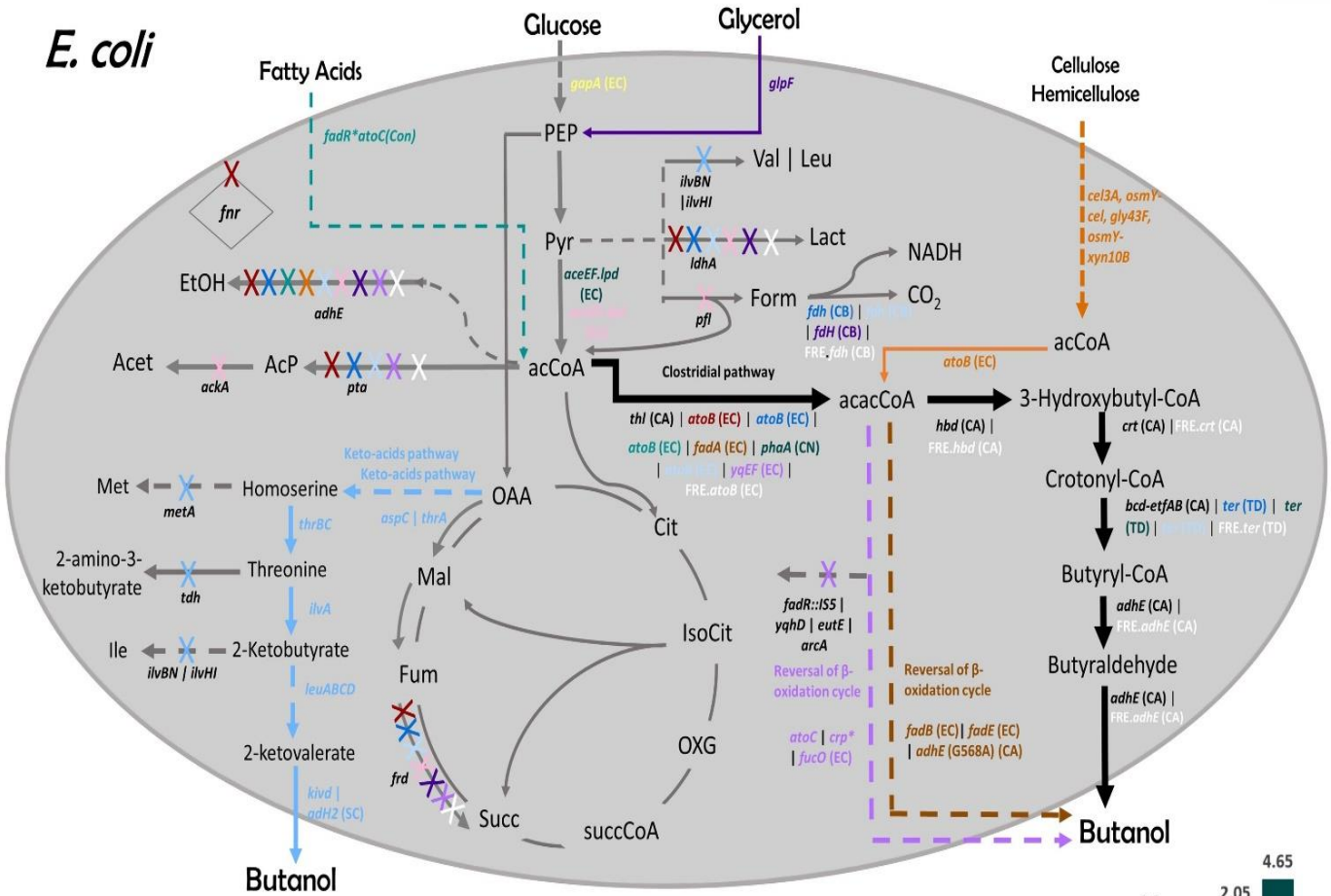
PEM

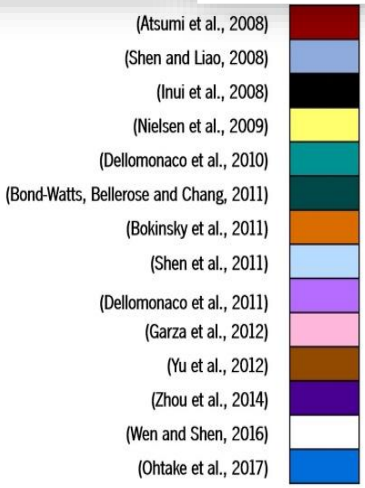
A joint effort by SILICOLIFE

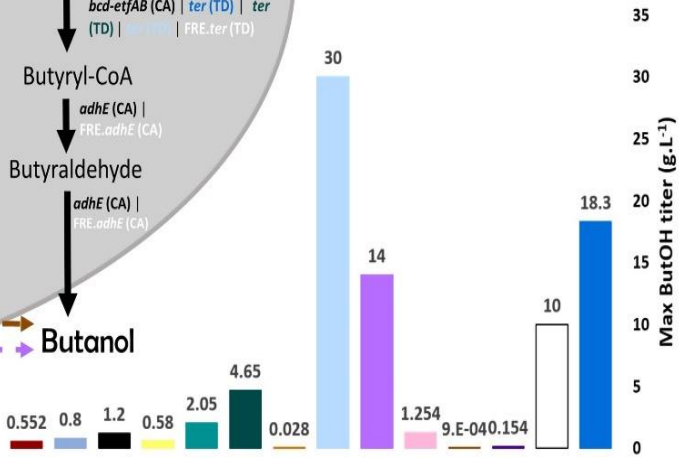
40 Hottest Small Companies in the Advanced Bioeconomy



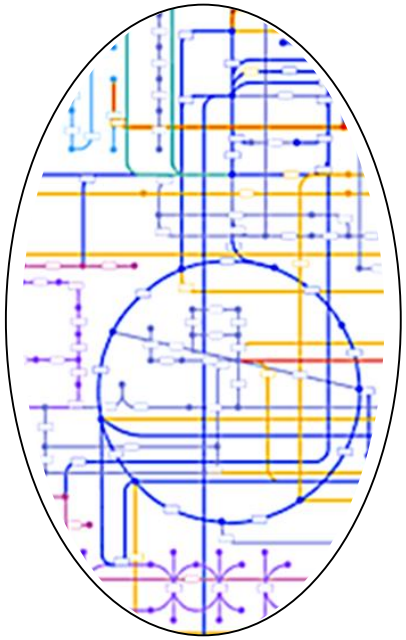
n-Butanol is a chemical currently obtained from petrochemical processes with many applications in industry. It is also one of the fuels of the future



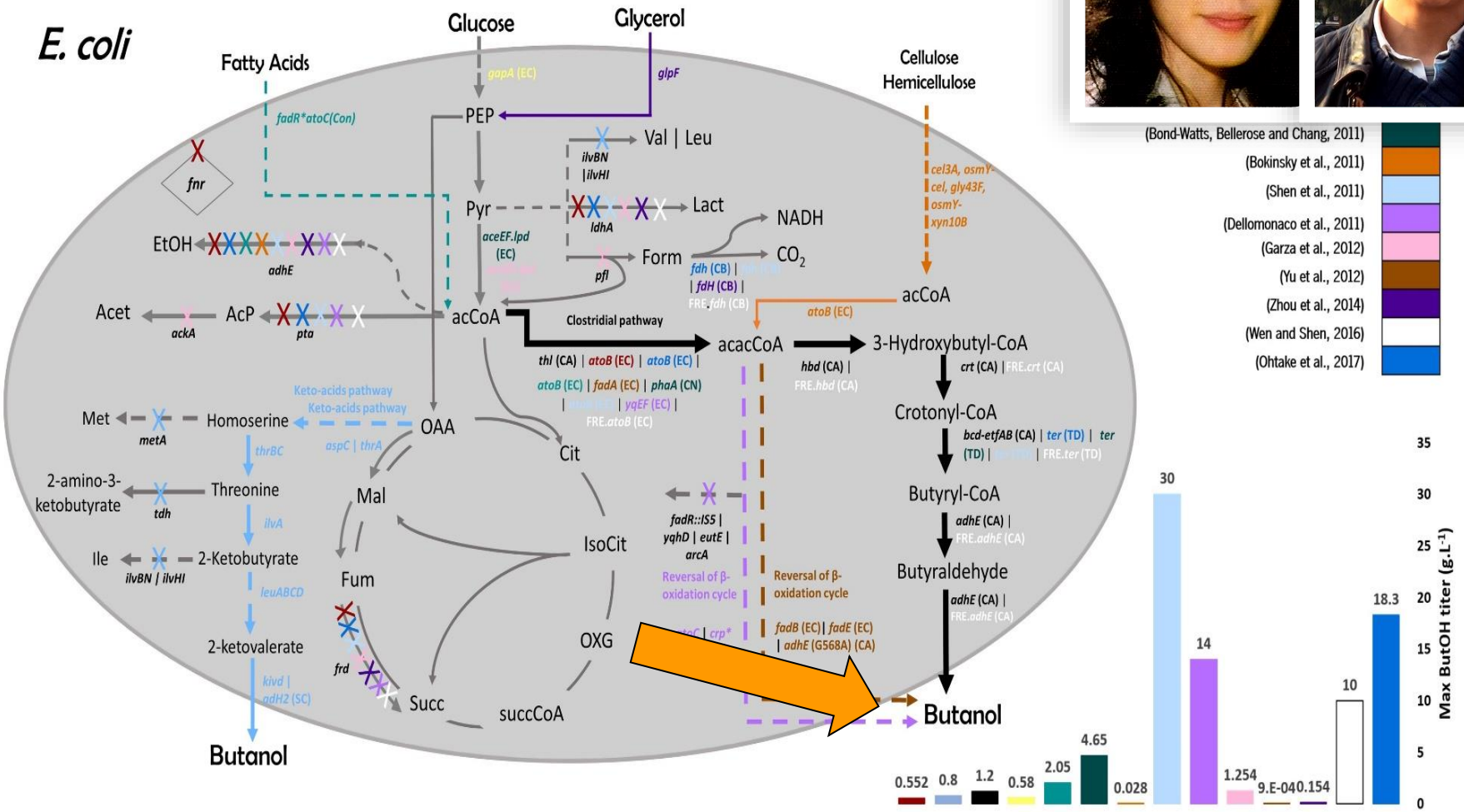



Host Organism



?

n-Butanol




Ferreira et al (2018) Patent pending

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## Some Lessons Learnt:

- The team and persistence is more important than having a clear idea for a company since the beginning
- Many investors/advisors are biased towards product-oriented business models
- A dedicated and commited team was essential for achieving our goals
- Funding is always essential, but the amounts and sources vary a lot – in our case not much was needeed for launching the company.
- Continuous development of the technology was essential for upcoming stages. This was possible mainly through reinvestment of profits.
- A careful allocation of resources is essential

## My personal pathway:

- PhD in 2003/Post-Doc 2004
- First company (Biotempo) in 2002 – Bioprocess Development
- UMInho Faculty 2004 - 2017
- MIT short-term visit in 2007
- Second Company (SilicoLife) in 2011
- Pro-Rector at NOVA since 2017
- Third company soon (?)

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# A multidisciplinary team

which includes expertise in the Life Sciences, Bioengineering, Computer Science and Bioinformatics.

## Main Founders

**Simão Soares**
MSc Bioinformatics
BSc Informatics Engineering
Board member P-Bio

**Isabel Rocha**
PhD Chemical Engineering
UMinho Faculty
Founder Biotempo

**Miguel Rocha**
PhD Computer Science
UMinho Faculty
Bioinformatics expert

**Paulo Vilaça**
MSc Bioinformatics
BSc Informatics Engineering

**Bruno Sommer Ferreira**
PhD Biotechnology
Biotrend CEO