

A jigsaw puzzle of a cell diagram. The puzzle is mostly assembled, but a large white piece is missing from the top center, revealing a green background with a brown egg-like structure. The cell diagram includes various organelles: a blue nucleus, a network of orange endoplasmic reticulum, a blue mitochondrion with red internal folds, a red Golgi apparatus, a green chloroplast, a yellow vacuole, and a brown nucleus. The puzzle pieces are arranged in a circular pattern, with the missing piece being a large white one.

The puzzle of life  
**Imagine we could build a cell**



Ulrich Keyser



Joachim Spatz



**What is life?**

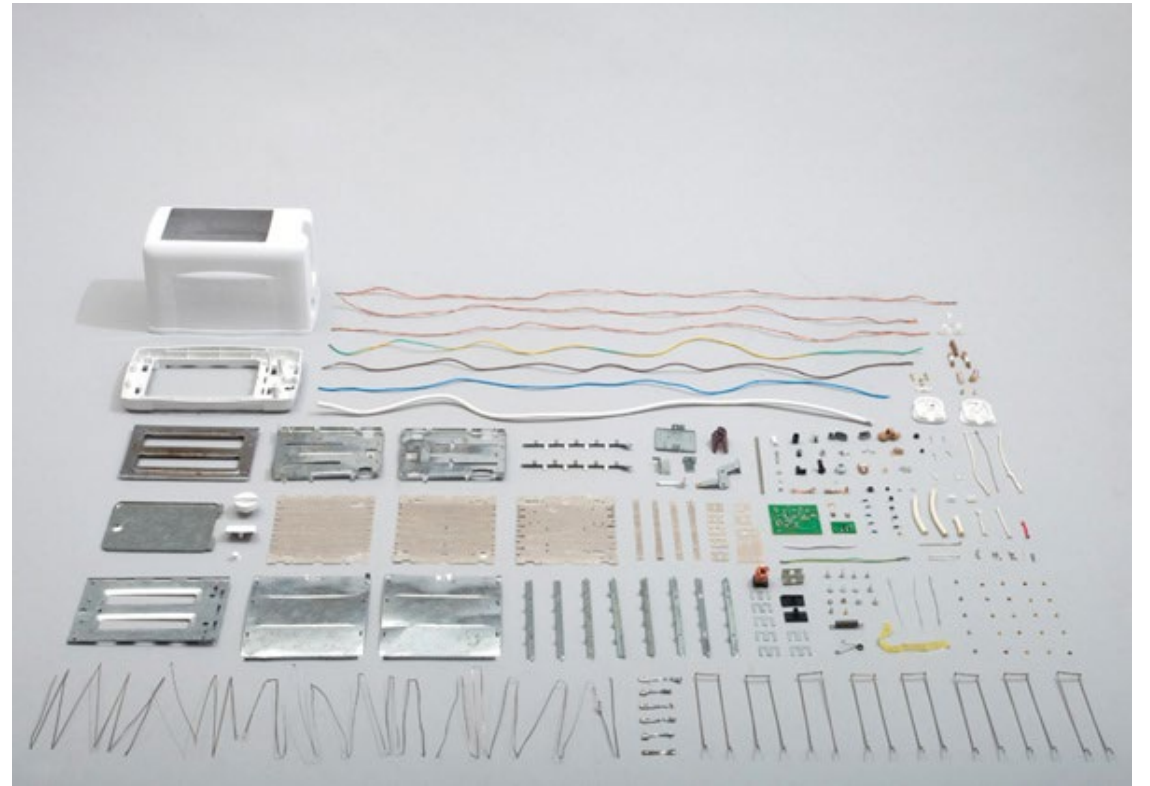
**How did it emerge?**

**Can we create it?**

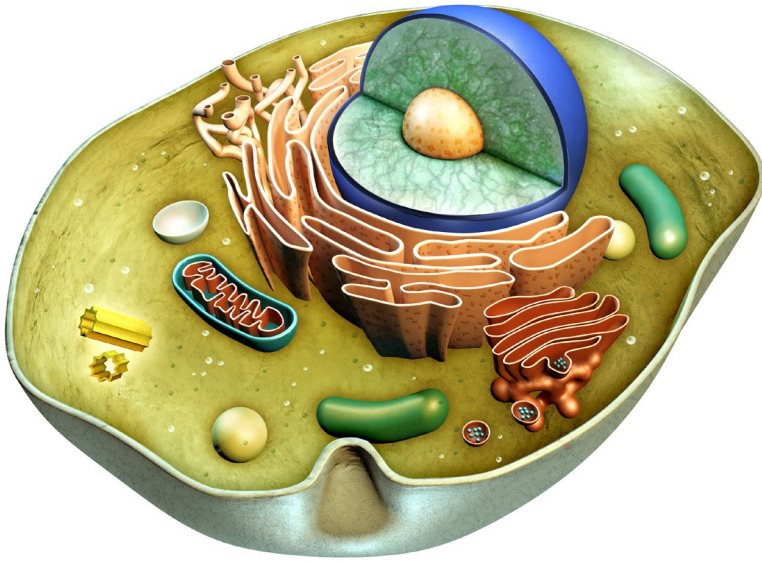
# Can we engineer a cell from molecular building blocks?



Video: David Rogers, Vanderbilt University, 1950s



# “Bottom-up” synthetic biology



Cell

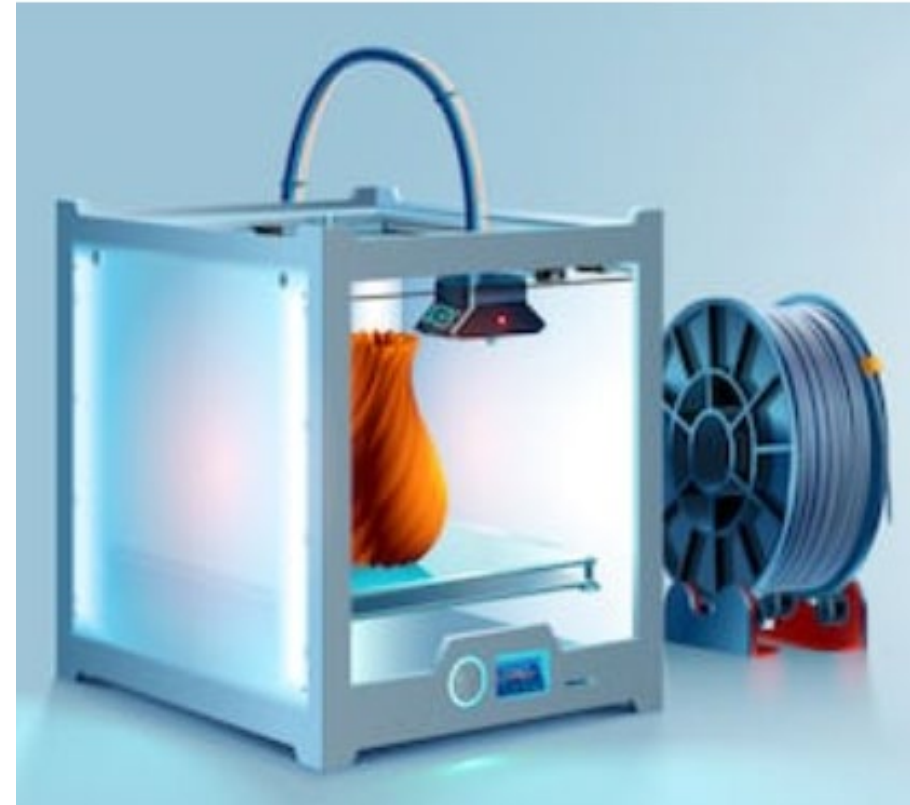


Cellular components

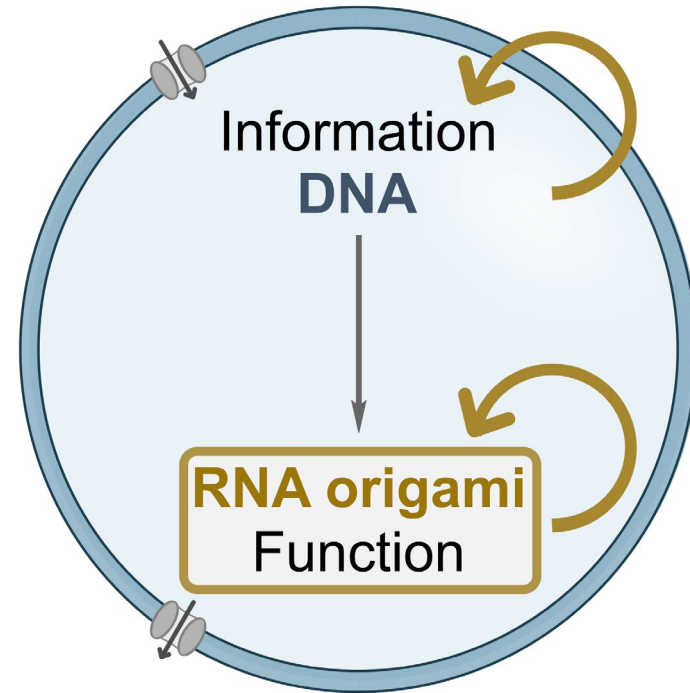
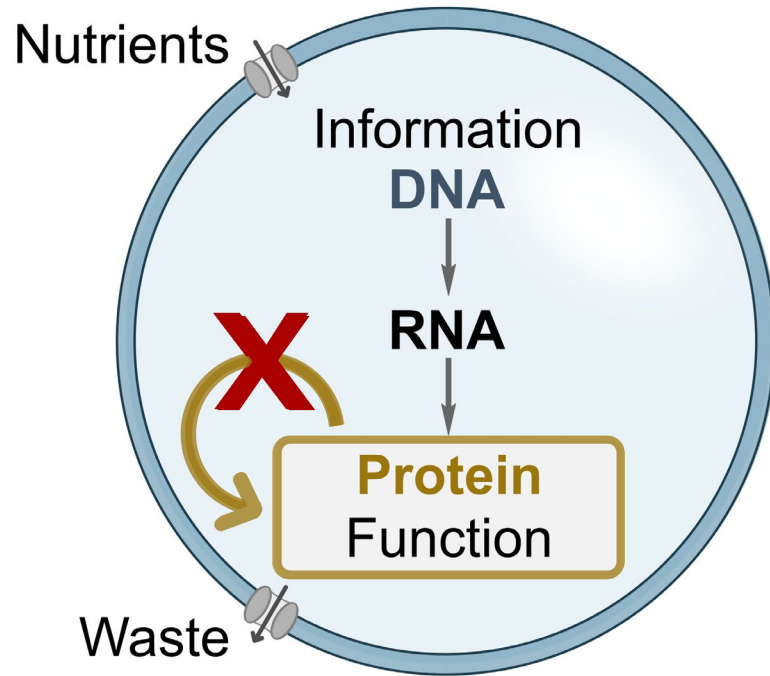
# “Bottom-up” synthetic biology



According to central dogma.



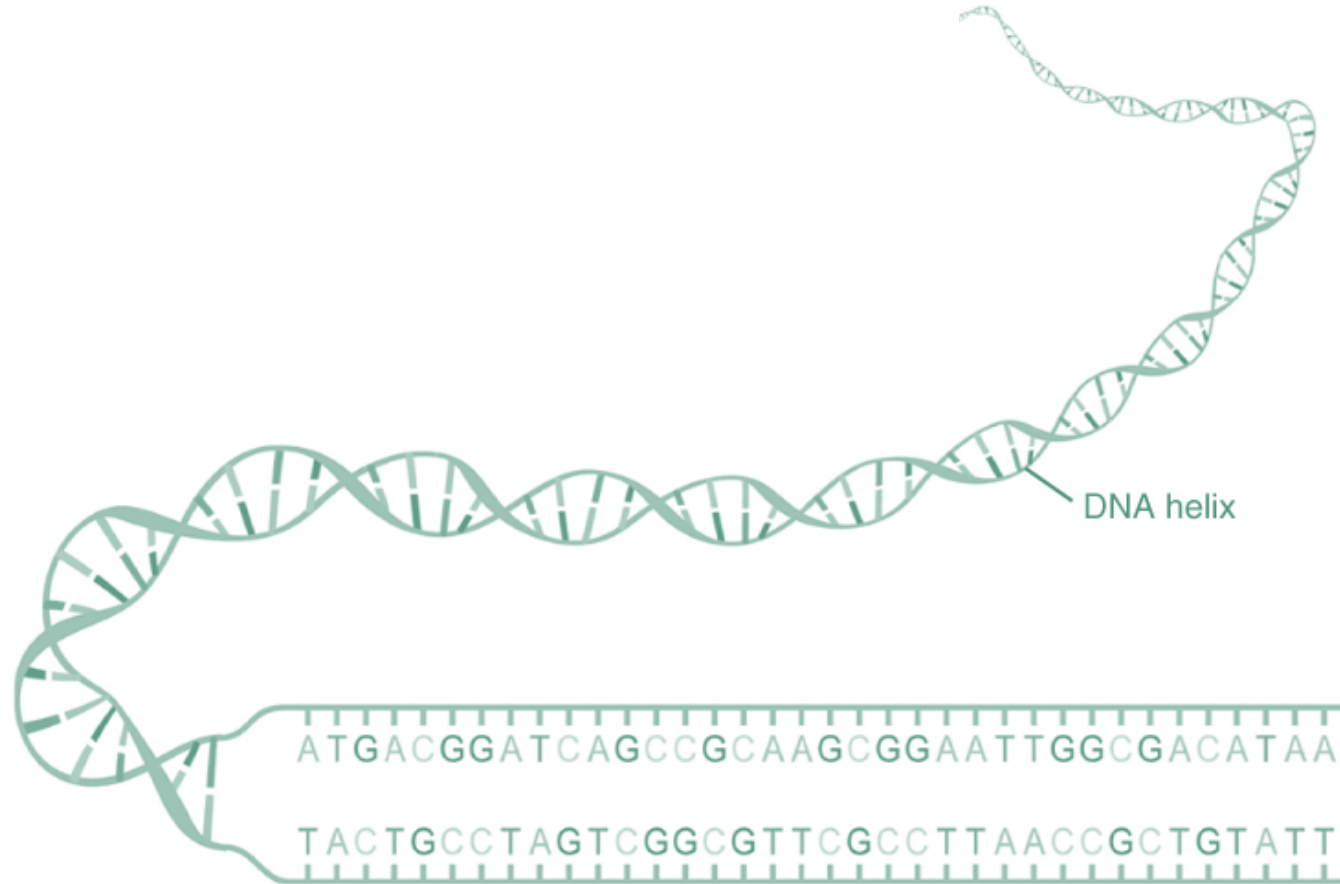
# “Bottom-up” synthetic biology



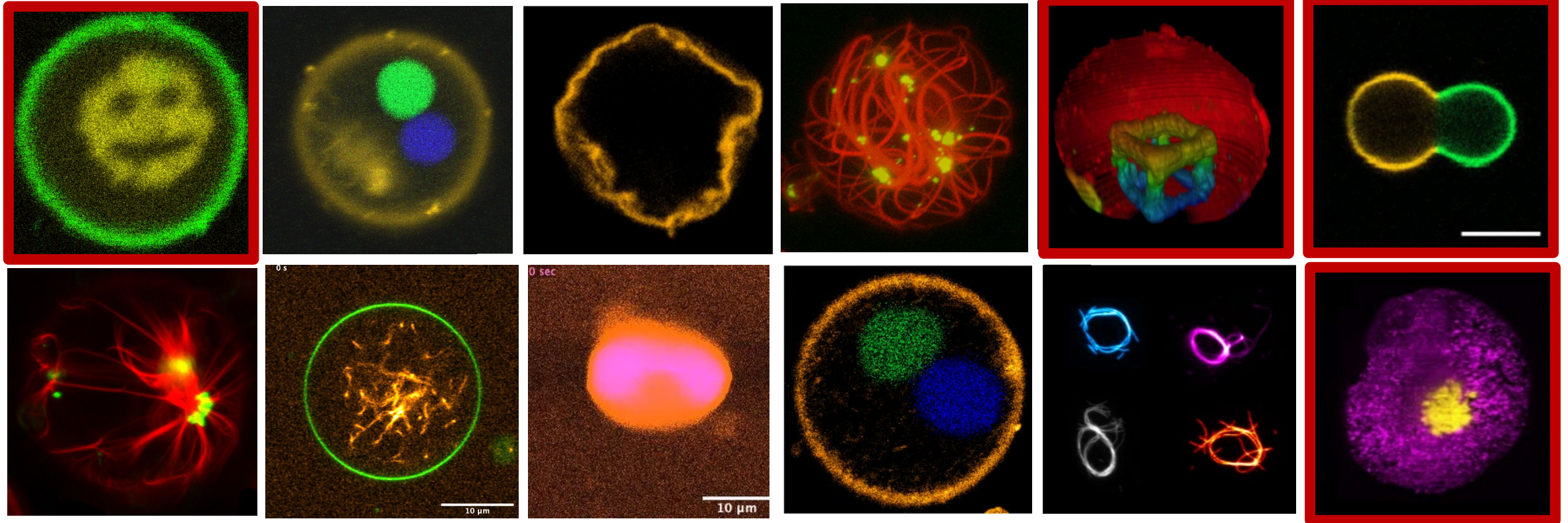
**Our goal:** Bottom-up construction of a synthetic cellular model system that operates based on **our own molecular hardware** and is capable of self-replication and evolution.



# DNA origami: Folding DNA, not paper



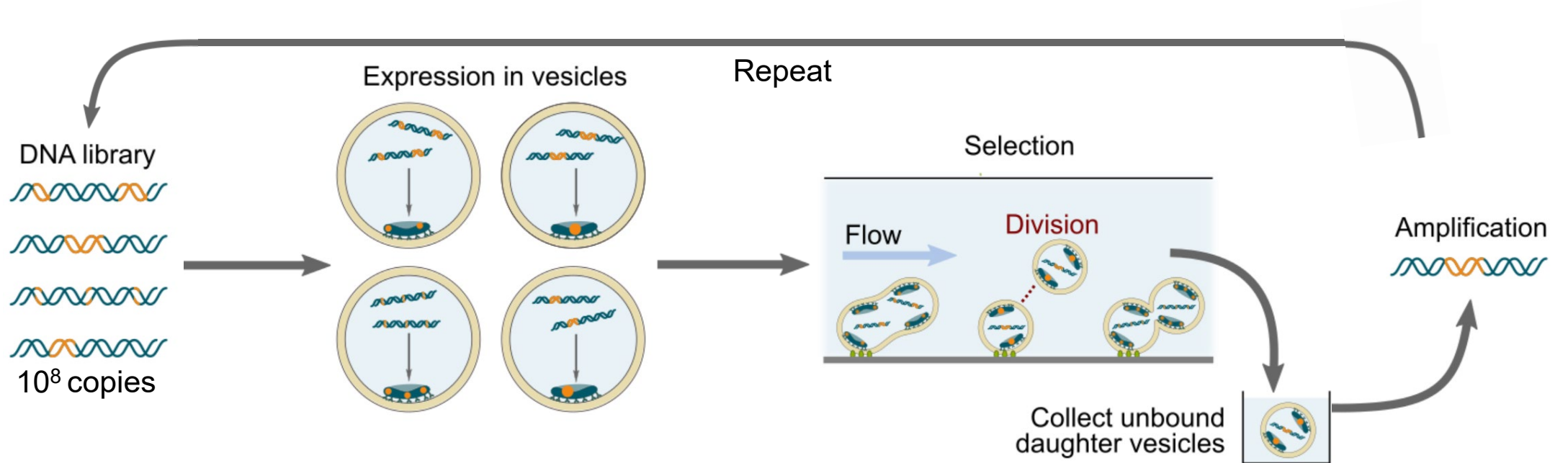
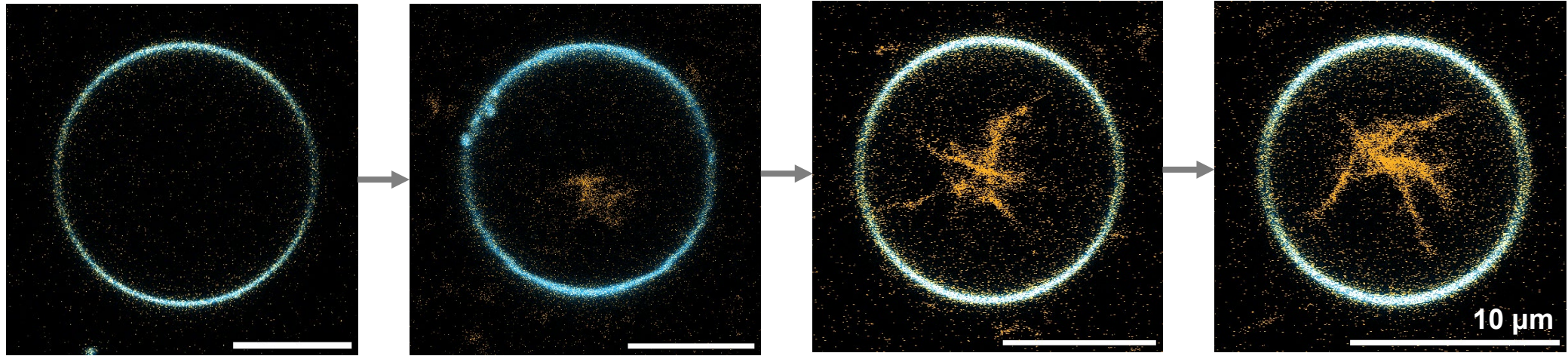
# What we can already build: A family portrait of our synthetic cells



# RNA origami



# Synthetic cells make their own RNA origami machinery



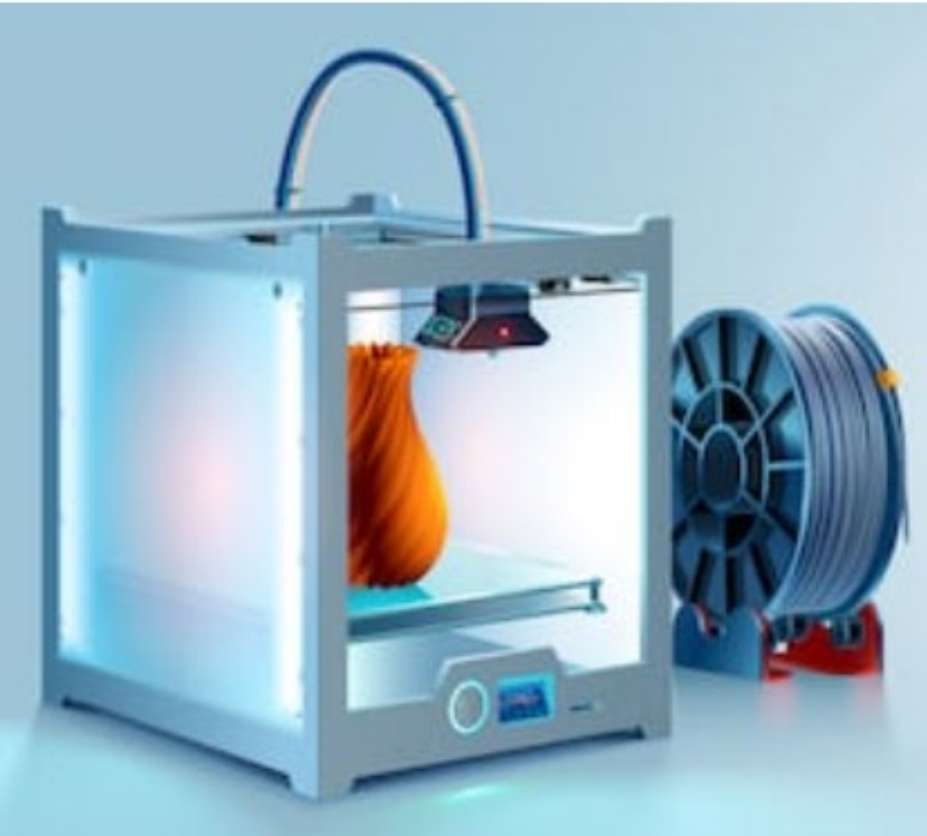
A jigsaw puzzle of a cell diagram. The puzzle is mostly assembled, but a large white piece is missing from the top center, revealing a green background with a brown egg-like structure. The cell diagram includes various organelles: a blue nucleus, a network of orange endoplasmic reticulum, a blue mitochondrion with red internal folds, a red Golgi apparatus, a green chloroplast, a yellow vacuole, and a small white vesicle. The puzzle pieces are arranged in a circular pattern, with some missing pieces around the edges.

The puzzle of life  
**Imagine we could build a cell**

A jigsaw puzzle of a cell with various organelles like a nucleus, mitochondria, and Golgi apparatus. A semi-transparent white box is overlaid in the center, containing the text "Thank you all!".

**Thank you all!**

# “Bottom-up” synthetic biology



Lipid vesicle



Cellular components

