

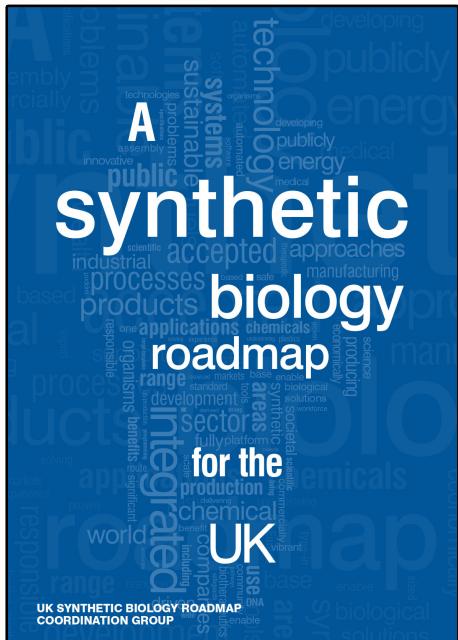
The Edinburgh Genome Foundry Lab Automation as a Service

V. Zulkower, April 2019



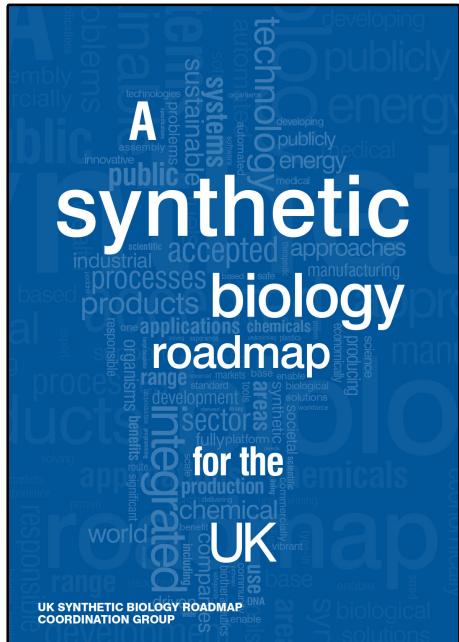
Synthetic Biology centres in the UK

Synthetic Biology centres in the UK



Synthetic Biology UK Roadmap, 2012

Synthetic Biology centres in the UK



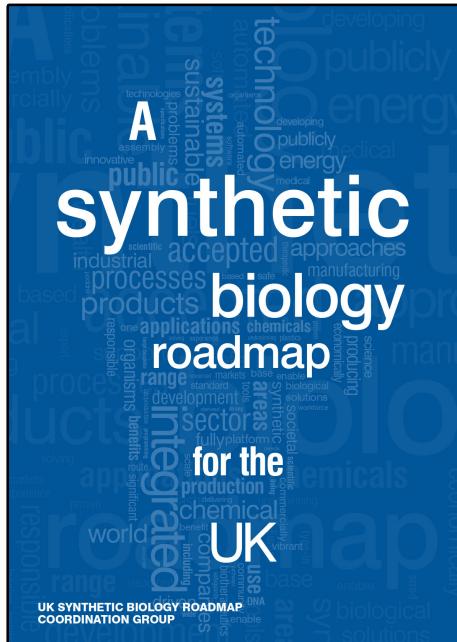
Synthetic Biology UK Roadmap, 2012

1. Invest in a network of multidisciplinary centres to establish an outstanding UK synthetic biology resource

Facilitating communications and learning, and networking experts across disciplines with customers, public and private interest groups are common themes running through this roadmap. One key element will be to provide access to cutting-edge resources for both the academic community and industry.

- 1.1 Sufficient resources should be deployed within the UK to ensure availability of research capacity and a full spectrum of essential facilities including sequencing and synthesis, CAD and robotics commensurate with the needs of the innovation community.

Synthetic Biology centres in the UK



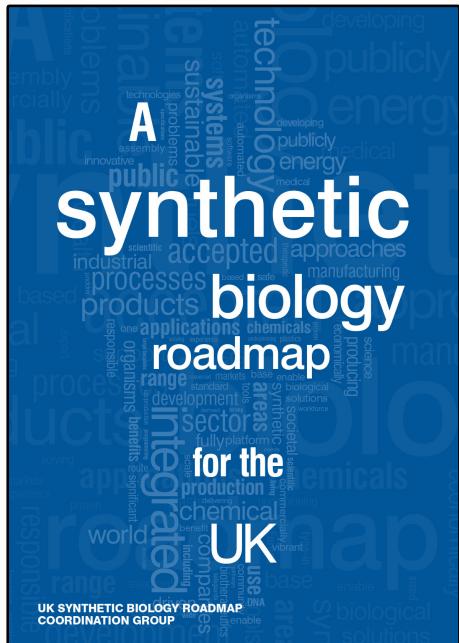
Synthetic Biology UK Roadmap, 2012

1. Invest in a network of multidisciplinary centres to establish an outstanding UK synthetic biology resource

Facilitating communications and learning, and networking experts across disciplines with customers, public and private interest groups are common themes running through this roadmap. One key element will be to provide access to cutting-edge resources for both the academic community and industry.

- 1.1 Sufficient resources should be deployed within the UK to ensure availability of research capacity and a **full spectrum of essential facilities including sequencing and synthesis, CAD and robotics commensurate with the needs of the innovation community.**

Synthetic Biology centres in the UK



Synthetic Biology UK Roadmap, 2012

- 1. Invest in a network of multidisciplinary centres to establish an outstanding UK synthetic biology resource**

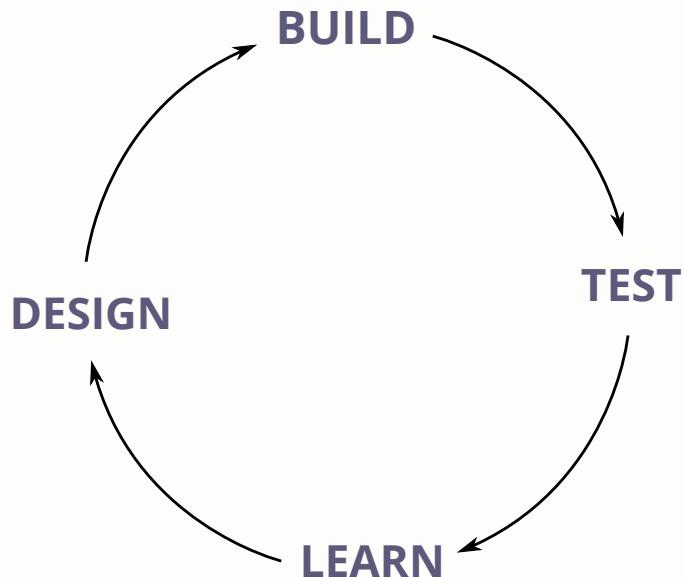
Facilitating communications and learning, and networking experts across disciplines with customers, public and private interest groups are common themes running through this roadmap. One key element will be to provide access to cutting-edge resources for both the academic community and industry.

1.1 Sufficient resources should be deployed within the UK to ensure availability of research capacity and a **full spectrum of essential facilities including sequencing and synthesis, CAD and robotics commensurate with the needs of the innovation community.**

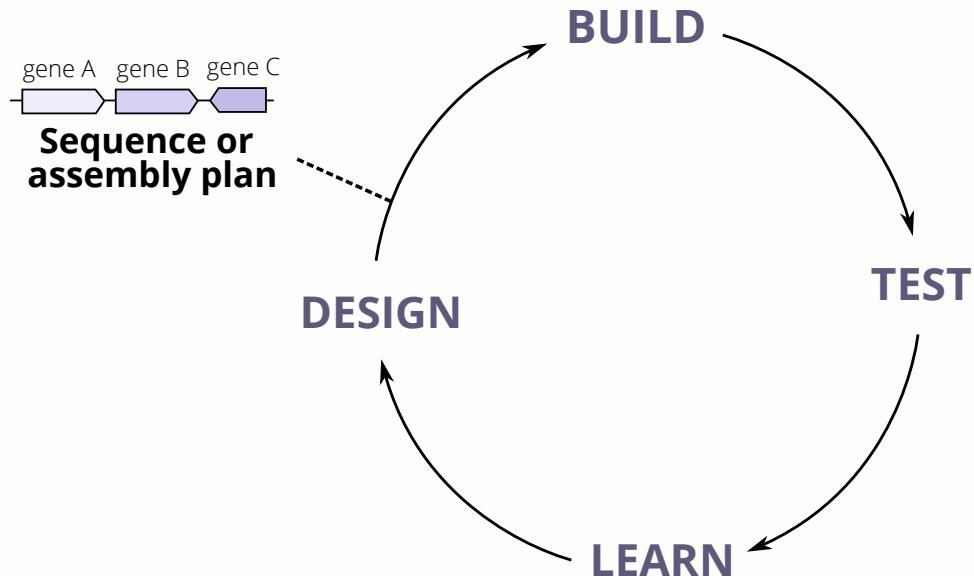


Accelerating Development Cycles in Synthetic Biology

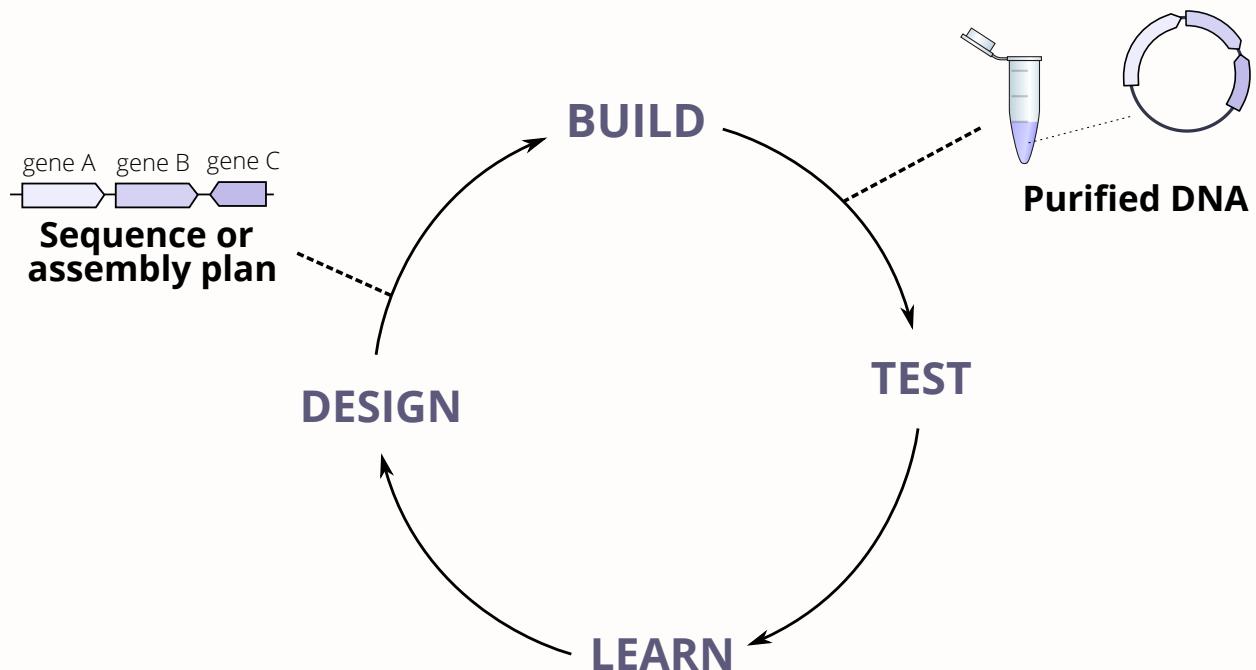
Accelerating Development Cycles in Synthetic Biology



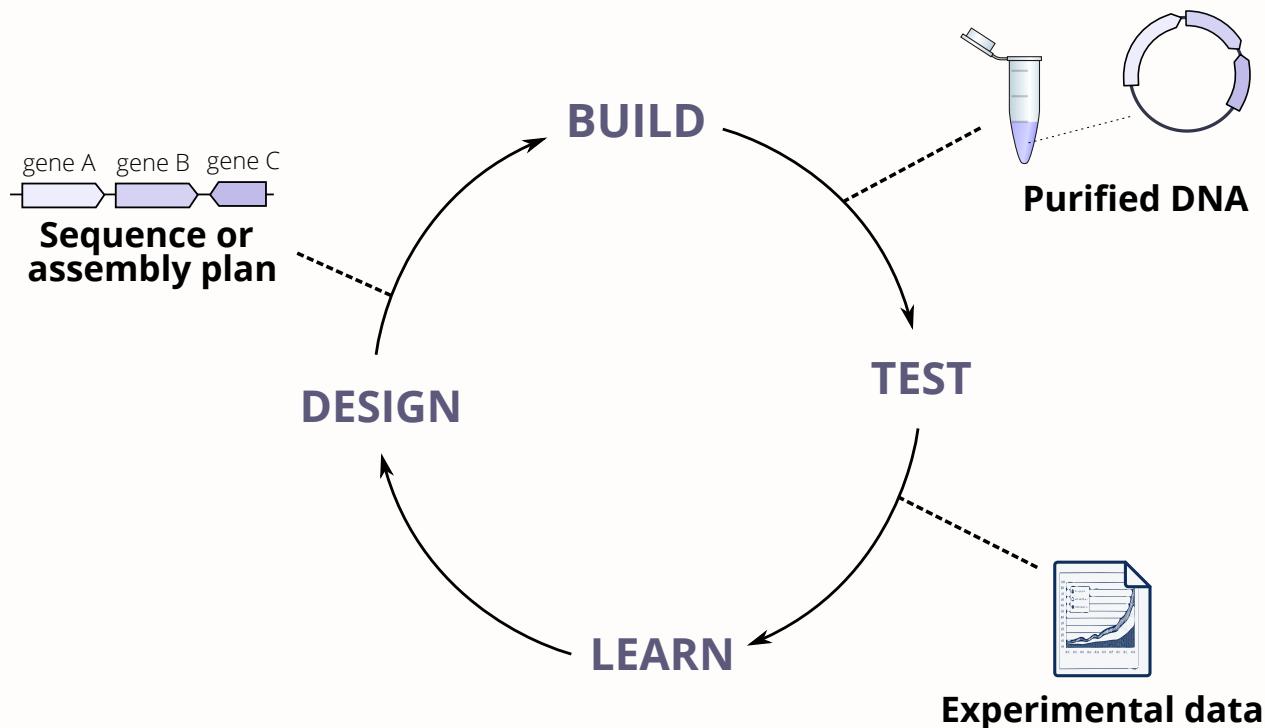
Accelerating Development Cycles in Synthetic Biology



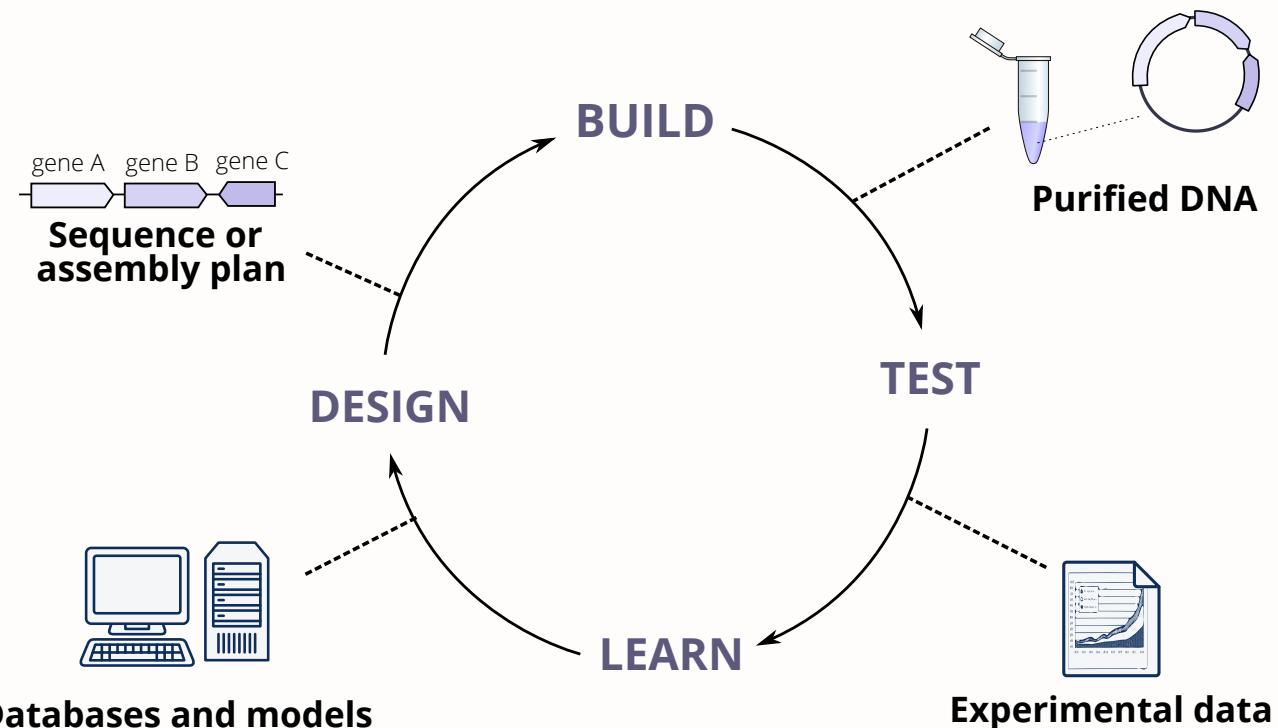
Accelerating Development Cycles in Synthetic Biology



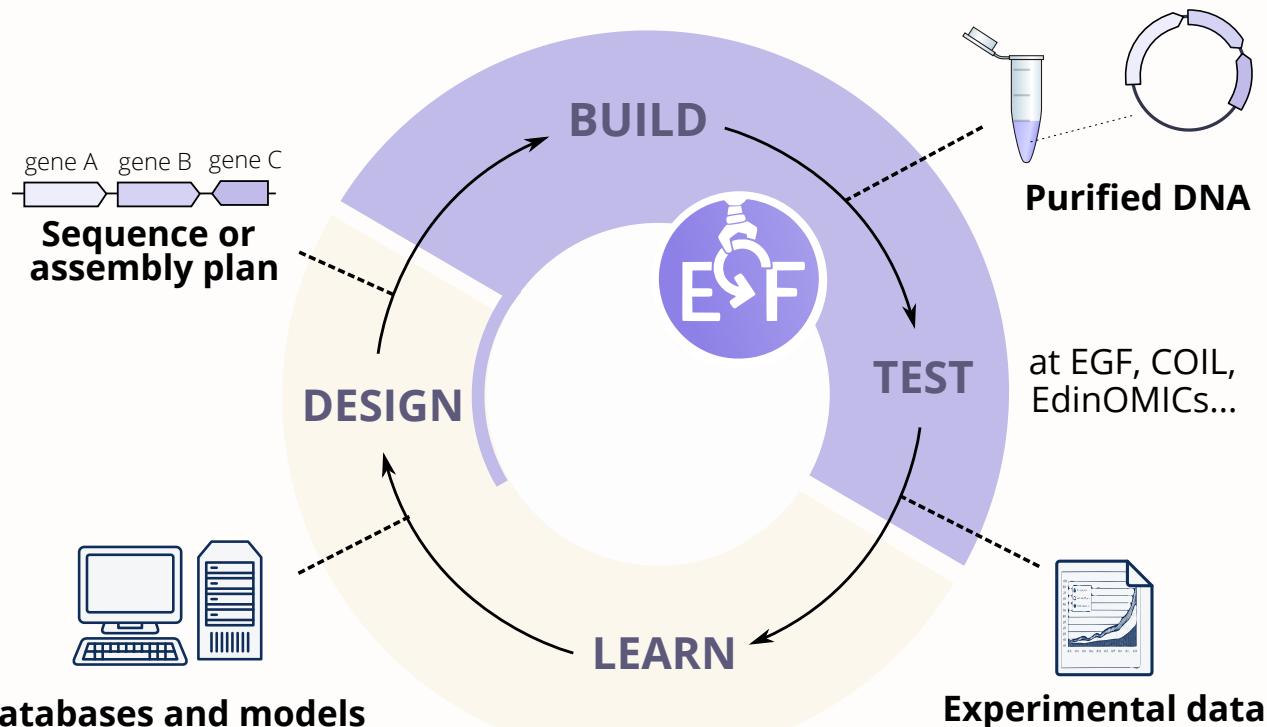
Accelerating Development Cycles in Synthetic Biology



Accelerating Development Cycles in Synthetic Biology

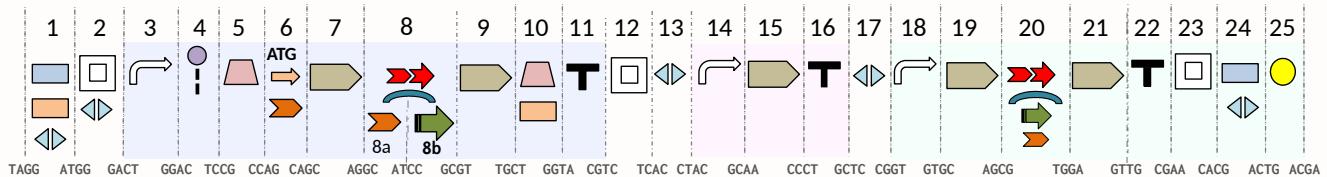


Accelerating Development Cycles in Synthetic Biology

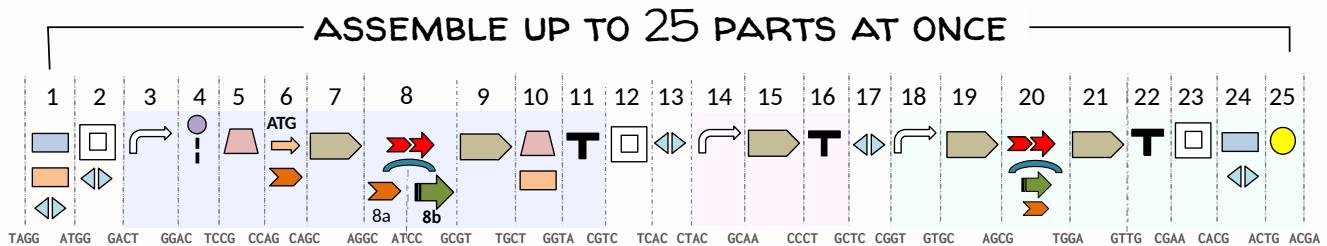


Our favorite assembly standard: EMMA

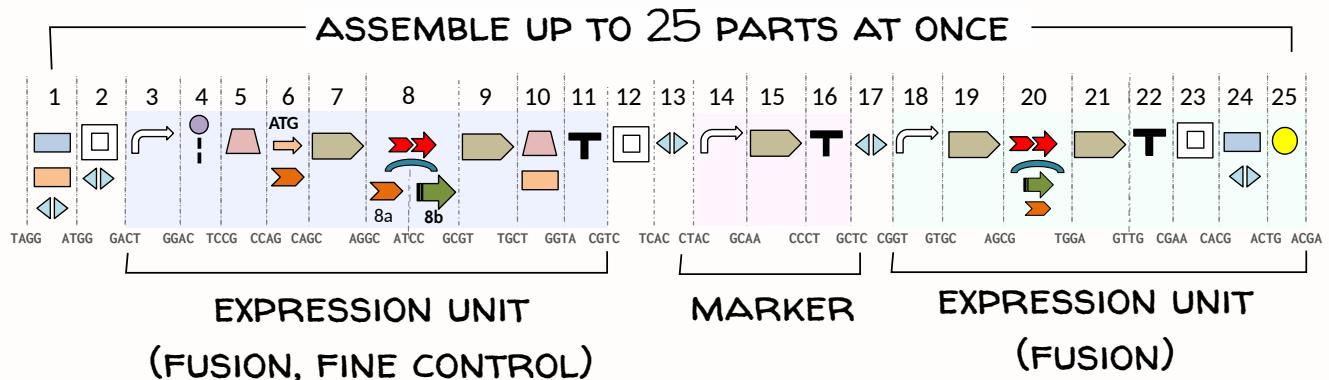
Our favorite assembly standard: EMMA



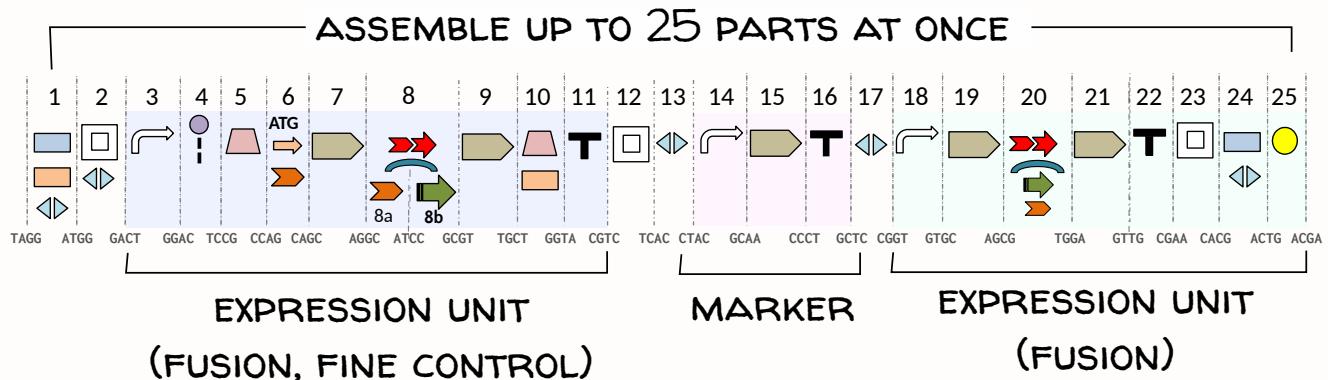
Our favorite assembly standard: EMMA



Our favorite assembly standard: EMMA



Our favorite assembly standard: EMMA



Used at the EGF for:

- ▶ Mammalian expression vectors,
- ▶ Viral gene therapy projects
- ▶ CRISPR studies
- ▶ Chromosomal insertion for structural biology projects...

How to work with us

How to work with us

1. PROJECT VALIDATION



GENERALLY 1-2 WEEKS

How to work with us

1. PROJECT VALIDATION



GENERALLY 1-2 WEEKS

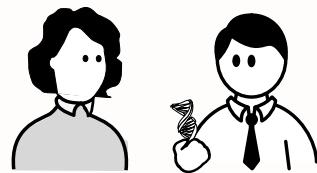
How to work with us

1. PROJECT VALIDATION



GENERALLY 1–2 WEEKS

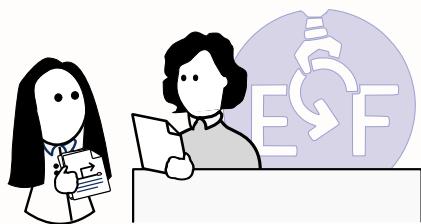
2. DNA PARTS ORDERING



GENERALLY 4–6 WEEKS
FOR PARTS 1–5KB
~10c / BP + £40 / PART

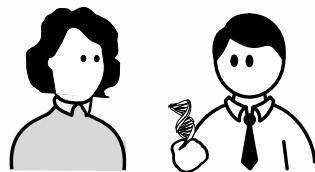
How to work with us

1. PROJECT VALIDATION



GENERALLY 1–2 WEEKS

2. DNA PARTS ORDERING

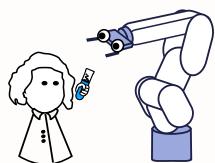


GENERALLY 4–6 WEEKS

FOR PARTS 1–5KB

~ 10c / BP + £40 / PART

3. ASSEMBLY ON OUR PLATFORM



GENERALLY 1–3 WEEKS

~ £30 / ASSEMBLY

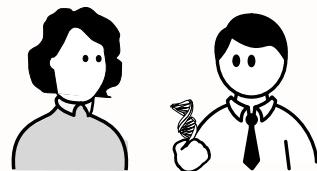
How to work with us

1. PROJECT VALIDATION



GENERALLY 1-2 WEEKS

2. DNA PARTS ORDERING

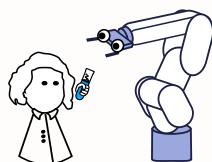


GENERALLY 4-6 WEEKS

FOR PARTS 1-5KB

~ 10c / BP + £40 / PART

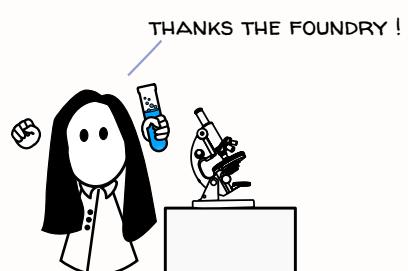
3. ASSEMBLY ON OUR PLATFORM



GENERALLY 1-3 WEEKS

~ £30 / ASSEMBLY

4. HAPPY CUSTOMER

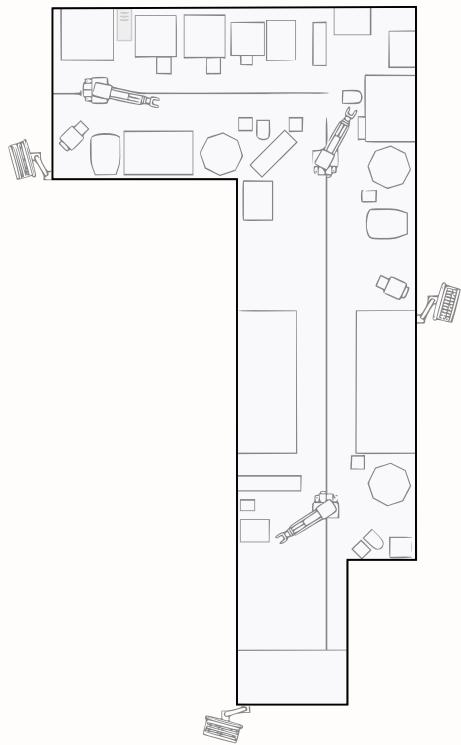


The EGF's High-Throughput robotic platform



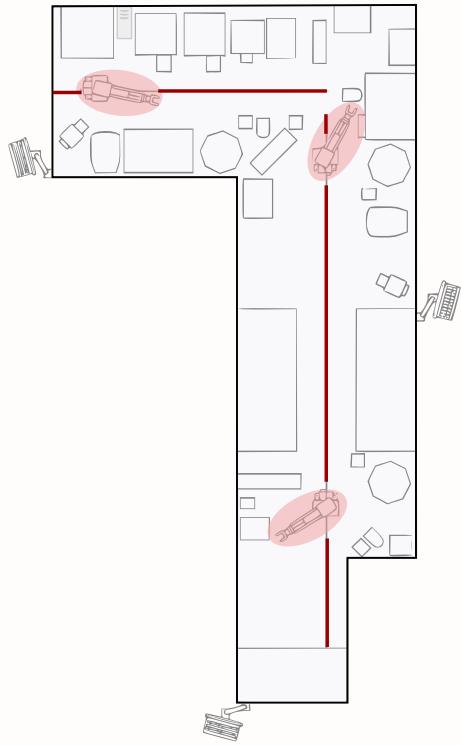
The EGF's High-Throughput Robotic Platform

EGF robotic setup

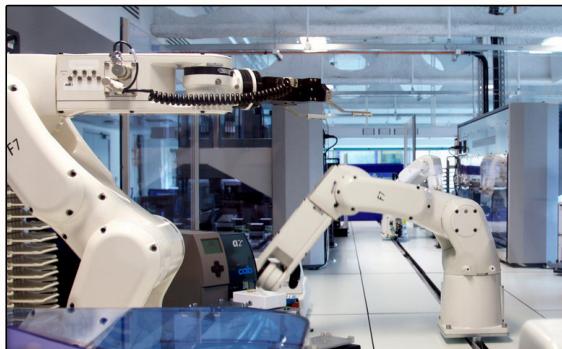


The EGF's High-Throughput Robotic Platform

EGF robotic setup

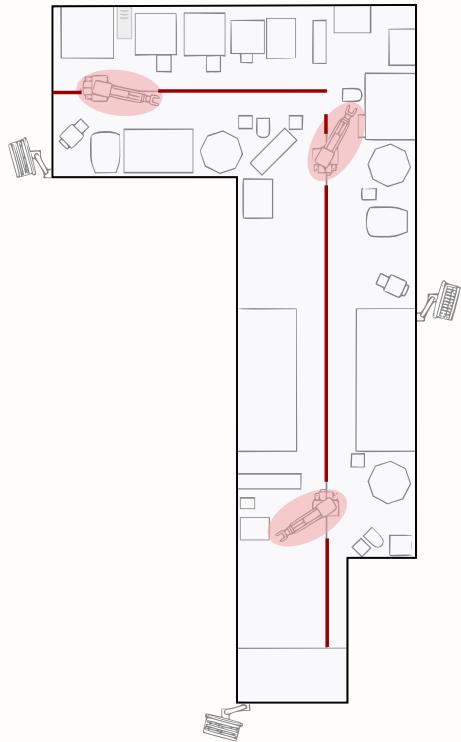


Robotic arms

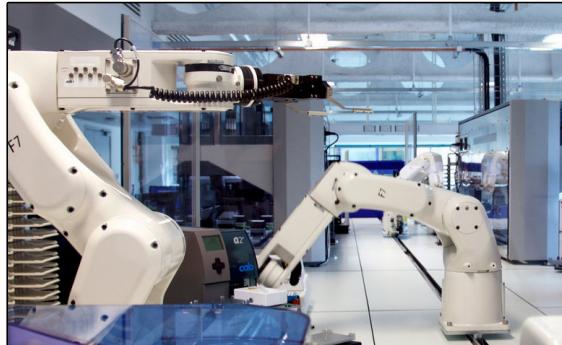


The EGF's High-Throughput Robotic Platform

EGF robotic setup



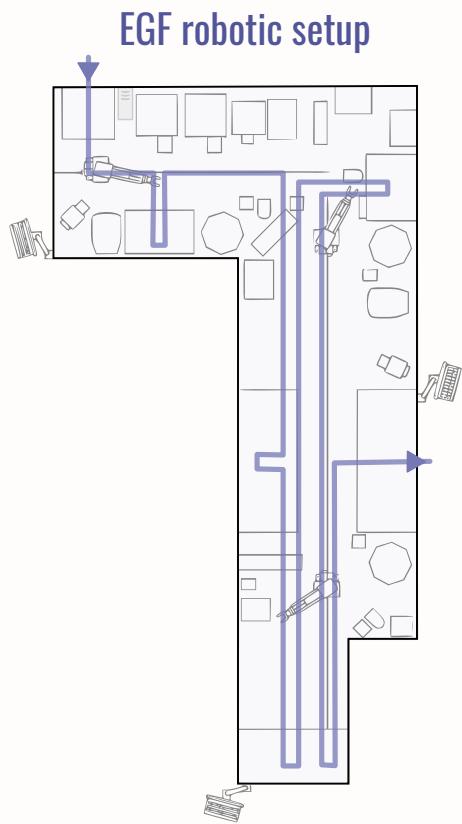
Robotic arms



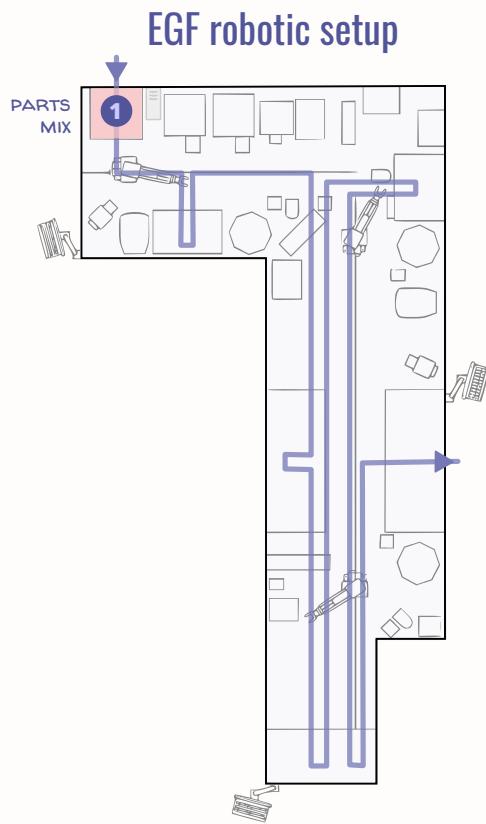
Microplates



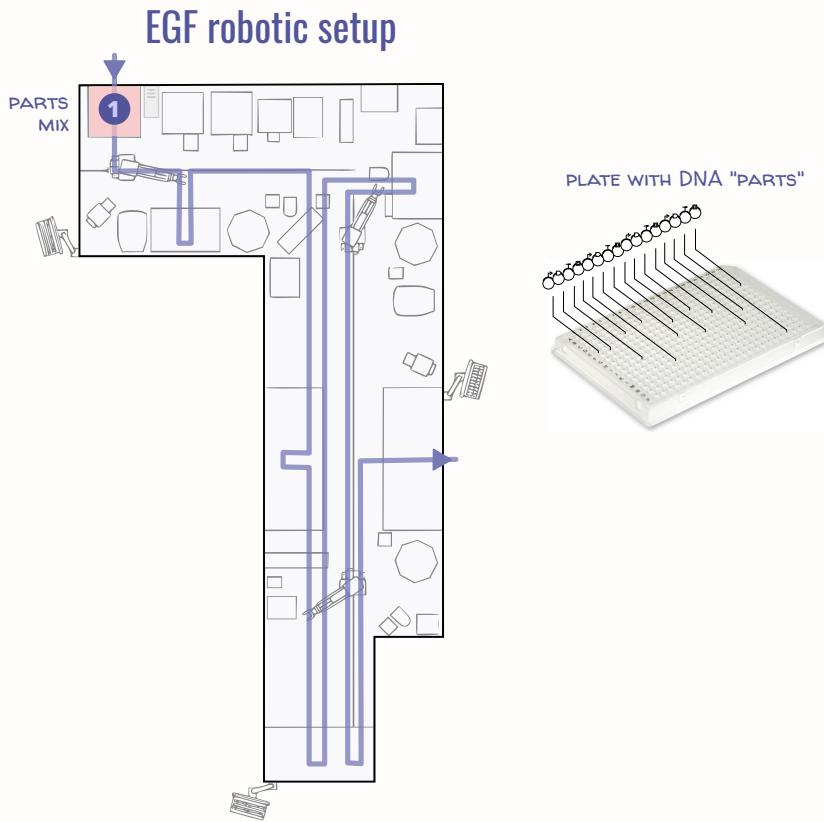
The EGF's High-Throughput Robotic Platform



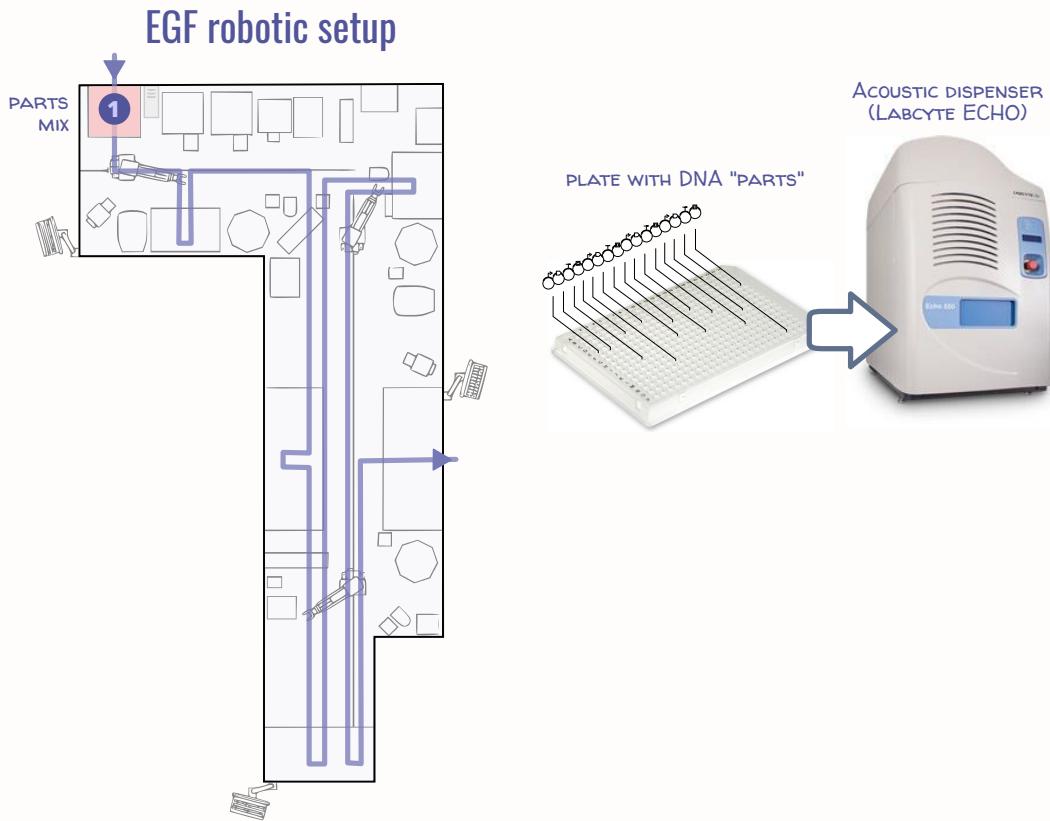
The EGF's High-Throughput Robotic Platform



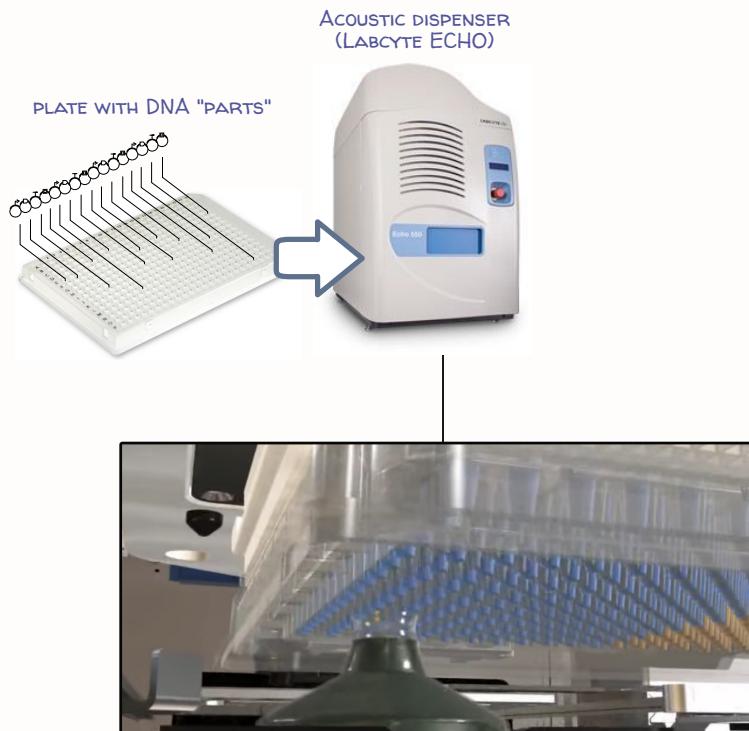
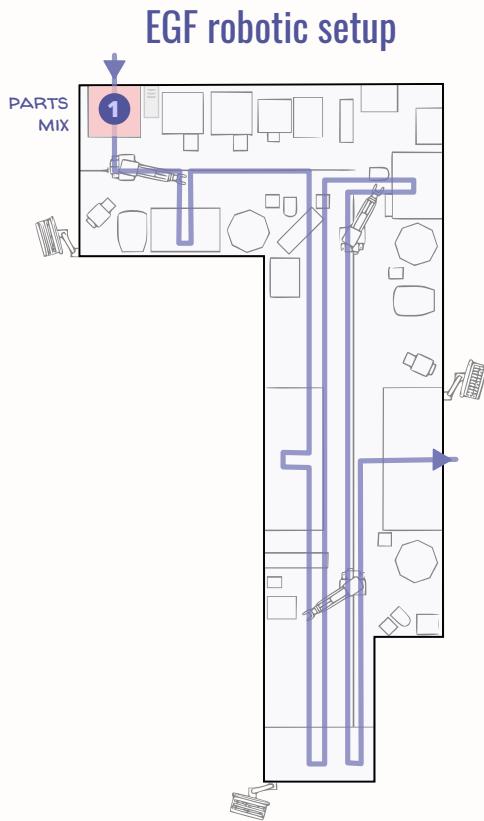
The EGF's High-Throughput Robotic Platform



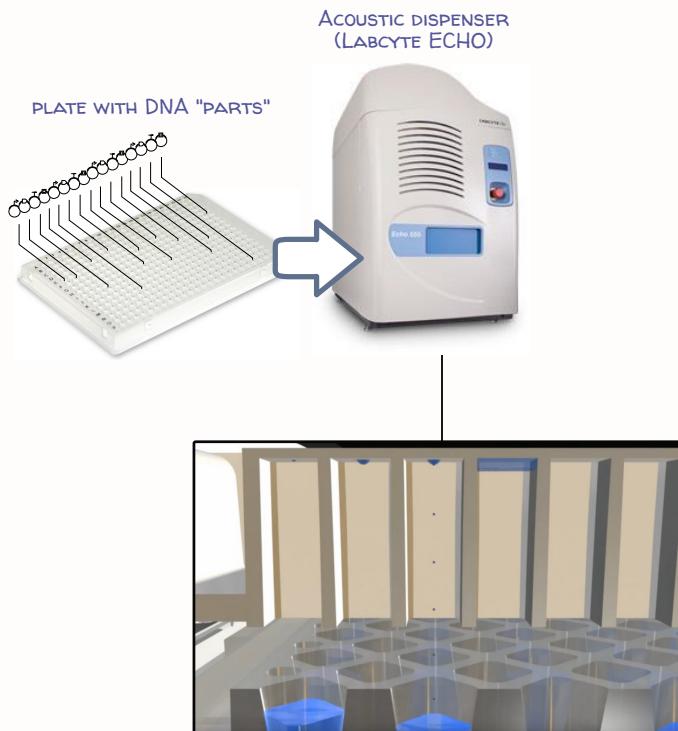
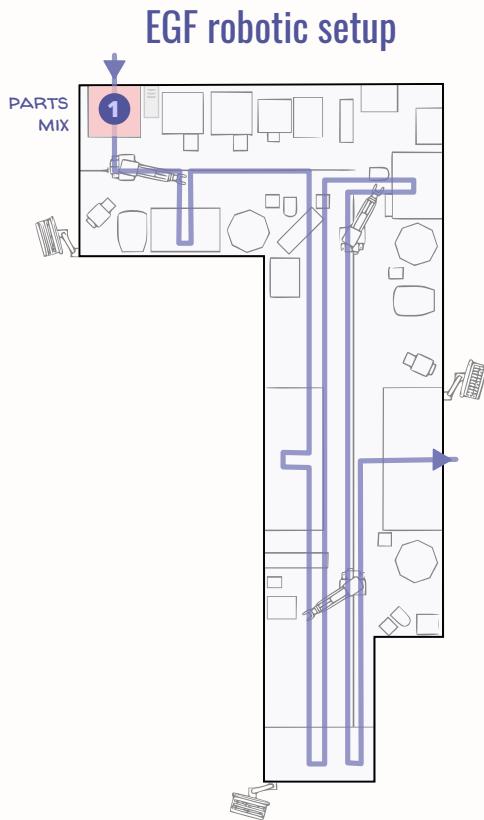
The EGF's High-Throughput Robotic Platform



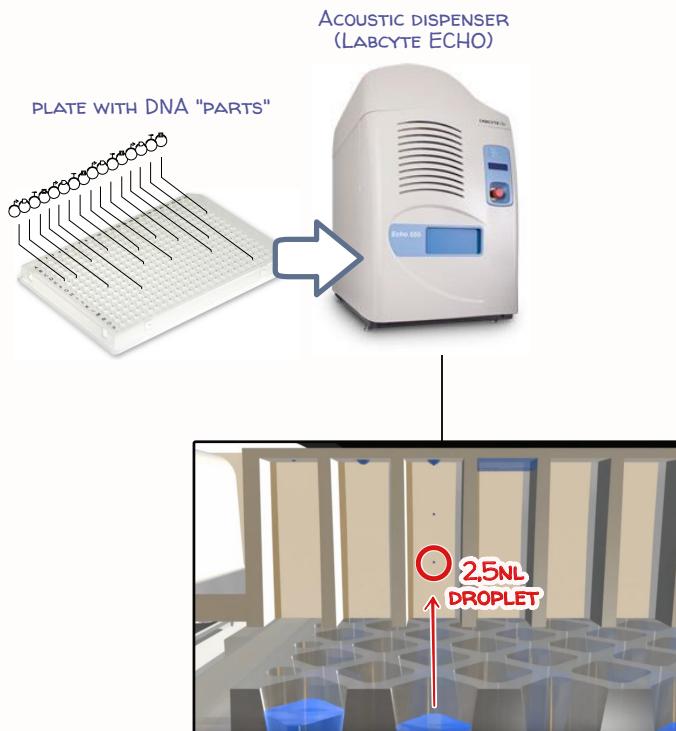
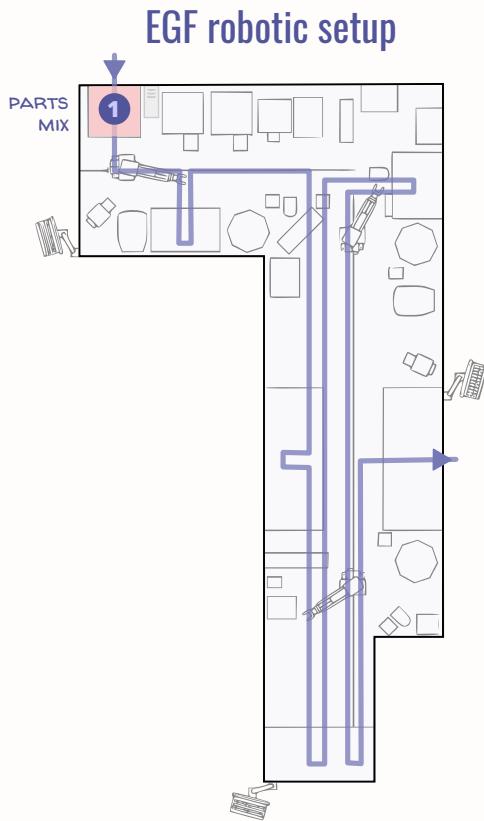
The EGF's High-Throughput Robotic Platform



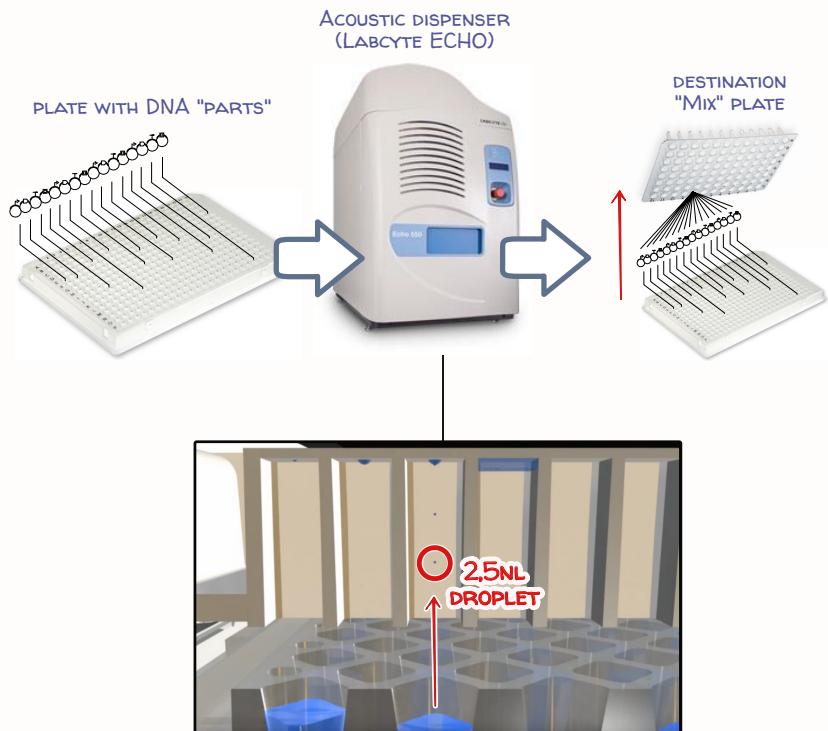
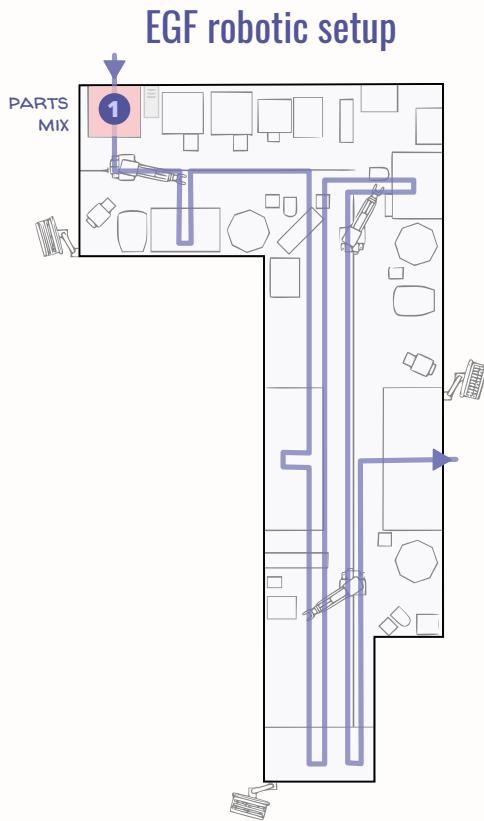
The EGF's High-Throughput Robotic Platform



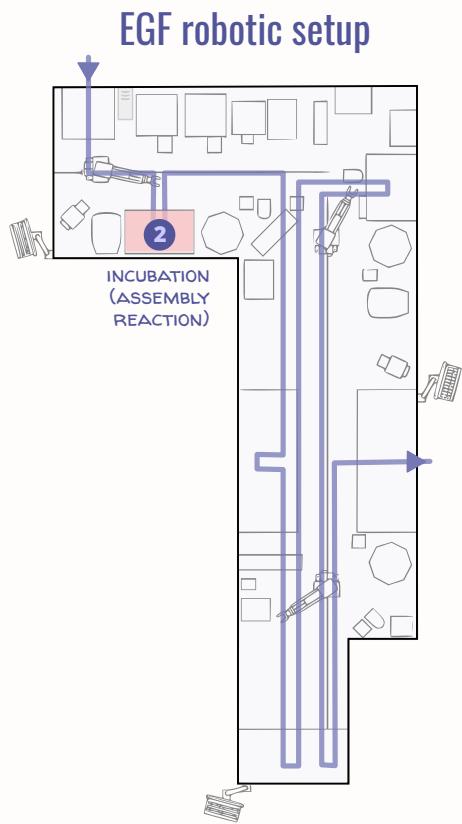
The EGF's High-Throughput Robotic Platform



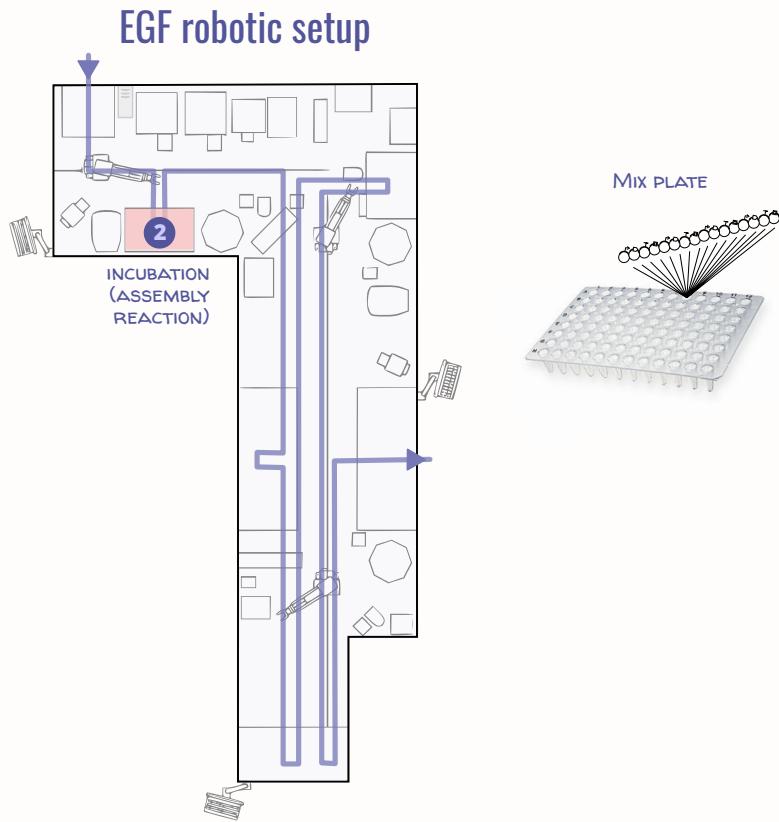
The EGF's High-Throughput Robotic Platform



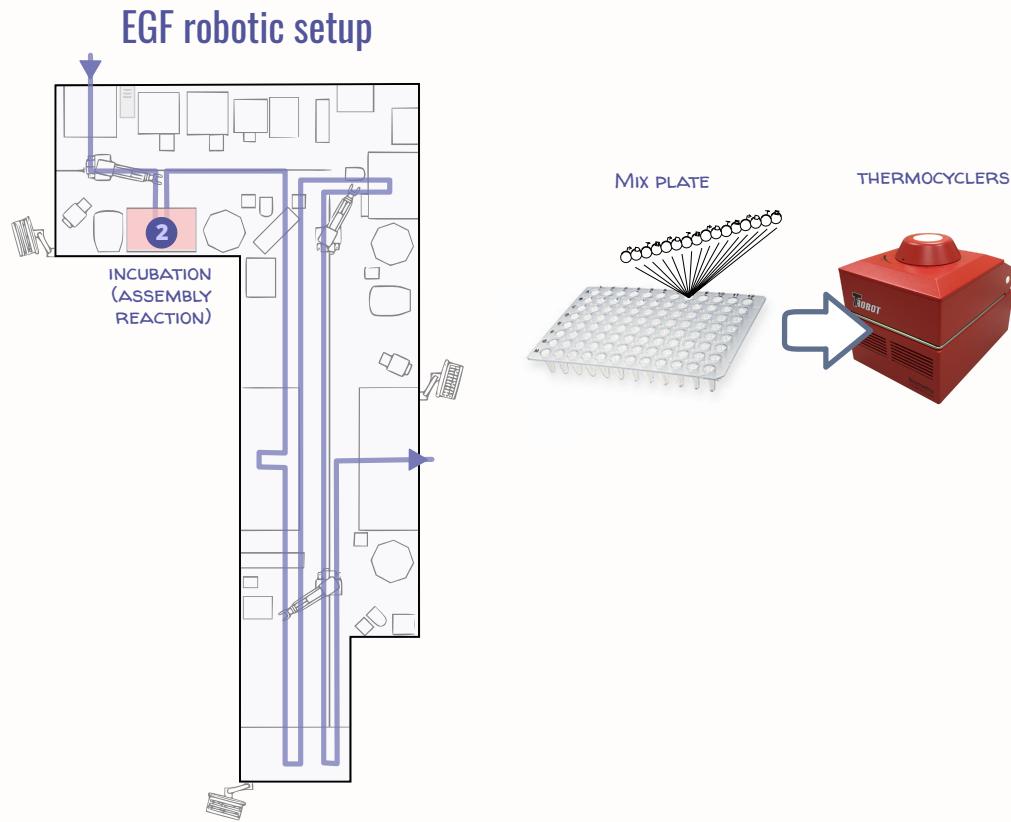
The EGF's High-Throughput Robotic Platform



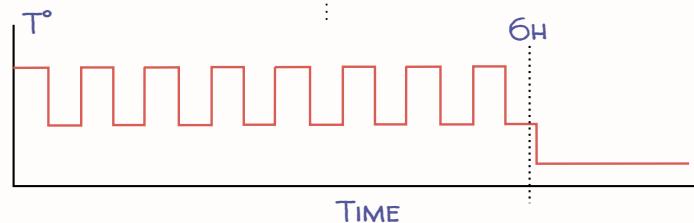
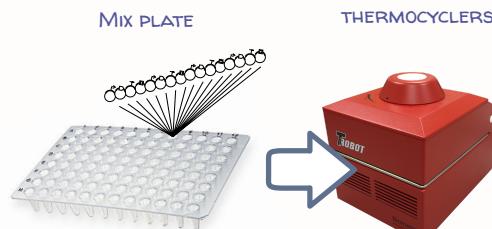
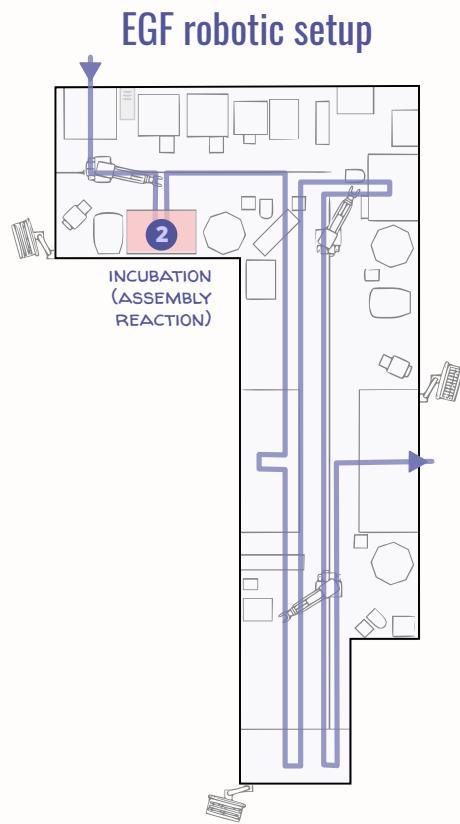
The EGF's High-Throughput Robotic Platform



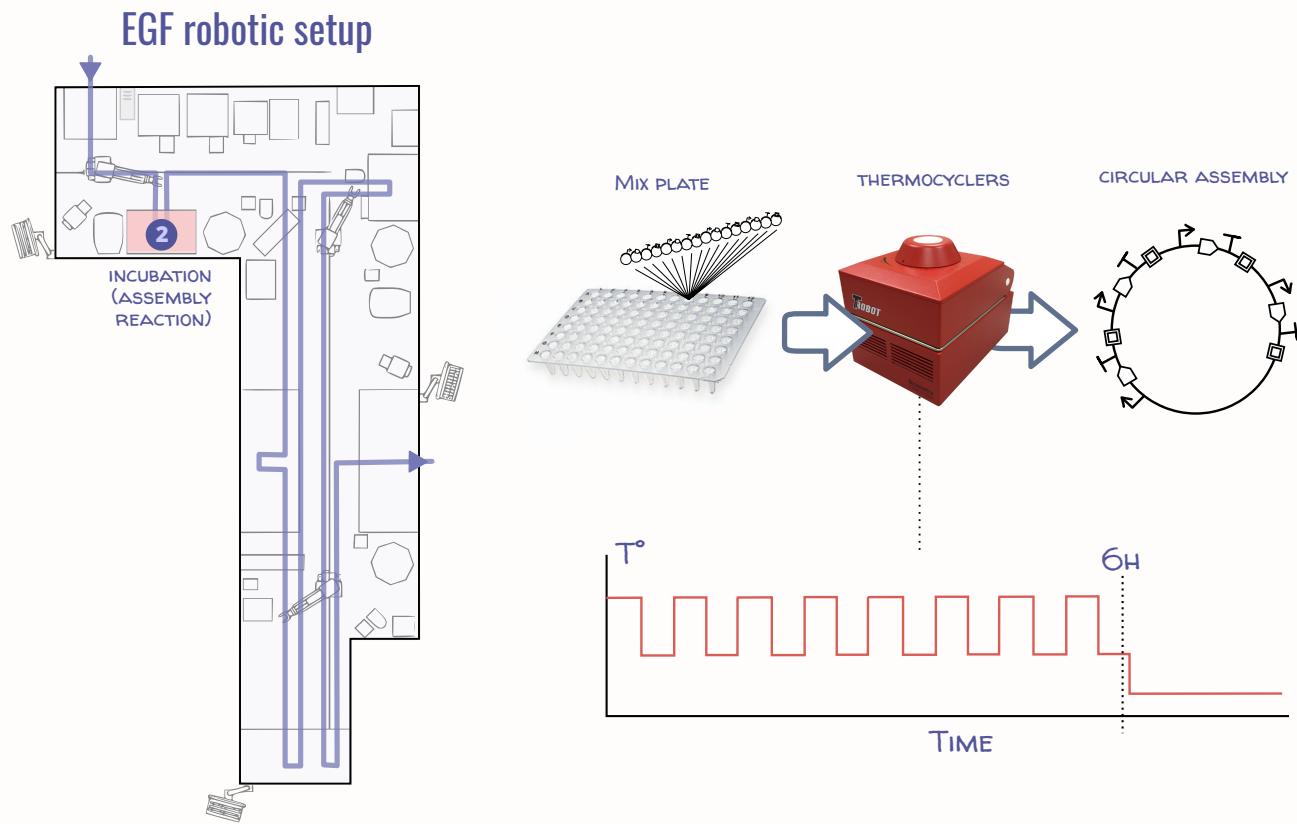
The EGF's High-Throughput Robotic Platform



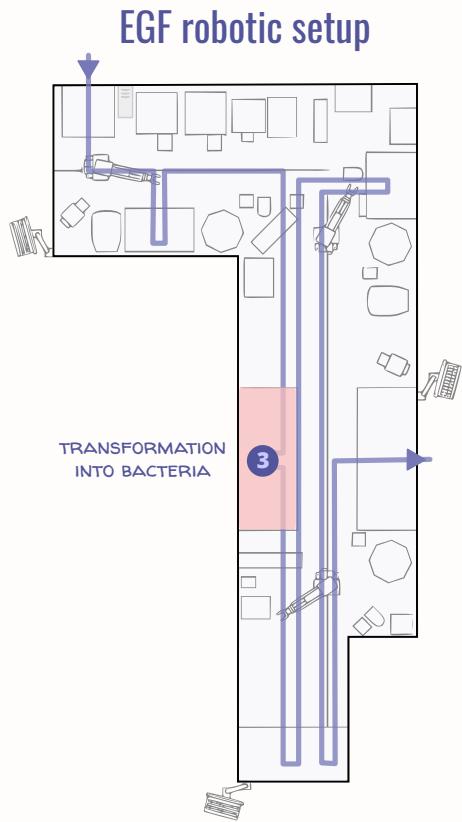
The EGF's High-Throughput Robotic Platform



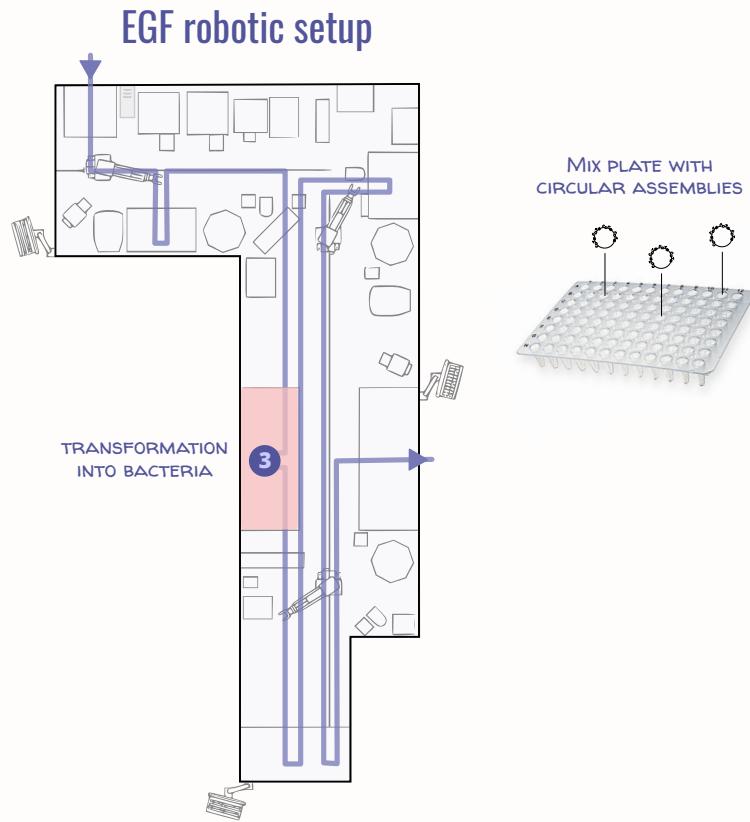
The EGF's High-Throughput Robotic Platform



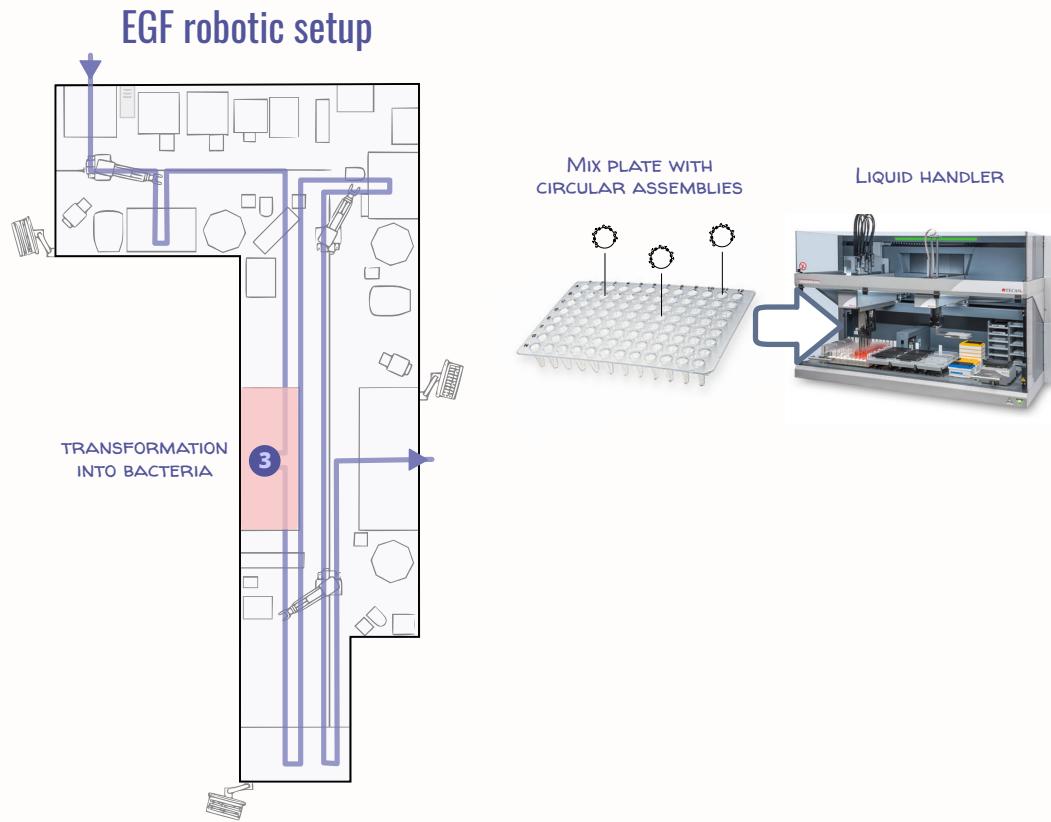
The EGF's High-Throughput Robotic Platform



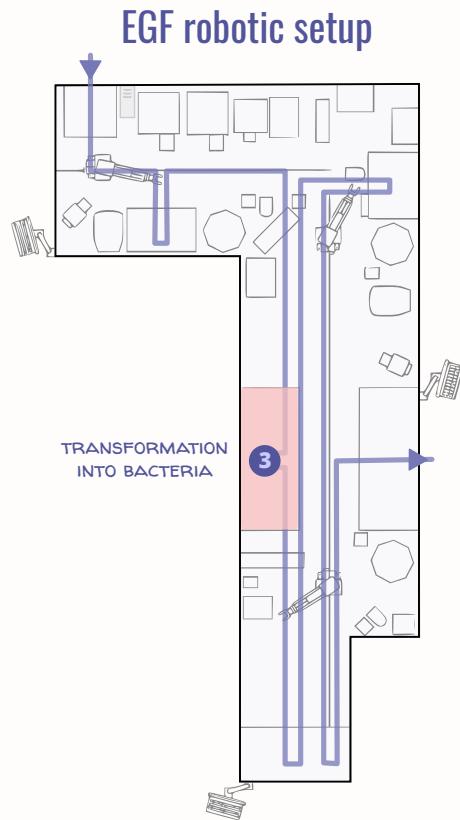
The EGF's High-Throughput Robotic Platform



The EGF's High-Throughput Robotic Platform

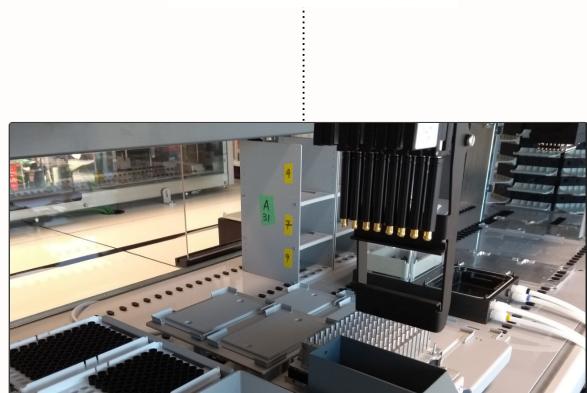
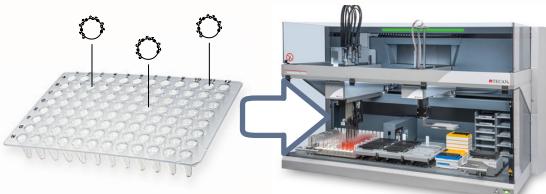


The EGF's High-Throughput Robotic Platform

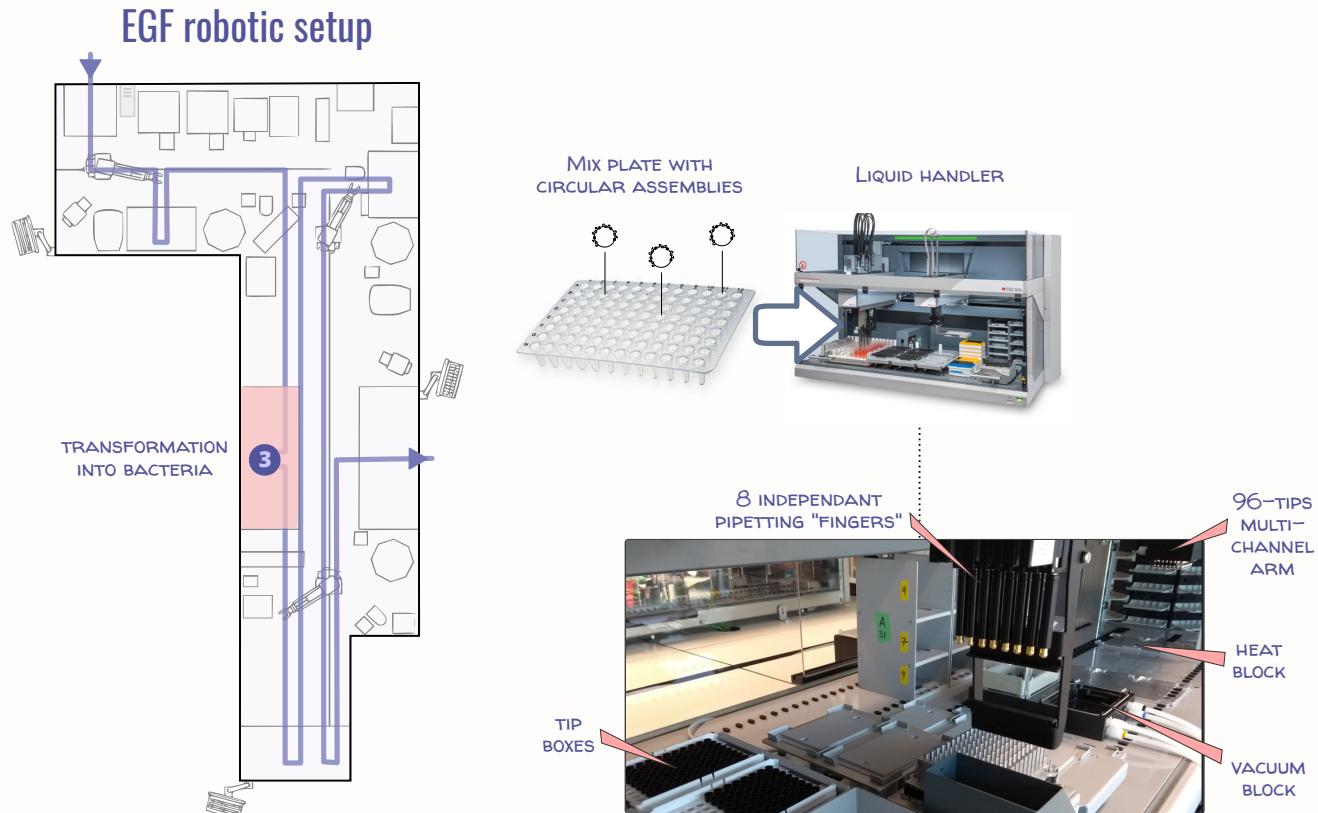


MIX PLATE WITH
CIRCULAR ASSEMBLIES

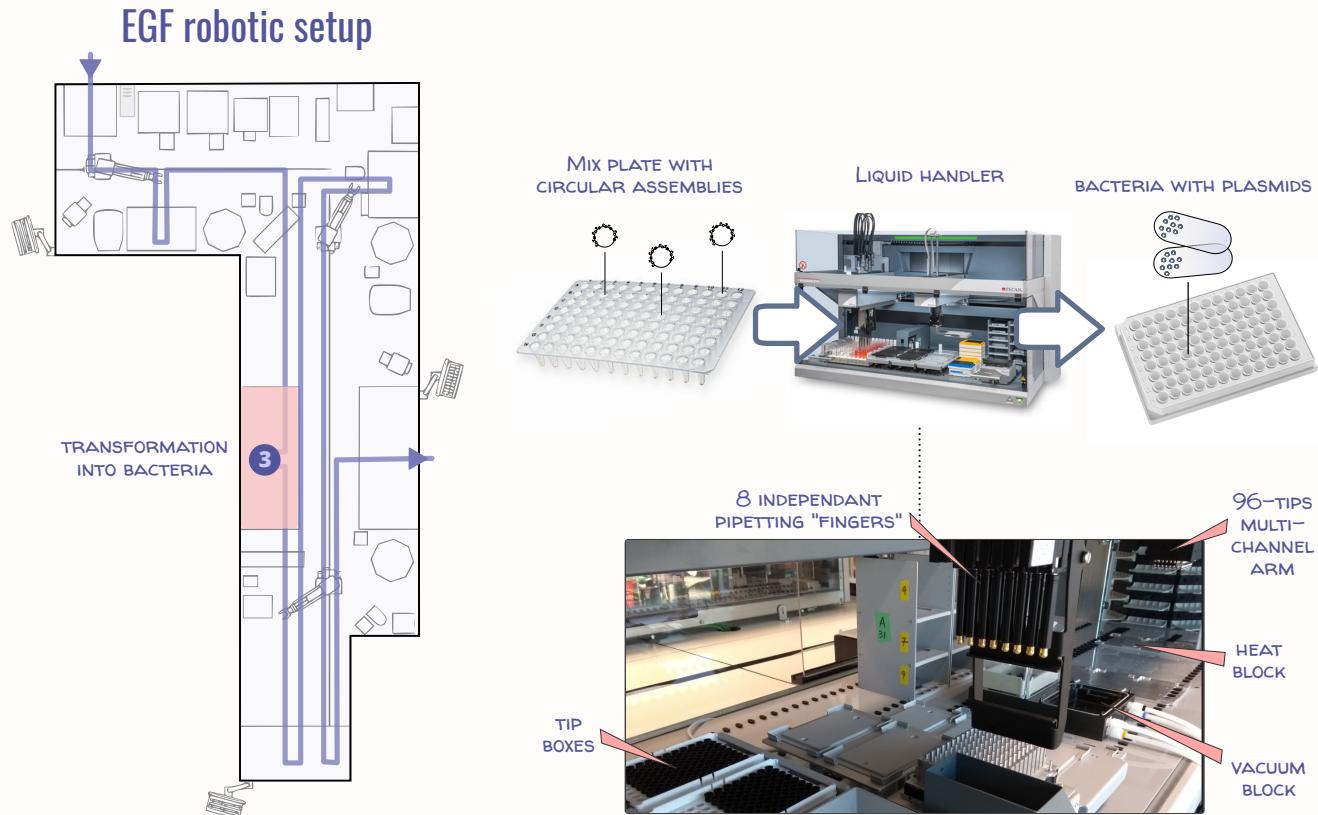
LIQUID HANDLER



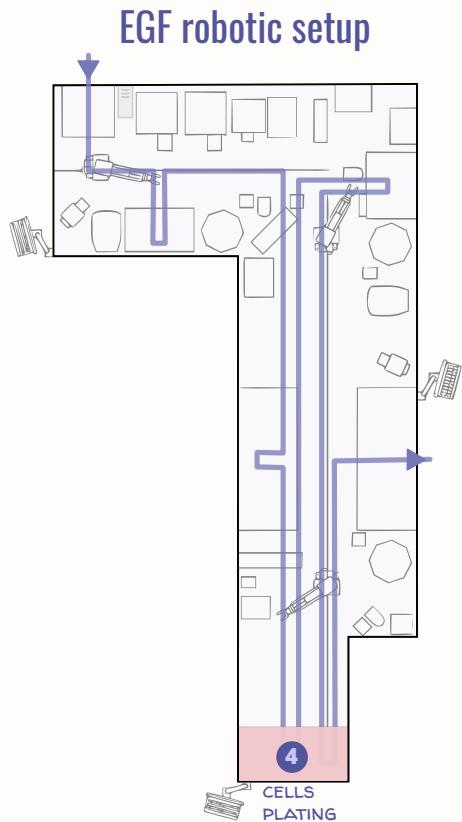
The EGF's High-Throughput Robotic Platform



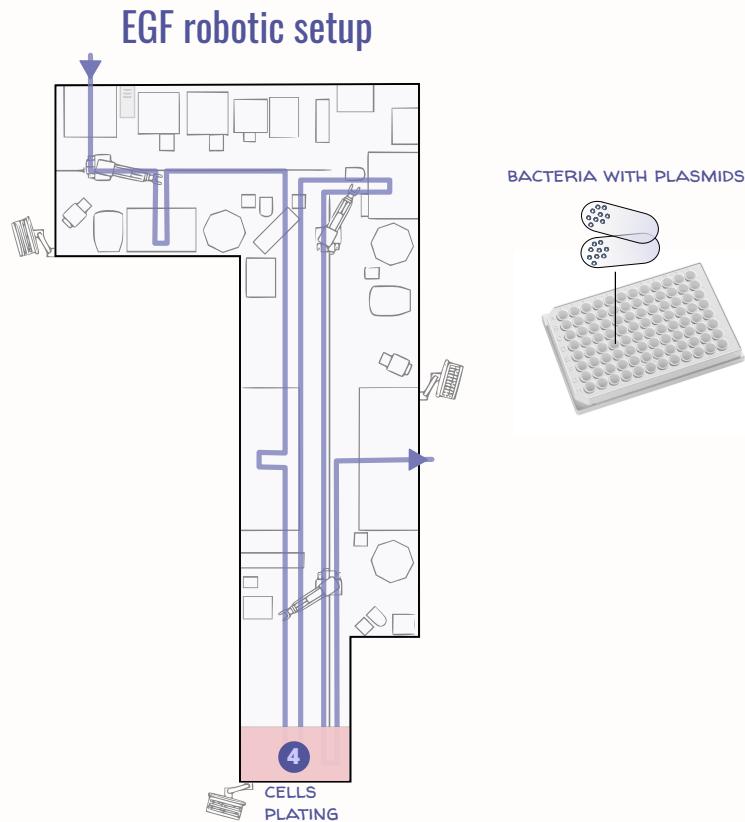
The EGF's High-Throughput Robotic Platform



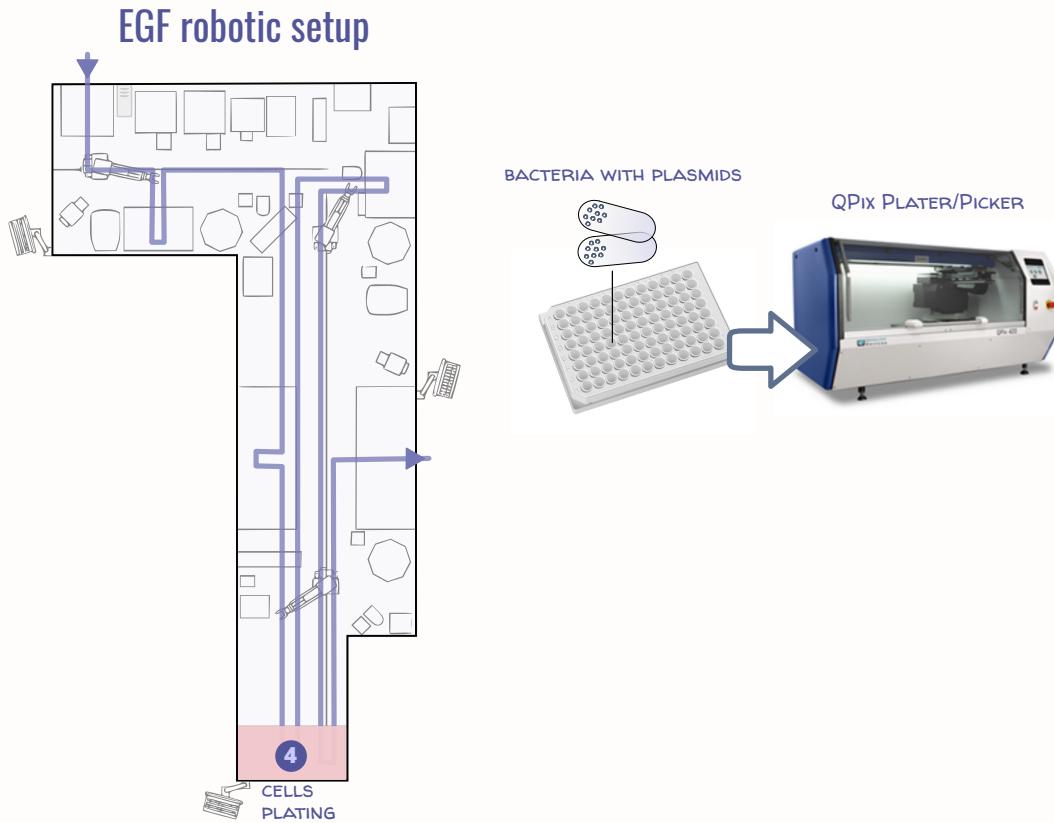
The EGF's High-Throughput Robotic Platform



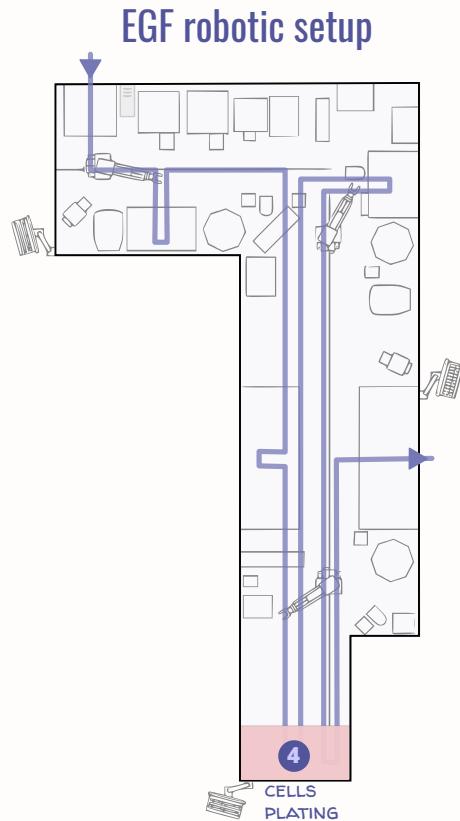
The EGF's High-Throughput Robotic Platform



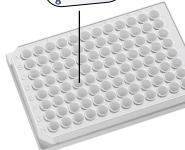
The EGF's High-Throughput Robotic Platform



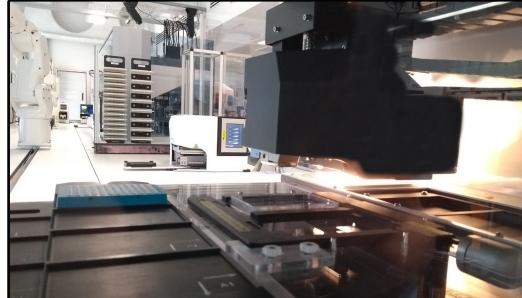
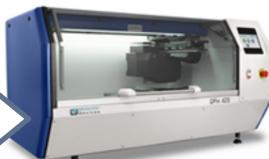
The EGF's High-Throughput Robotic Platform



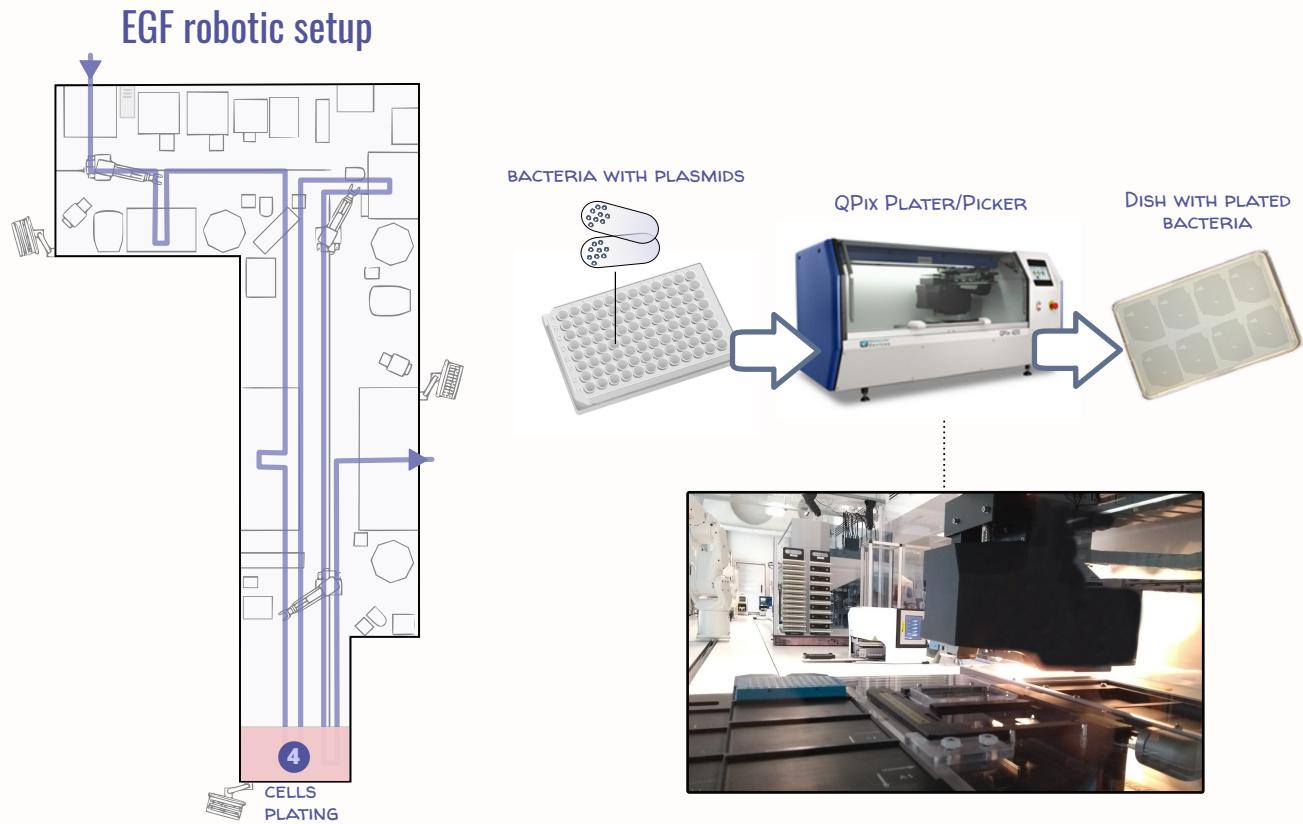
BACTERIA WITH PLASMIDS



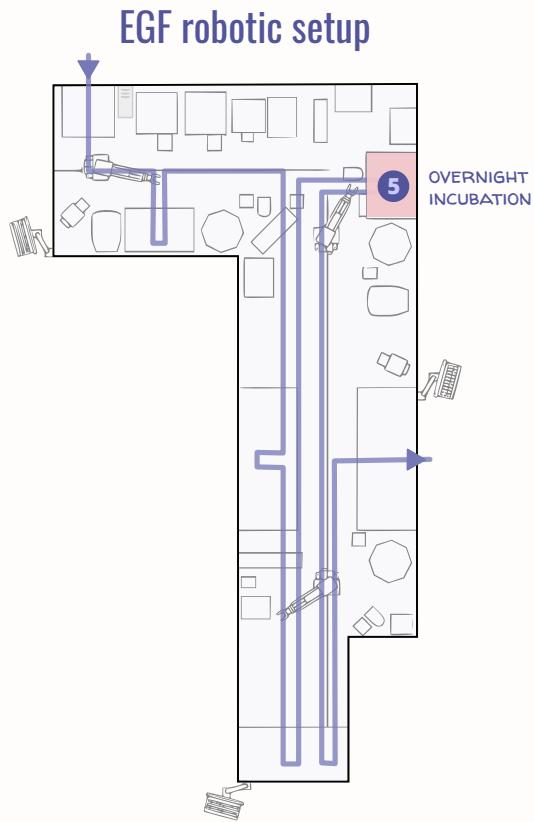
QPix PLATER/PICKER



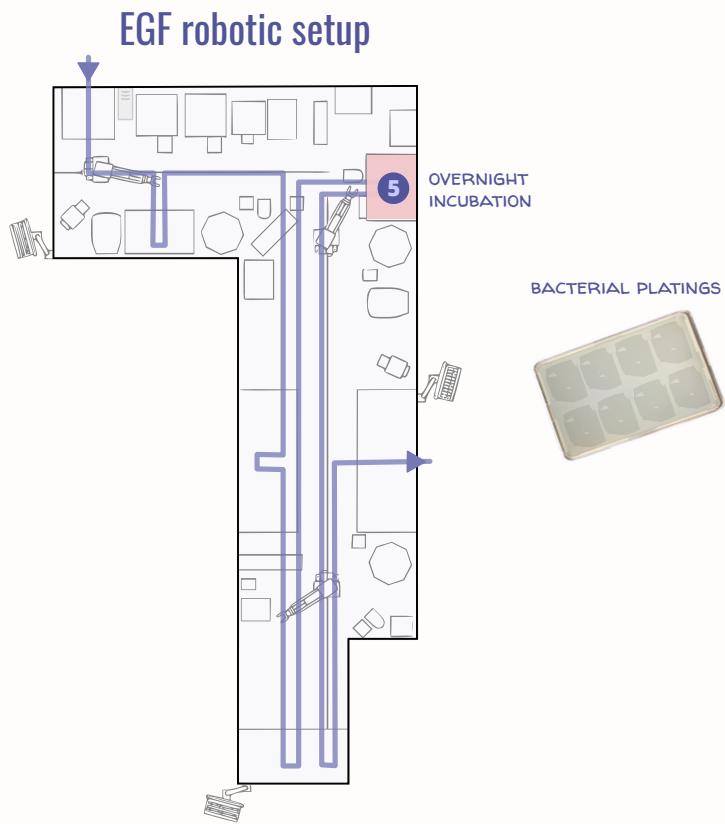
The EGF's High-Throughput Robotic Platform



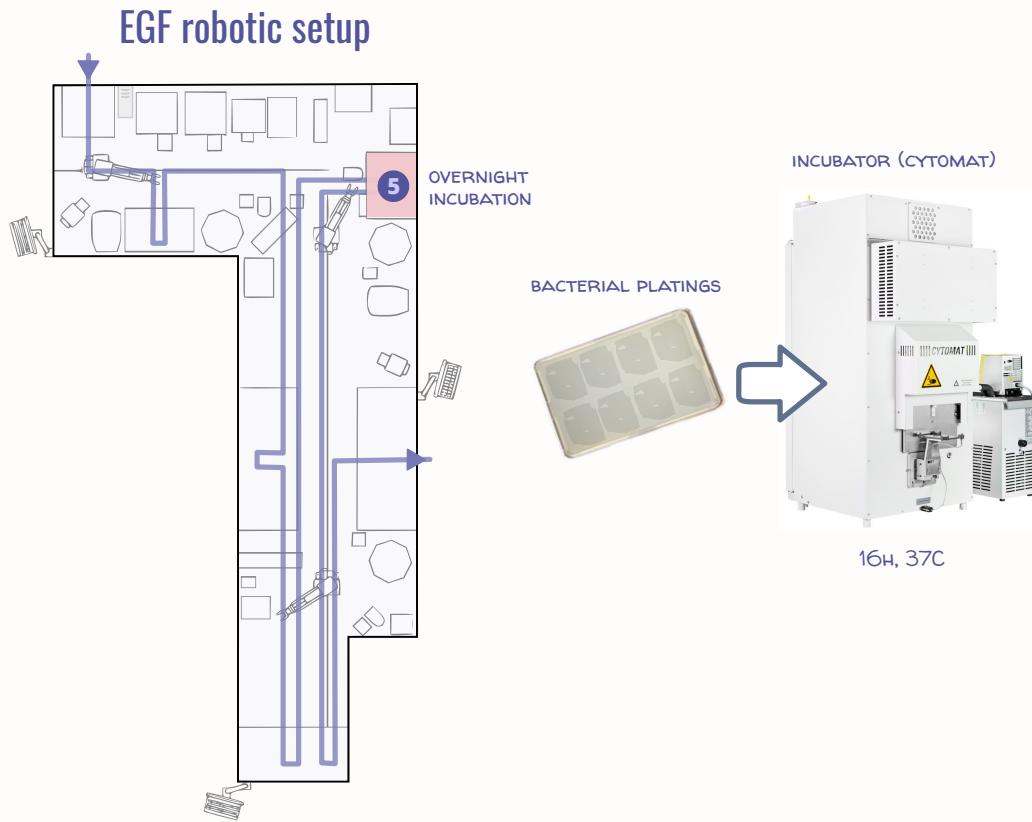
The EGF's High-Throughput Robotic Platform



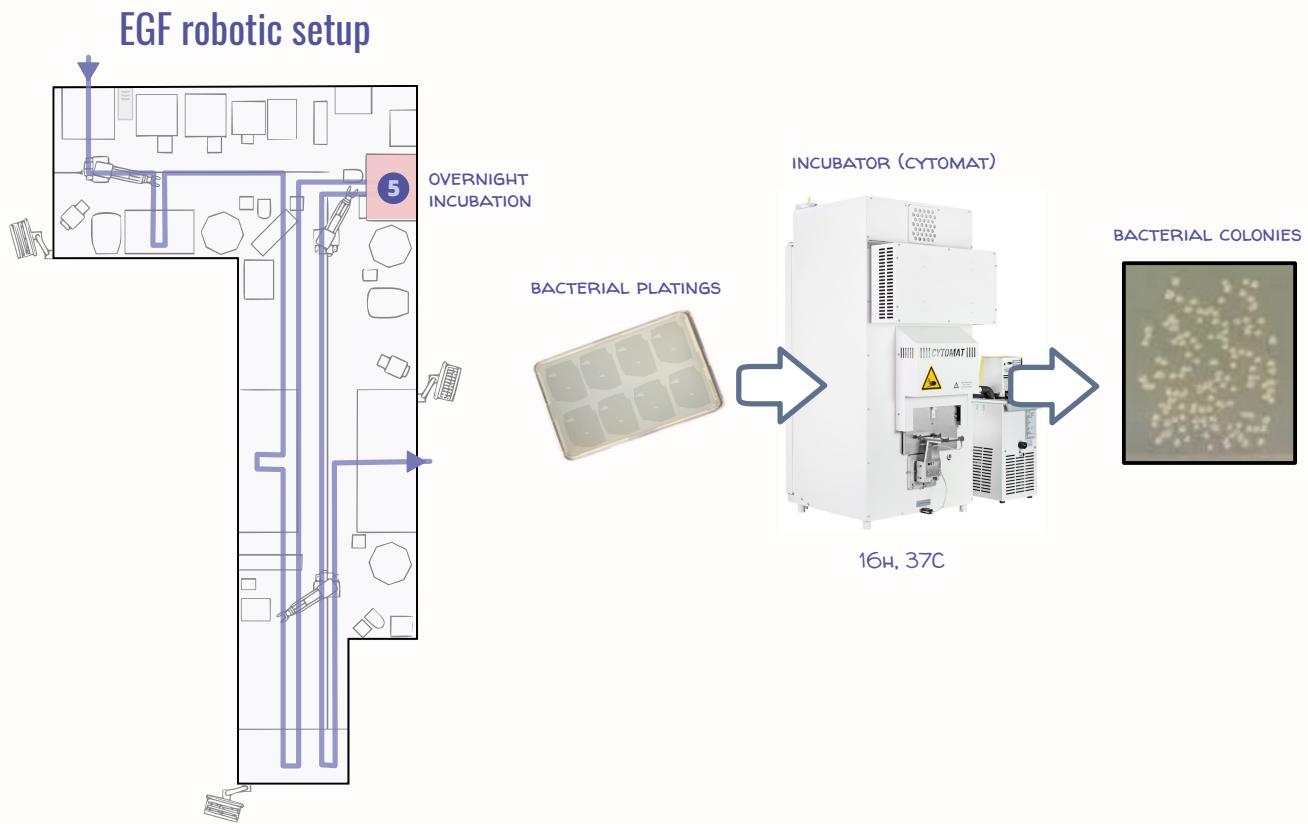
The EGF's High-Throughput Robotic Platform



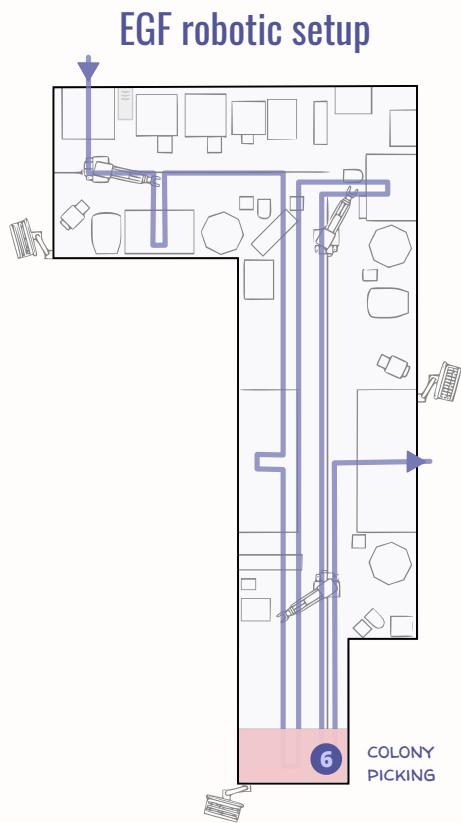
The EGF's High-Throughput Robotic Platform



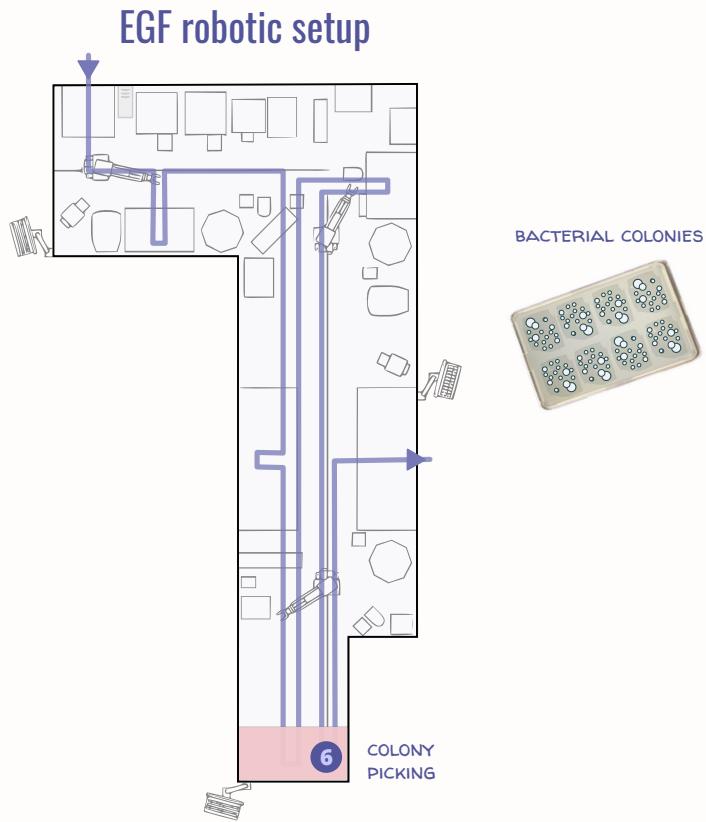
The EGF's High-Throughput Robotic Platform



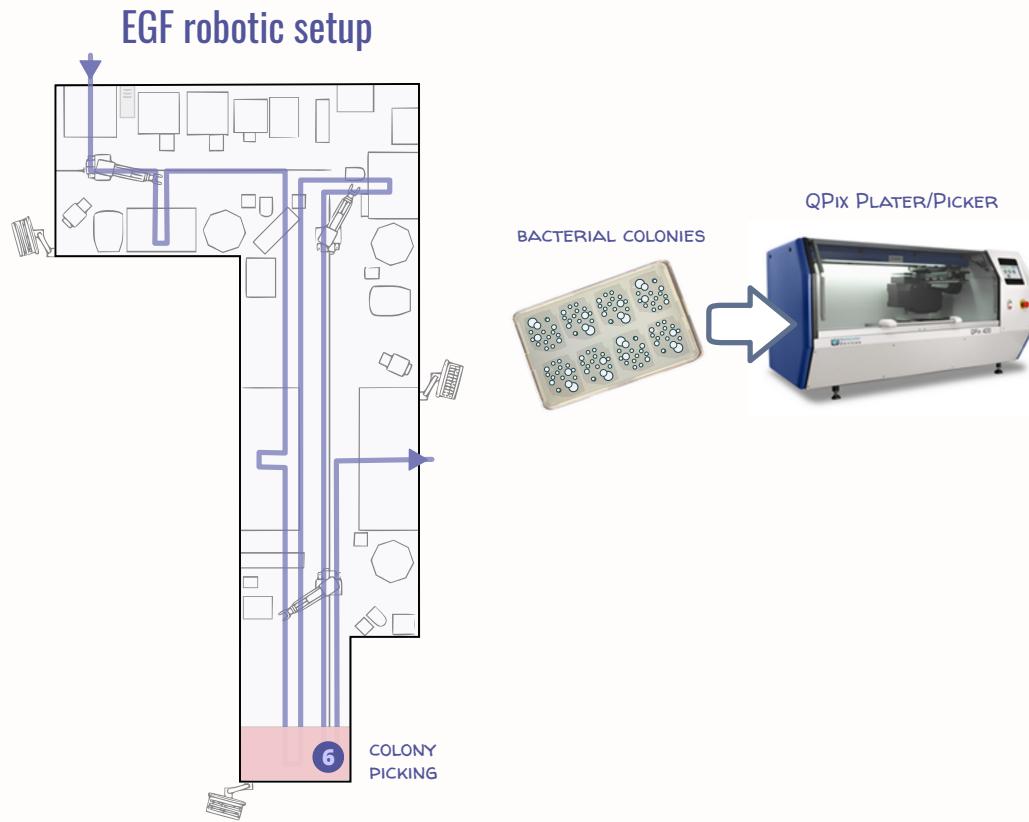
The EGF's High-Throughput Robotic Platform



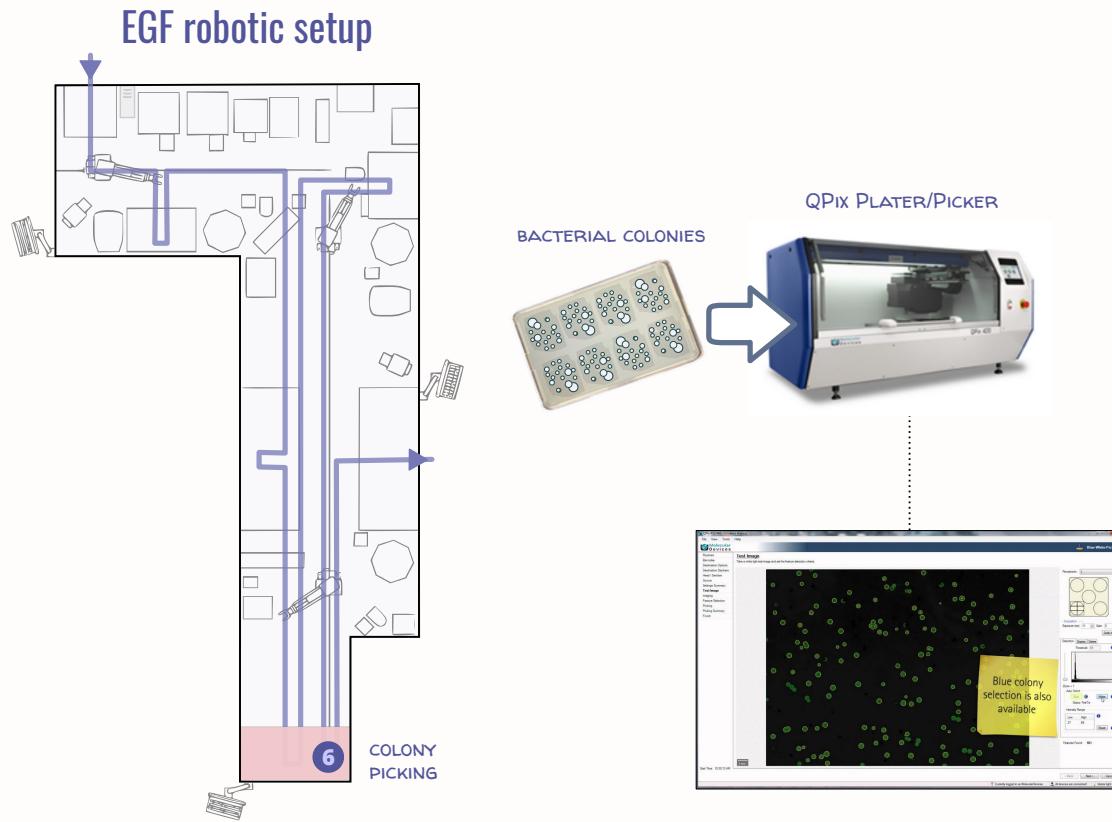
The EGF's High-Throughput Robotic Platform



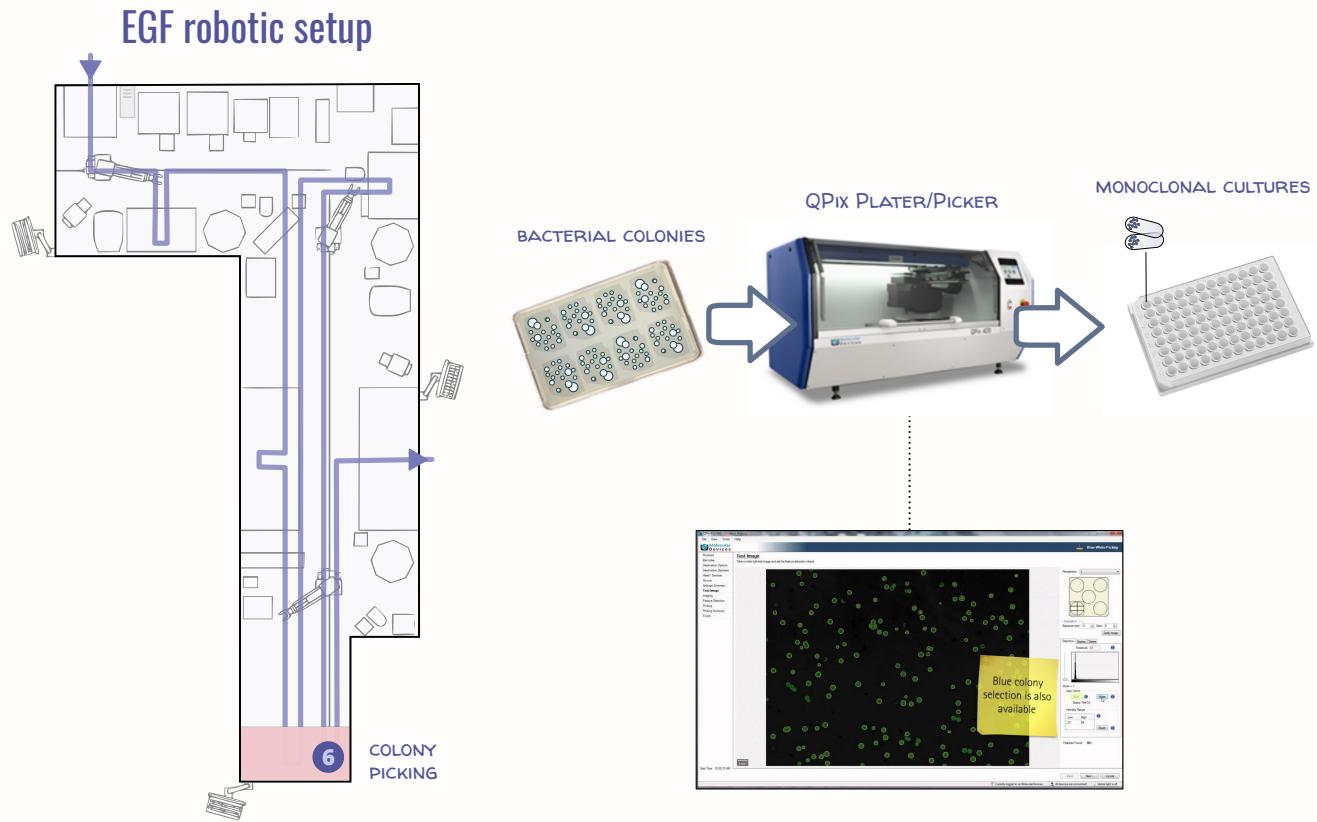
The EGF's High-Throughput Robotic Platform



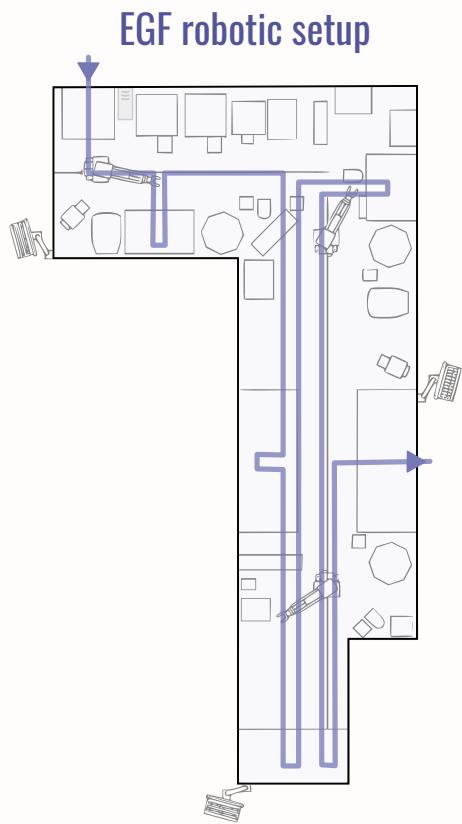
The EGF's High-Throughput Robotic Platform



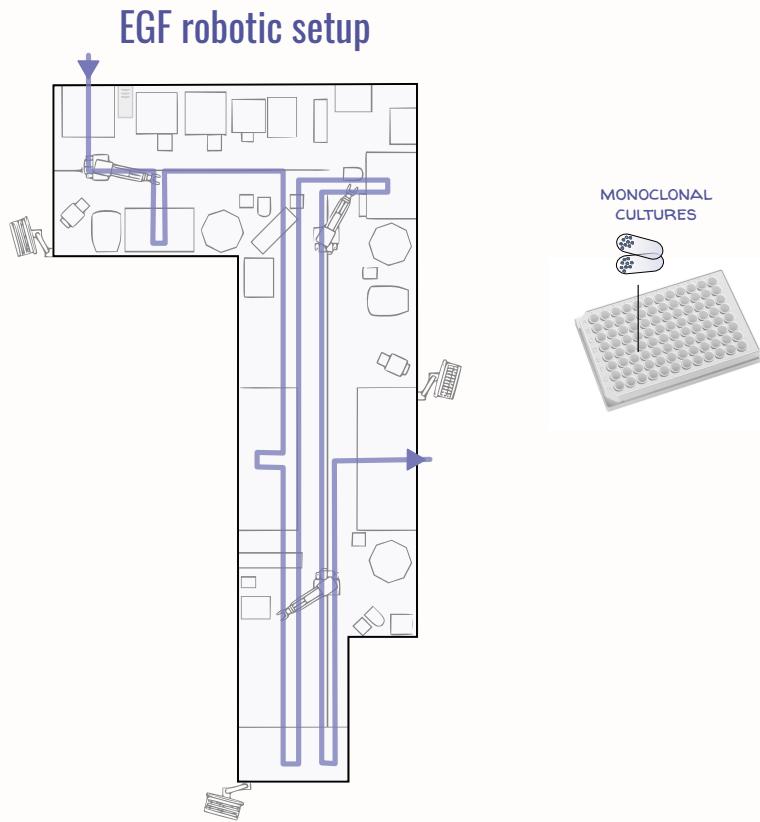
The EGF's High-Throughput Robotic Platform



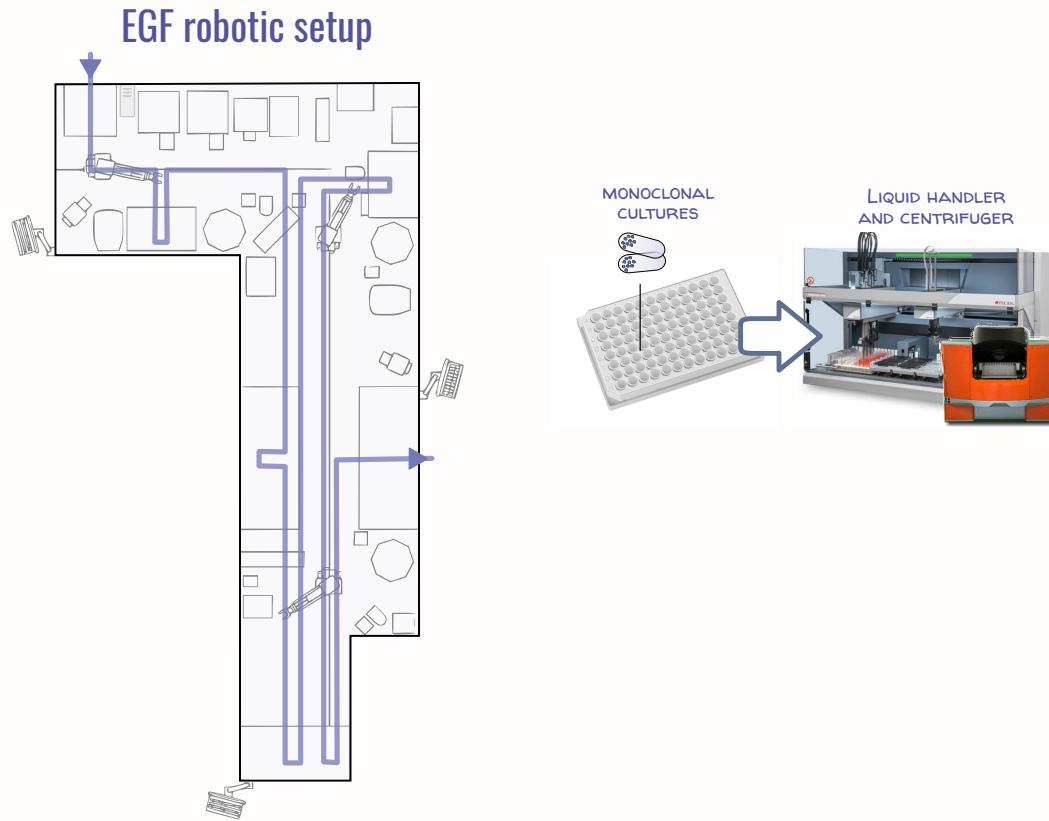
The EGF's High-Throughput Robotic Platform



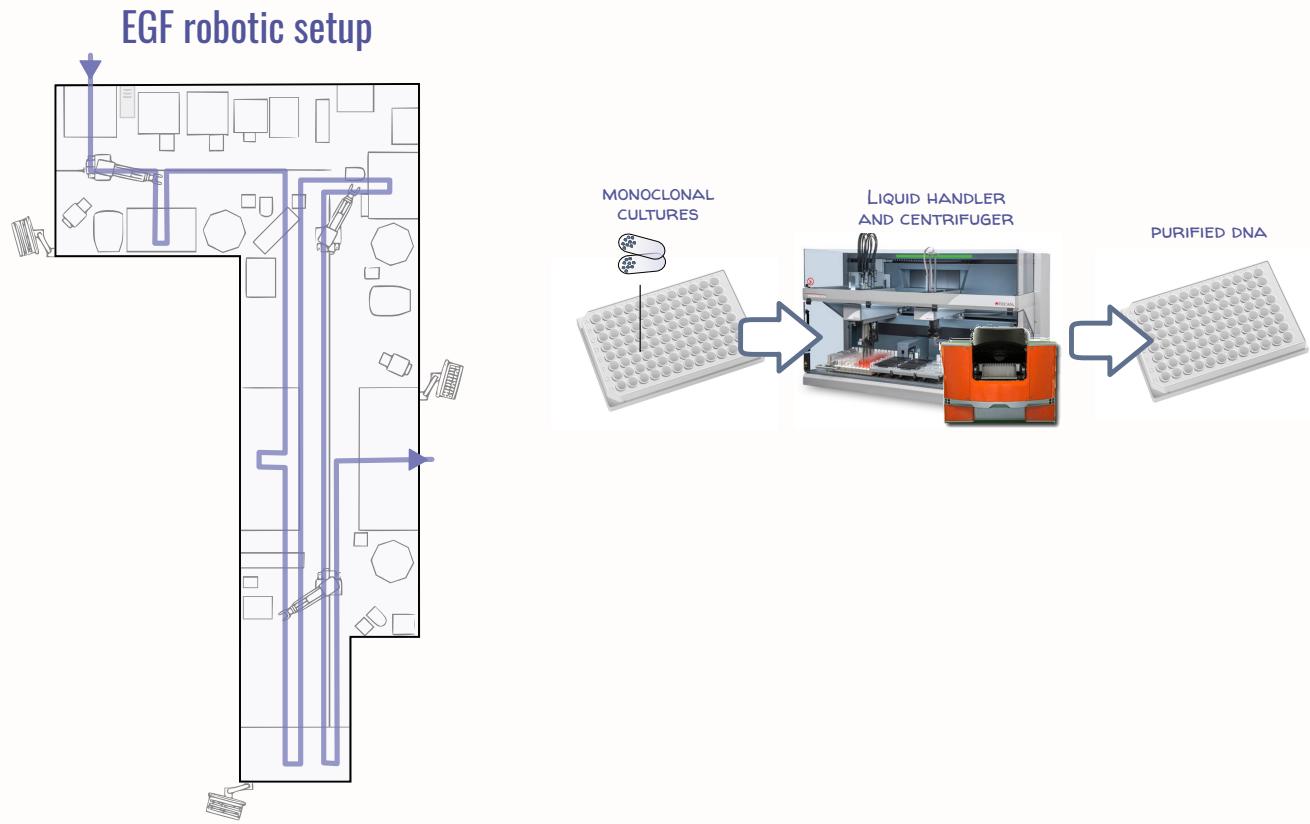
The EGF's High-Throughput Robotic Platform



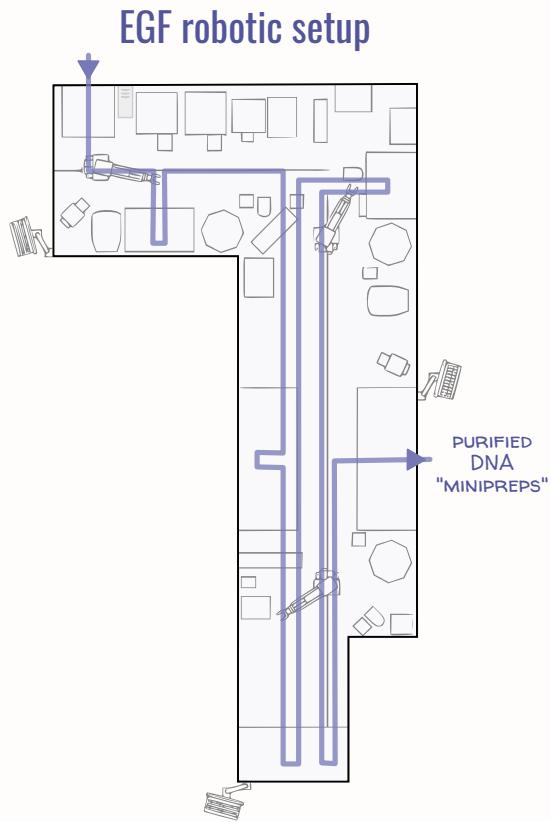
The EGF's High-Throughput Robotic Platform



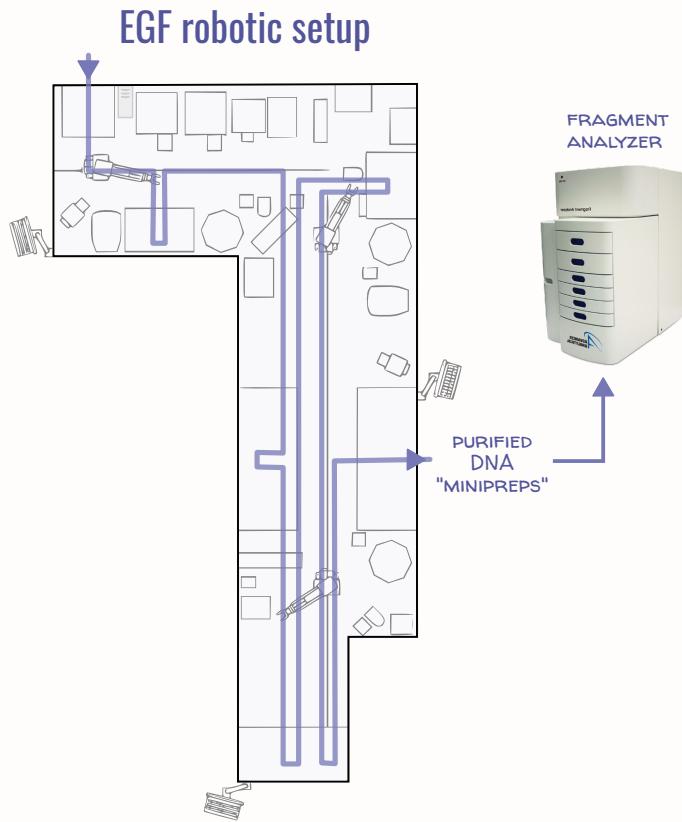
The EGF's High-Throughput Robotic Platform



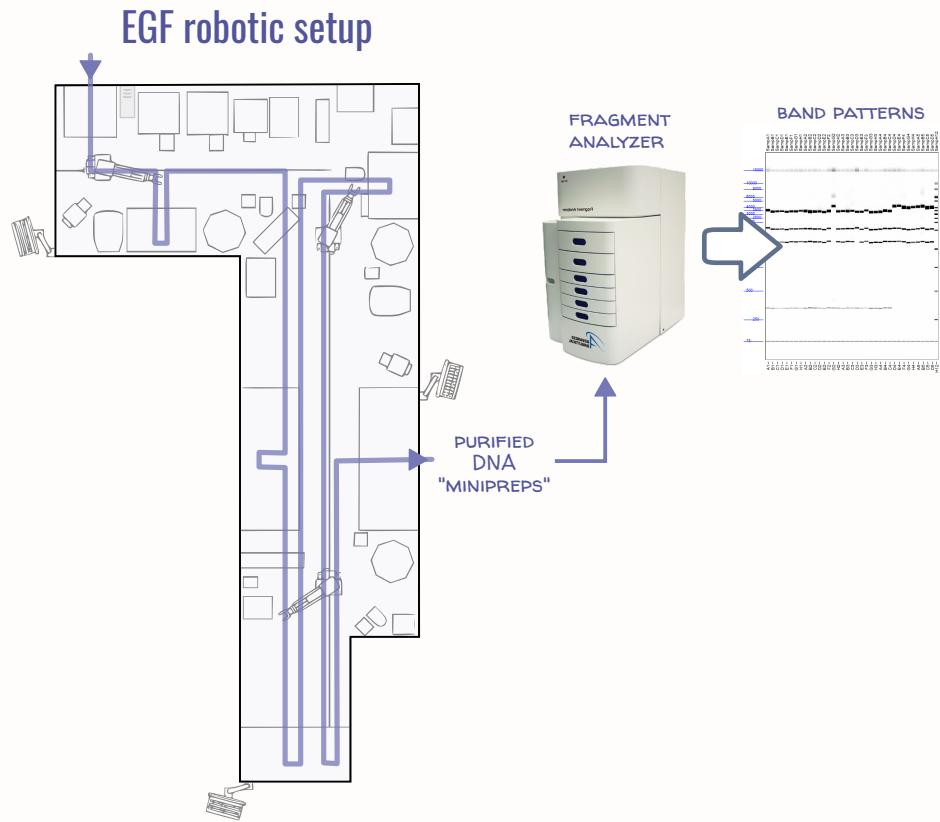
The EGF's High-Throughput Robotic Platform



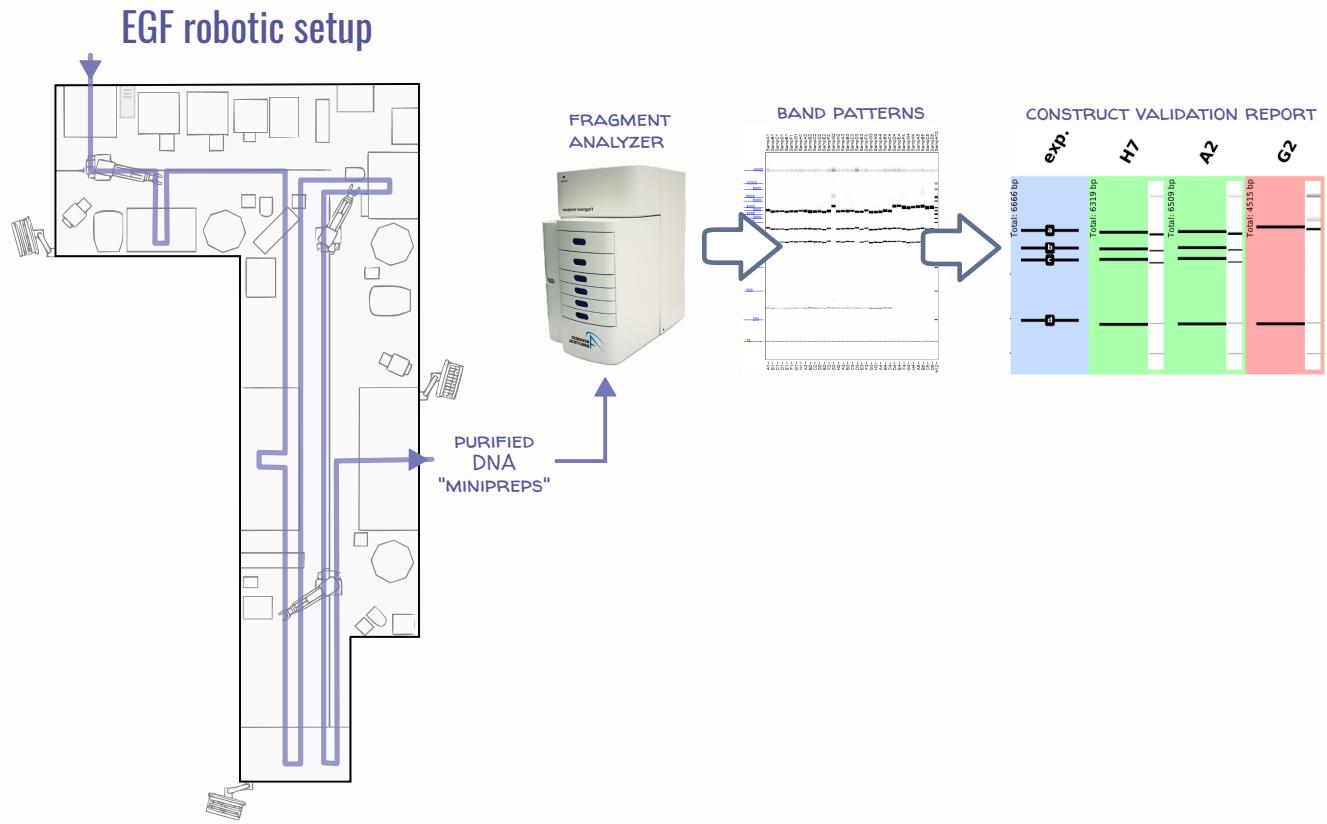
The EGF's High-Throughput Robotic Platform



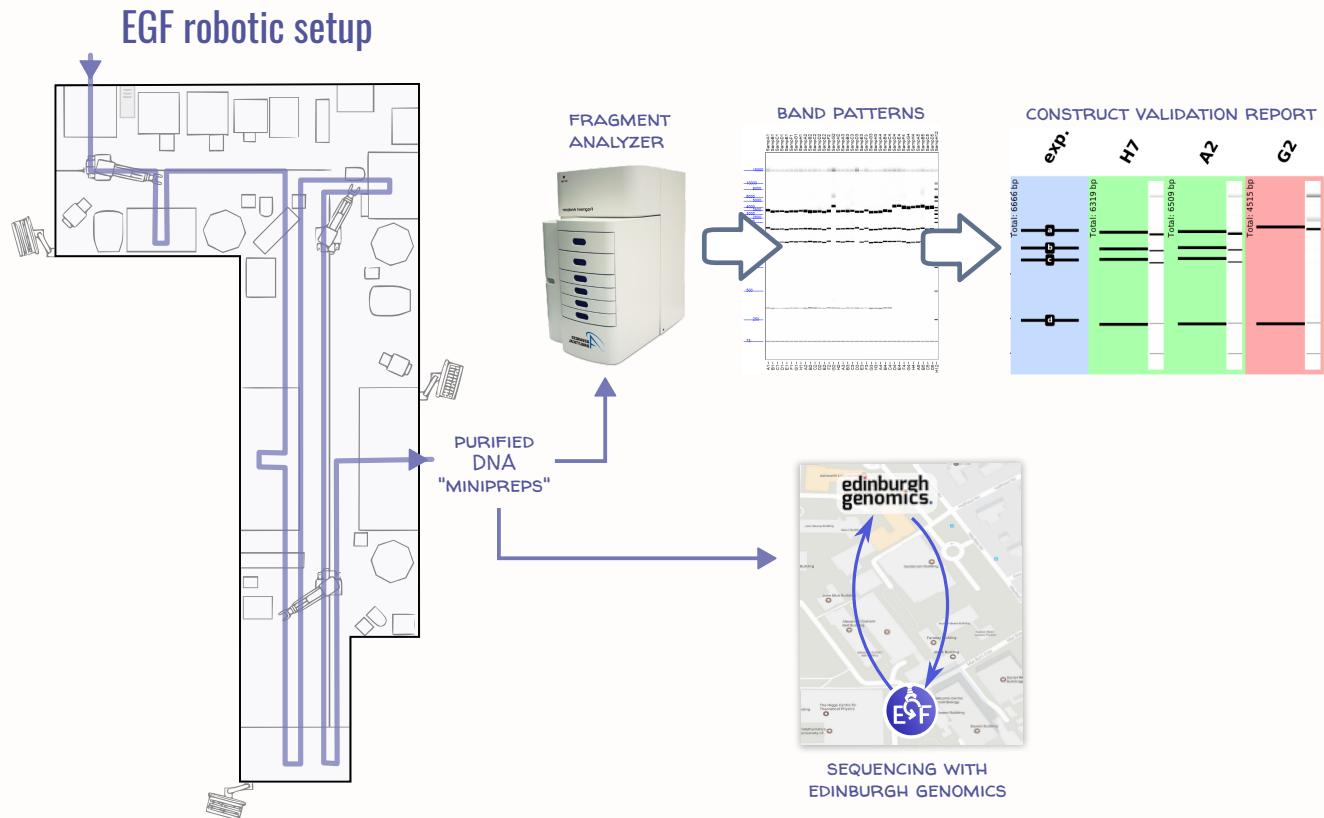
The EGF's High-Throughput Robotic Platform



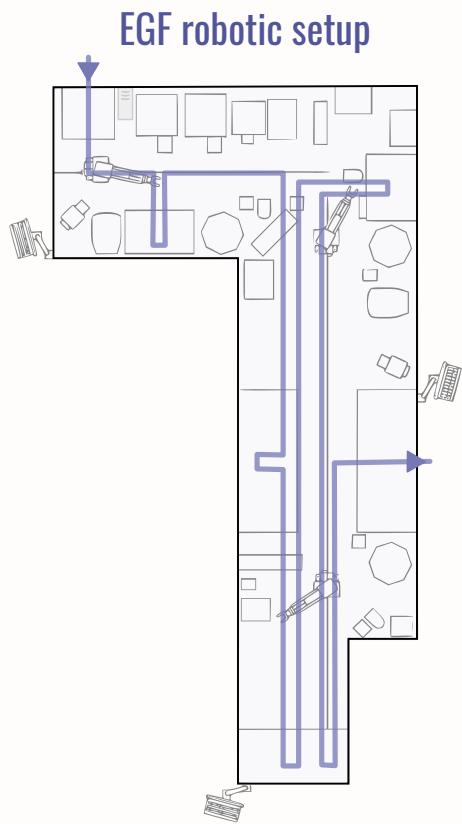
The EGF's High-Throughput Robotic Platform



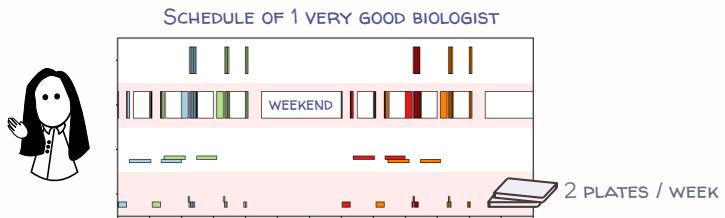
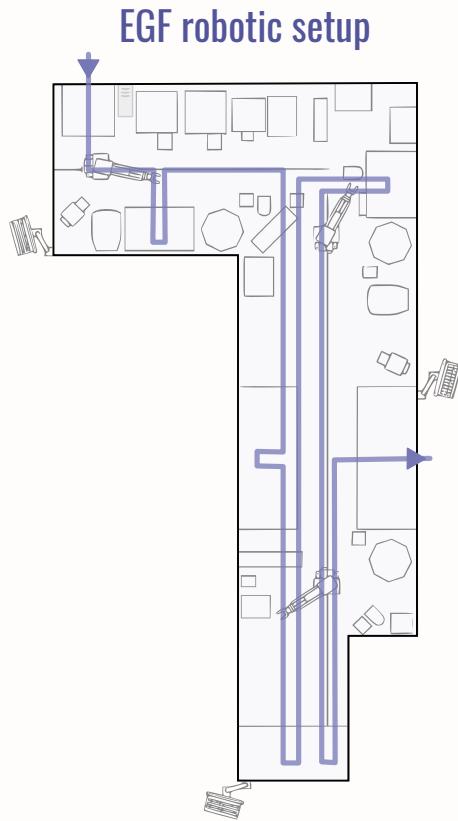
The EGF's High-Throughput Robotic Platform



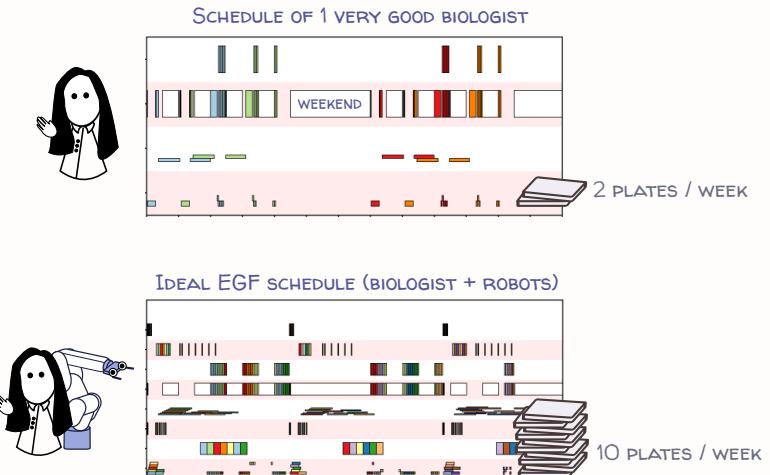
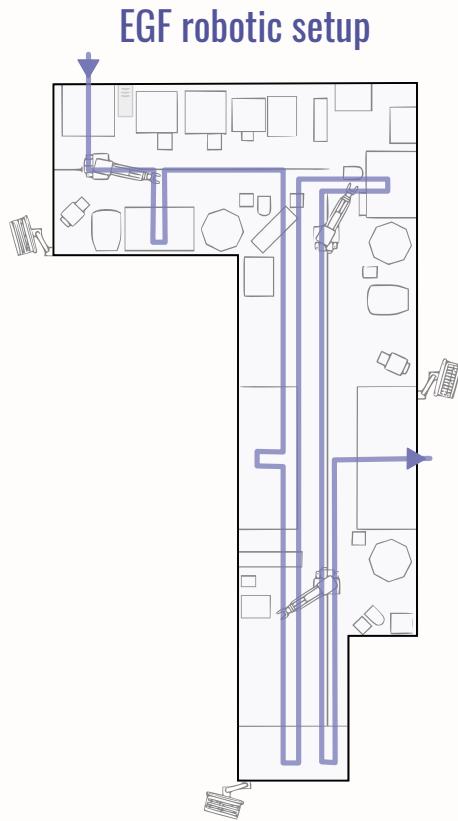
The EGF's High-Throughput Robotic Platform



The EGF's High-Throughput Robotic Platform

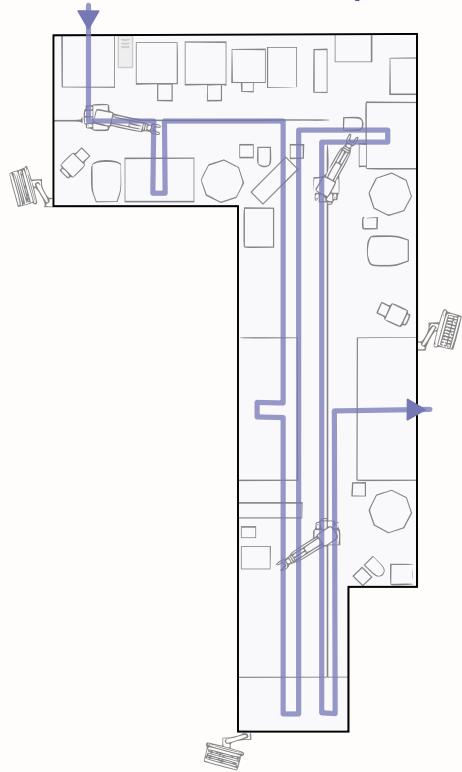


The EGF's High-Throughput Robotic Platform

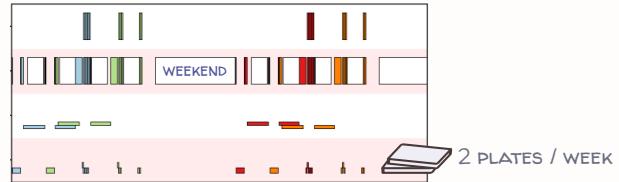


The EGF's High-Throughput Robotic Platform

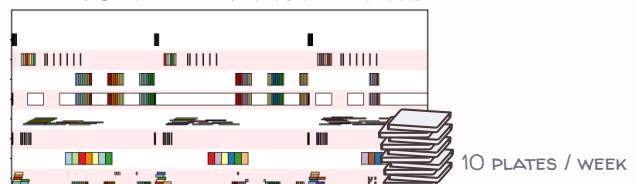
EGF robotic setup



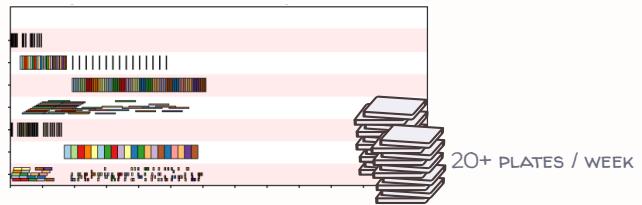
SCHEDULE OF 1 VERY GOOD BIOLOGIST



IDEAL EGF SCHEDULE (BIOLOGIST + ROBOTS)



IDEAL SCHEDULE UNDER FULL AUTOMATION



Phenotyping at the EGF

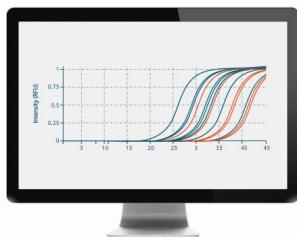
Phenotyping at the EGF

Real-time PCR

Roche Lightcycler



FLUORESCENCE CHARTS



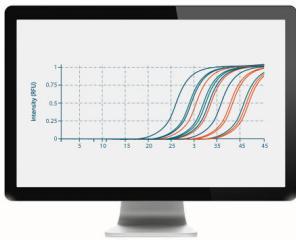
Phenotyping at the EGF

Real-time PCR

Roche Lightcycler



FLUORESCENCE CHARTS

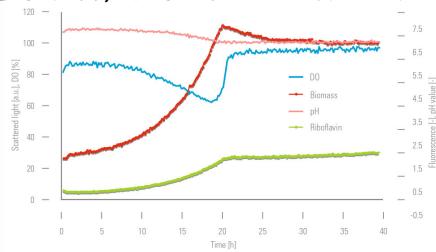


Controlled fermenter

MP2Labs Robolector



CONTROLABLE pH, DO (OXYGEN), BIOMASS, FLUORESCENCE EXPERIMENTS



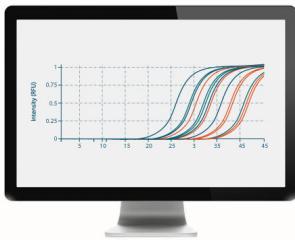
Phenotyping at the EGF

Real-time PCR

Roche Lightcycler



FLUORESCENCE CHARTS



Controlled fermenter

MP2Labs Robolector



CONTROLABLE pH, DO (OXYGEN), BIOMASS, FLUORESCENCE EXPERIMENTS

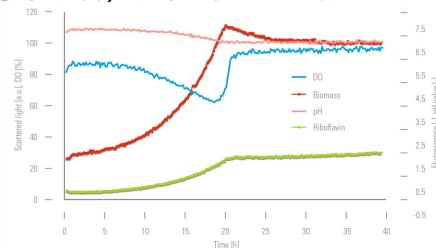
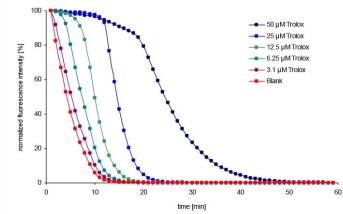


Plate readers

Roche Lightcycler



OD, FLUORESCENCE TIME COURSES

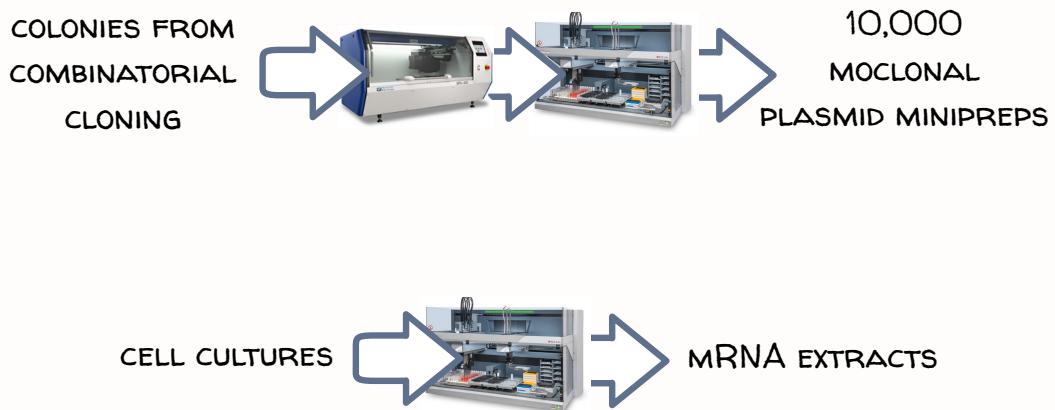


Other possible workflows

Other possible workflows



Other possible workflows



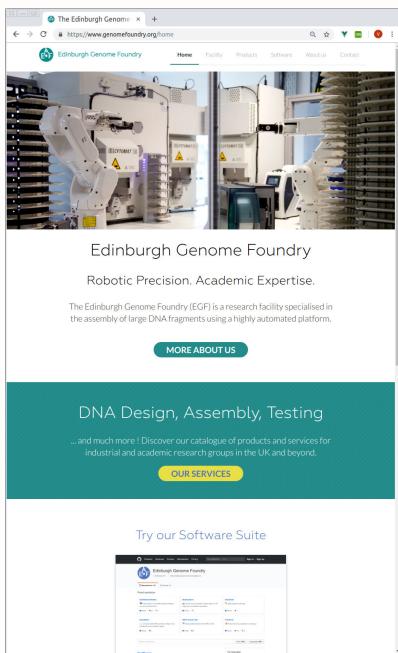
Other possible workflows



The EGF on the Web

The EGF on the Web

EGF Website (products/contact)
[genomefoundry.org](https://www.genomefoundry.org)



The screenshot shows the homepage of the Edinburgh Genome Foundry website. At the top, there's a navigation bar with links for Home, Facility, Products, Software, Altruos, and Contact. Below the navigation is a large image of a robotic arm in a laboratory setting. The main title "Edinburgh Genome Foundry" is displayed, followed by the tagline "Robotic Precision. Academic Expertise." A brief description states: "The Edinburgh Genome Foundry (EGF) is a research facility specialised in the assembly of large DNA fragments using a highly automated platform." A "MORE ABOUT US" button is present. A teal-colored sidebar on the left lists services: "DNA Design, Assembly, Testing" and "... and much more! Discover our catalogue of products and services for Industrial and academic research groups in the UK and beyond." A "OUR SERVICES" button is located in this sidebar. At the bottom, there's a section titled "Try our Software Suite" with a screenshot of the software interface.

The EGF on the Web

EGF Website (products/contact) genomefoundry.org



Edinburgh Genome Foundry
Robotic Precision. Academic Expertise.

The Edinburgh Genome Foundry (EGF) is a research facility specialised in the assembly of large DNA fragments using a highly automated platform.

[MORE ABOUT US](#)

DNA Design, Assembly, Testing

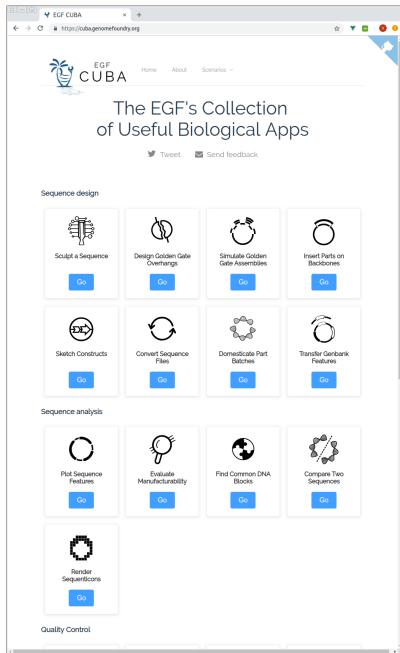
... and much more! Discover our catalogue of products and services for industrial and academic research groups in the UK and beyond.

[OUR SERVICES](#)

Try our Software Suite



Public web apps for biologists cuba.genomefoundry.org



The EGF's Collection of Useful Biological Apps

[Tweet](#) [Send feedback](#)

Sequence design

- Sculpt a Sequence
- Design Golden Gate Overhangs
- Simulate Golden Gate Assemblies
- Insert Parts on Backbones

Sequence analysis

- Sketch Constructs
- Convert Sequence Files
- Domesticate Part Batches
- Transfer Germlink Features

Quality Control

- Plot Sequence Features
- Evaluate Manufacturability
- Find Common DNA Blocks
- Compare Two Sequences

Render Sequences

The EGF on the Web

EGF Website (products/contact) genomefoundry.org

The Edinburgh Genome Foundry (EGF) is a research facility specialised in the assembly of large DNA fragments using a highly automated platform.

Edinburgh Genome Foundry
Robotic Precision. Academic Expertise.

... and much more! Discover our catalogue of products and services for industrial and academic research groups in the UK and beyond.

[MORE ABOUT US](#)

DNA Design, Assembly, Testing

Try our Software Suite

Public web apps for biologists cuba.genomefoundry.org

The EGF's Collection of Useful Biological Apps

Sequence design

- Sculpt a Sequence
- Design Golden Gate Overhangs
- Simulate Golden Gate Assemblies
- Insert Parts on Backbones

Sketch Constructs

- Convert Sequence Files
- Domesticate Part Batches
- Transfer Features

Sequence analysis

- Plot Sequence Features
- Evaluate Manufacturability
- Find Common DNA Blocks
- Compare Two Sequences

Quality Control

- Render Sequences

Github repos (80% MIT) @Edinburgh-Genome-Foundry

Edinburgh Genome Foundry

Repositories

- bio** Python library for protein-based verification of Combinatorial Brought for Lab Automation & Synthetic Biology
- cuba** Python library for quick sequence features (e.g. from Genbank files)
- primers** Python library for primer-based verification of DNA assemblies: primer selection, data analysis, etc.
- dnachisel** DNA sequence optimizer
- dnacutter** Simple cloning inhibitor (Stuffer-Gate etc.) for single and conditional assemblies

Top languages

- Python
- Vim
- JavaScript
- HTML
- Jupyter Notebook

Most used topics

- synthetic biology
- bio-assembly
- bio-automation
- bio-robotics

People

- Zafar

Thanks from the team!

DIRECTION

Susan Rosser
Founding Co-director



Filippo Melanoscina
Co-Director



Giovanni Stracquadanio
Co-Director



Liz Fletcher
Centre Manager



TEAM

Jane Paget
Application Scientist



Scott Neilson
Technician



Pascoe Harvey
Technical expert



Valentin Zulkower
Software Manager

