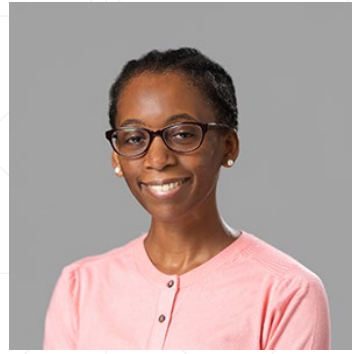




**Dr Kate Barclay**



**Dr Laura Porcza**



**Dr Bernice Wright**



# RESILIENCE

UK Medicines Manufacturing  
Skills Centre of Excellence

# RESILIENCE Work Placement Training

## Route Exchange Network – Health and Science

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6<sup>th</sup> May 2026



UNIVERSITY OF  
BIRMINGHAM



- **Workplace accelerators**
  - Foundation course
  - Main accelerator course
- **Education and career materials**
  - Advanced medicines and diseases posters
  - Workbooks
  - Workshop activities
- **Laboratory work placements**
  - Mammalian cell culture
  - Analysis of cell activity
  - Data analysis and interpretation
  - Data presentation
- **STEM career events**
  - Job searching
  - CV writing
  - Personal statement writing
  - Lab tours

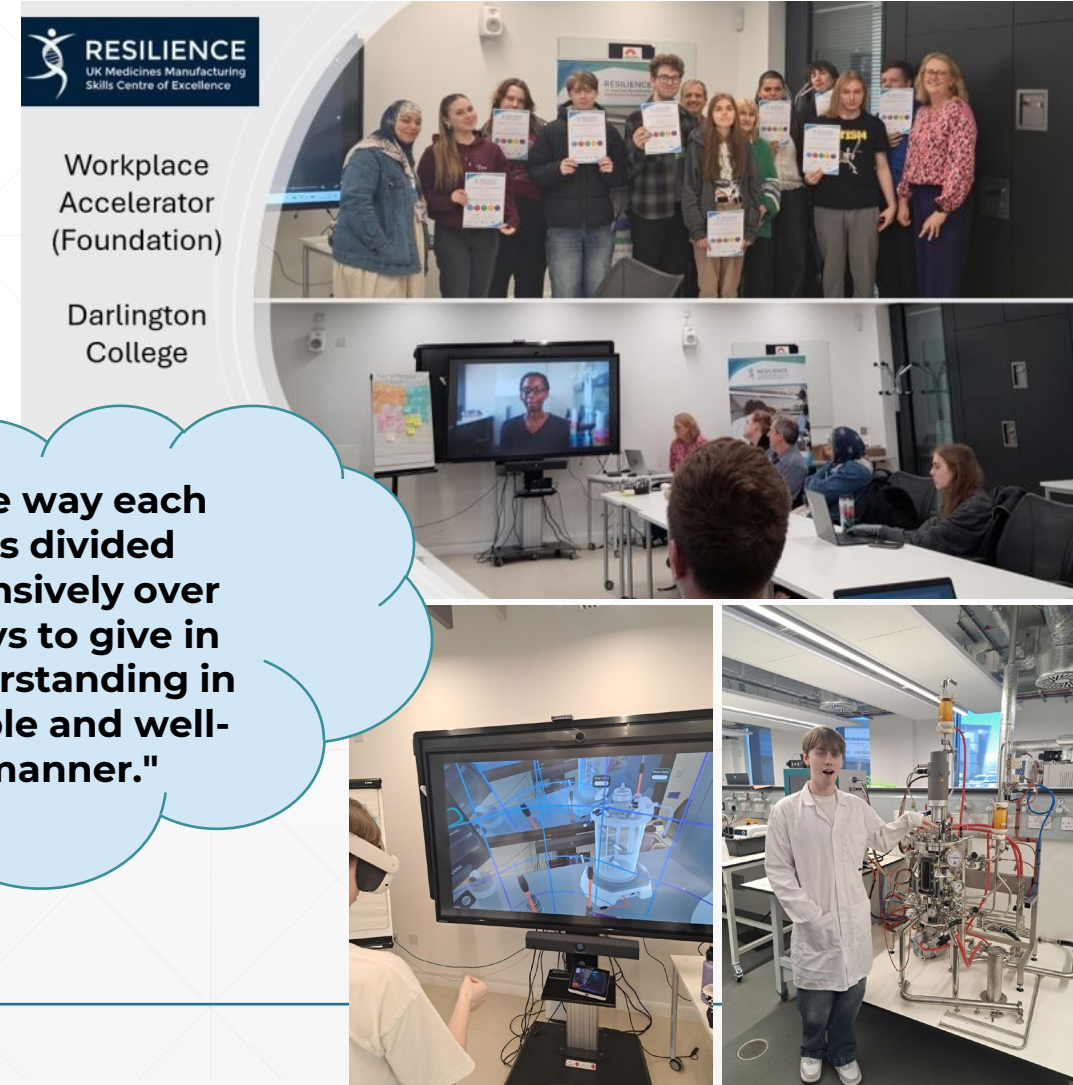


# Work place Accelerator Programme

The RESILIENCE workplace Accelerator programme is designed to meet training needs of post-16, UG, PhD/PDRA/CPD, degree apprentices.

- ❖ **Module 1:** Introduction to the UK Medicines Manufacturing Sector
- ❖ **Module 2:** Focus on the Patient, Quality and Good Manufacturing Practices
- ❖ **Module 3:** Health & Safety and Sustainable Manufacturing Technology
- ❖ **Module 4:** Organisations values and Expected Behaviours
- ❖ **Module 5:** Career Progression, Interview Skills and CV Writing

Teesside University, National Horizons Centre, Darlington - Workplace Accelerator (Darlington College) BTEC [16-17<sup>th</sup> & 24-25<sup>th</sup> Mar. 2026]



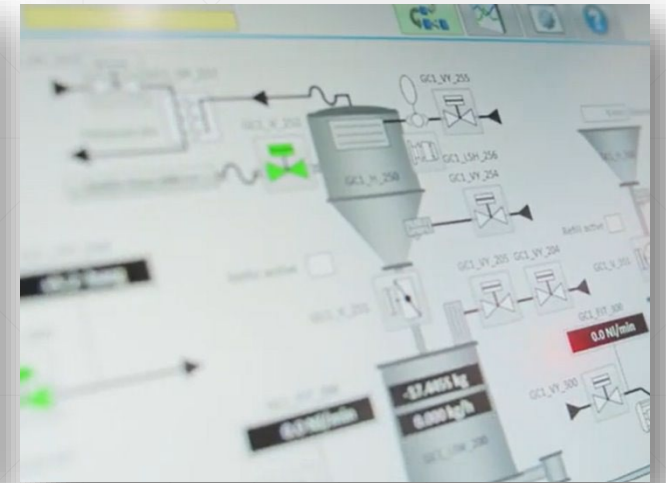
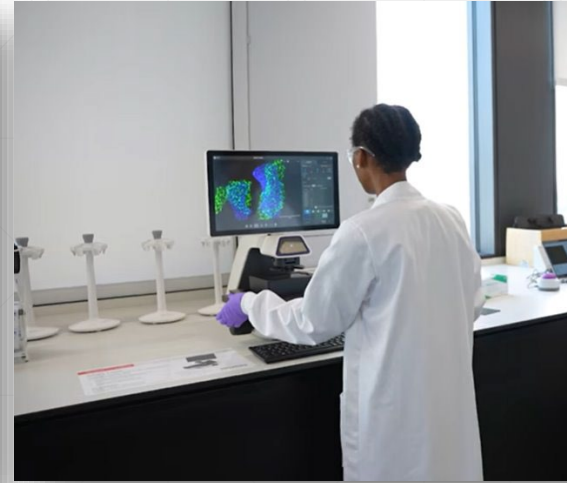
Workplace Accelerator (Foundation)

Darlington College

"I would say that I loved everything about it . It gave me so my reflections of my own experiences and life. During this time I learned so much about pharmaceutical companies"

"The practical skills I can take away and also information about more jobs"

"I liked the way each topic was divided comprehensively over several days to give in depth understanding in an accessible and well-paced manner."

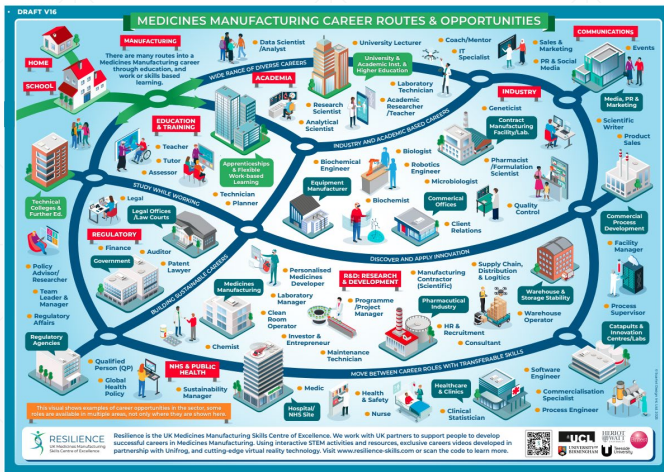


Overview of careers across the sector

Laboratory Scientist Apprenticeship

Biochemical Engineer Careers Guide

Process Operator - Career Change



**Standard Member benefits (Open to all).**  
 Access to:

- free teaching materials for undergraduate and MSc level
- free teaching materials for ages 16-18
- free teaching materials for ages 14-16
- outreach materials

**Enhanced Member benefits. All standard materials, plus:**

- Access to undergraduate accelerator materials or 16+ accelerator materials
- Annual free loan of VR headsets (5 per site)
- Annual single site FourPlus VR software license first year paid in full by RESILIENCE; second year 50% fee paid)
- Access to Bodyswaps VR software

### V6 MAKING MEDICINES: SMALL MOLECULES

**1** Medical Need Identified

**2** Paracetamol medicine is developed

**3** Paracetamol formulation defined

### CASE STUDY: PARACETAMOL

Paracetamol, or acetaminophen, is a non-opioid analgesic and antipyretic agent used to treat fever and mild to moderate pain. It is a small molecule drug which is chemically synthesised.

- Late 1800s: a need for a safe, effective medicine to treat general pain and fever is identified.
- In the 1870s the active pharmaceutical ingredient (API) – the medicinal compound which has an effect on the

### V7 MAKING MEDICINES: VACCINES

**1** Medical Need Identified

**2** Screening & Drug Candidate Selection

**3** Entry & Basic Research

### CASE STUDY: COVID-19 VACCINE

- December 2019: A new Coronavirus strain is identified in Wuhan, China. The virus rapidly spreads creating a global pandemic.
- Within 1 month Covid-19's genome is identified and is shared globally. A surface 'spike' protein essential for infection is identified as an optimal vaccine target.
- Several potential vaccine medicines

### V6 MAKING MEDICINES: CELL AND GENE THERAPIES

**1** Medical Need Identified

**2** Patient provides stem cell sample

**3** Experiments and research

**4** Process Scaling

**5** Manufacturing

**6** Pre-Treatment

**7** Treatment

**8A** Patients live a SCD free life

**8B** Monitoring/Clinical Trials

**WHAT HAPPENS IN SICKLE CELL DISEASE?**  
Healthy red blood cells are soft, flexible and round. SCD makes red blood cells become sticky, hard and C-shaped. The sickle cells get stuck and block the blood flow inside small blood vessels, which can be painful and may require hospital treatment. Sickle cells also break down more quickly than healthy red blood cells. Not having enough red blood cells can lead to anaemia.

**INSIDE A BLOOD VESSEL WITH SCD**

Normal red blood cell

Sickle cell

Normal red blood cell

Sickle-cell

Sickle-shaped cells don't pass easily through blood vessels

### CASE STUDY: SICKLE CELL DISEASE

Sickle Cell Disease (SCD) is a genetic blood disorder that causes red blood cells to become C-shaped and block blood flow, leading to pain and other complications. Traditional treatments, such as blood/bone marrow transfusions, medicines and pain management, only control symptoms, but they do not cure it. Gene therapy fixes the faulty gene to produce healthy blood cells.

- Sickle Cell Disease affects approx. 8M people worldwide, mainly in Africa, the Middle East and Asia.
- CD34+ Haematopoietic stem cells are collected from the patient and taken to the laboratory for genetic testing to identify the faulty gene.
- Once the faulty gene is identified, stem cells are genetically modified, using a technique called CRISPR/Cas9, to repair the faulty gene. Experiments are conducted to ensure the gene repair method is safe and effective.
- Process engineers scale the process to create multiple doses. SCD gene therapies are a form of personalised medicine and require a specialised, individualised approach, rather than a traditional, 'scaling up' method.
- The SCD gene therapy is produced at a manufacturing site. Satellite manufacturing sites may also be placed in hospitals, bringing production closer to patients.
- The patient undergoes chemotherapy to remove the faulty stem cells which cause sickle cell disease.
- At a hospital or healthcare site, the edited stem cells are re-transplanted into the patient, which engraft into the bone marrow and share the repaired gene in future generations of blood cells.
- SCD Gene therapies correct a patient's faulty genes. If successful, a patient's health condition is fixed permanently and they can live a SCD free life.
- Gene therapies have permanent effects and require extended post-market monitoring to ensure side-effects/problems are detected.

RESILIENCE UK Medicines Manufacturing Skills Centre of Excellence

Scan the code or please visit [www.resilience-skills.com](http://www.resilience-skills.com)

## CHROMATOGRAPHY

Chromatography is a technique used to separate mixtures by varying conditions to encourage binding to a stationary phase. Biomolecules have different properties such as size, charge, polarity (positive, negative, uncharged) that can be exploited to separate them from other molecules in a mixture.

### Key Terms

- Stationary phase or column or resin:** beads packed in a column e.g. dextran, agarose.
- Ligand:** attached to resin to give selectivity e.g. + charge, enzyme substrate (not required all modes e.g. size exclusion)
- Mobile phase or buffer:** solution flowed over the column. Varied composition to change conditions in the column
- Feed:** mixture applied to the column
- Eluate or effluent:** solution coming off column and potentially being collected

**Most common chromatography modes (by mode)**

- Hydrophobic Interaction (HIC):** hydrophobic biomolecules, water, uncharged) bind the strongest. Unbound by increasing salt concentration.
- Ion-exchange (IEX):** opposite charge to that of column same charge as that on column repels. Unbound by increasing salt concentration.
- Affinity:** Lock and key mechanism e.g. binding an enzyme to a substrate. Unbound by competition or change of conditions to the substrate.
- Size exclusion:** larger molecules elute first.

## Bioreactor Basics

Bioreactors keep cells at the perfect temperature to grow.

Stirring makes sure that cells and nutrients are evenly mixed.

Inlets in the top mean cells can be continuously fed.

The motor on top keeps things spinning!

Electrical probes monitor and control the conditions inside.

## Laboratory Notebook

Key Stages 1-2

### HUMAN BODY QUIZ

**DID YOU KNOW?**

Your brain generates enough electricity to power a small lightbulb.

About 20 watts – even when you're sleeping!

**TEST YOUR KNOWLEDGE**

Take our Human Body Quiz!

RESILIENCE 2024

## RESILIENCE VR Workshop Tutorial - Assembling a Bioreactor in Mixed...

27 views • 4 weeks ago

## YouTube Videos

## Data Scientist Apprentice

Age Pre-16

Age 16+

Age 18+

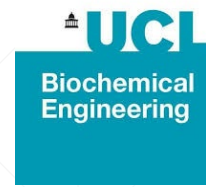
Outreach

## Commissioned infographics

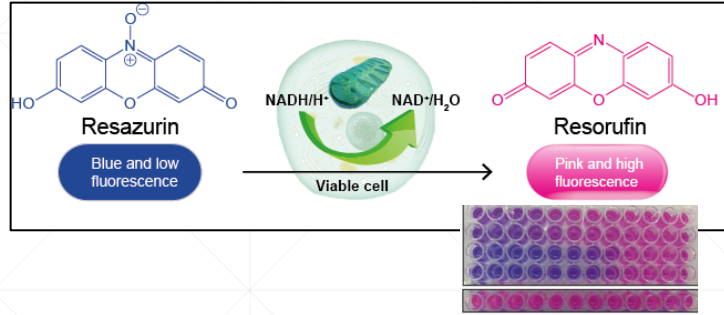
## Posters and Workbooks

## Unifrog videos

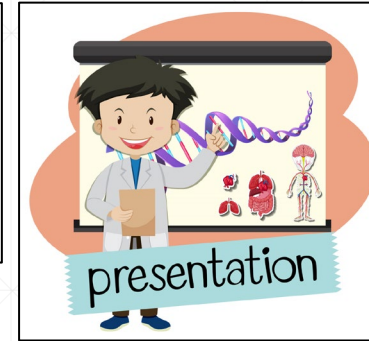
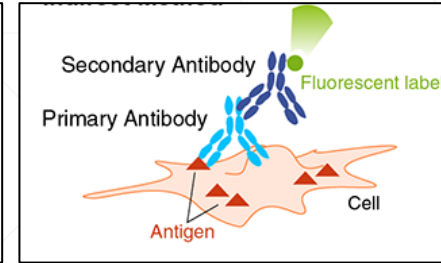
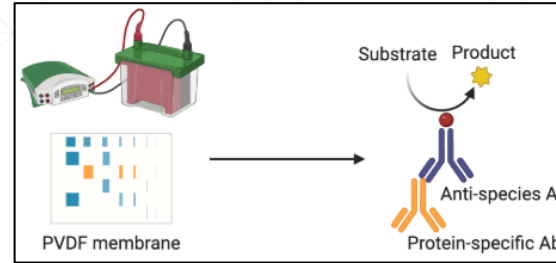
# T-level and BTEC lab work placements



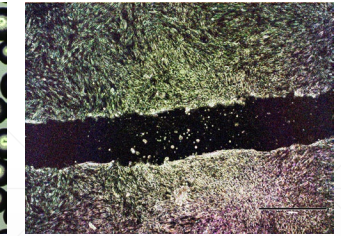
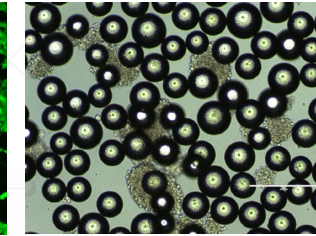
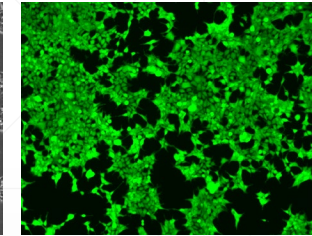
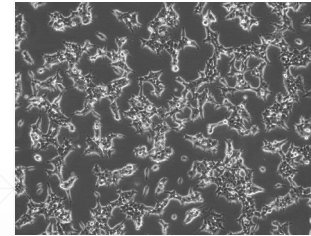
cell culture



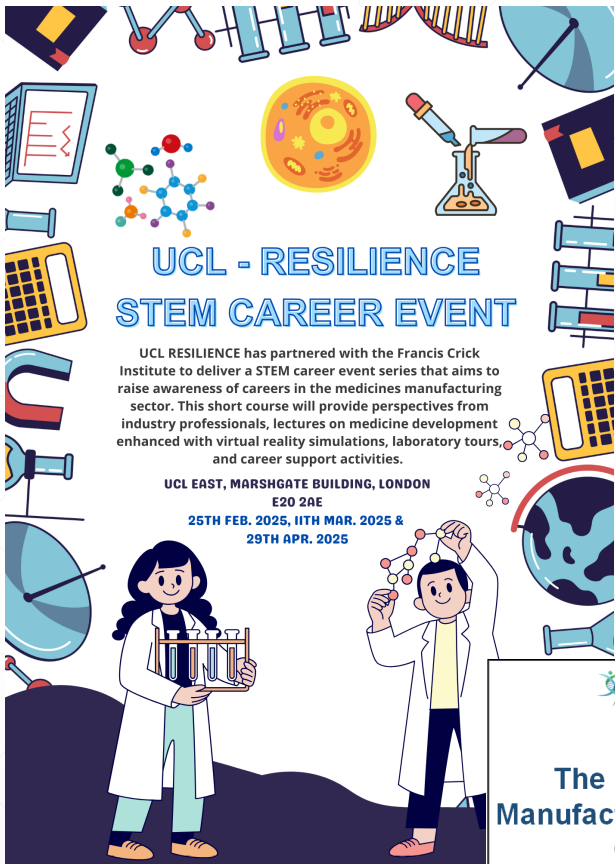
assessment of drug effect on cell proliferation



assessment of drug mechanisms of action




# STEM Career Workshop



## UCL - RESILIENCE STEM CAREER EVENT


UCL RESILIENCE has partnered with the Francis Crick Institute to deliver a STEM career event series that aims to raise awareness of careers in the medicines manufacturing sector. This short course will provide perspectives from industry professionals, lectures on medicine development enhanced with virtual reality simulations, laboratory tours, and career support activities.

UCL EAST, MARSHGATE BUILDING, LONDON E20 2AE  
 25TH FEB. 2025, 11TH MAR. 2025 & 29TH APR. 2025




### Day 1 - Tuesday 25th February 2025

|                 |  |
|-----------------|--|
| 09:00 - 09:15am | Registration & coffee                    |
| 09:15 - 09:45am | STEM Careers talk                        |
| 09:45 - 10:30am | Lecture: Cell Therapy                    |
| 10:30 - 11:00am | VR session & Lab tour                    |
| 11:10 - 11:50am | Activity 1: Exploring Career Aspirations |
| 11:50am - 12pm  | Break                                    |
| 12 - 12:40pm    | Workshop: CV writing                     |
| 12:45 - 1:30pm  | networking lunch                         |



### Day 2 - Tuesday 11th March 2025

|                 |                                    |
|-----------------|------------------------------------|
| 09:00 - 09:15am | Registration & coffee              |
| 09:15 - 09:45am | STEM Careers talk                  |
| 09:45 - 10:30am | Lecture: Small Molecule drugs      |
| 10:30 - 11:00am | VR session                         |
| 11:10 - 11:50am | Activity 2: Exploring STEM careers |
| 11:50am - 12pm  | Break                              |
| 12 - 12:40pm    | Workshop: Personal statements      |
| 12:45 - 1:30pm  | networking lunch                   |



### Day 3 - Tuesday 29th April 2025

|                 |  |
|-----------------|--|
| 09:00 - 09:15am | Registration & coffee                          |
| 09:15 - 09:45am | STEM Careers talk                              |
| 09:45 - 10:30am | Lecture: Gene Therapy                          |
| 10:30 - 11:00am | VR session                                     |
| 11:10 - 11:50am | Activity 3: Reflecting on Career Opportunities |
| 11:50am - 12pm  | Break  |
| 12 - 12:40pm    | Workshop: Job searching                        |
| 12:45 - 1:30pm  | networking lunch                               |




### The Medicines Manufacturing Careers Game

Learn how skills fit together for each career.

RESILIENCE STEM OUTREACH



# Student feedback

The coordinator was very knowledgeable and helpful throughout the whole placement, made everything do-able in such a short time.

i enjoyed going to the laboratory with my group and adding the Alamar blue assay on microtiter plate which was something new I've never tried before which made my experience enjoyable as i get to try to do something new

I enjoyed being able to connect with other companies within life sciences and gaining insight as to what it's like to be a research scientist.

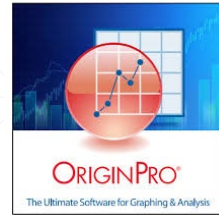
I enjoyed making a presentation and including all the information I learnt from the two days.

I enjoyed just getting there and getting on with the work and how the teachers are very patient and very helping.

I enjoyed the experiment on drug testing on cells.

I enjoyed the teamwork.

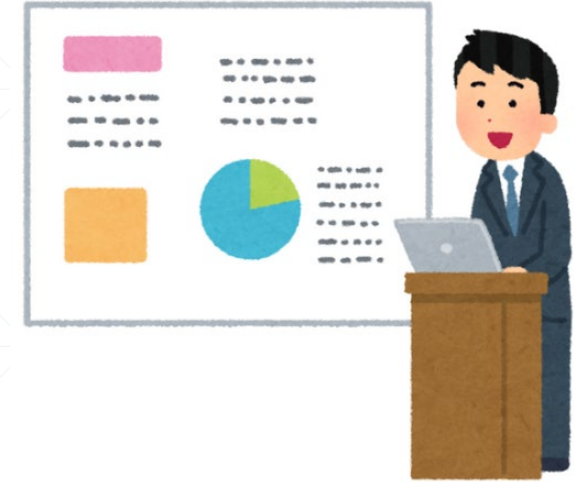
# Developing Support for T-level and BTEC placements



**data analysis and interpretation**



**literature searching**



**presentation skills**



**scientific report writing**



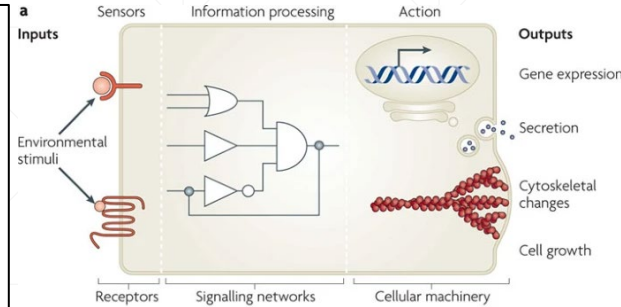
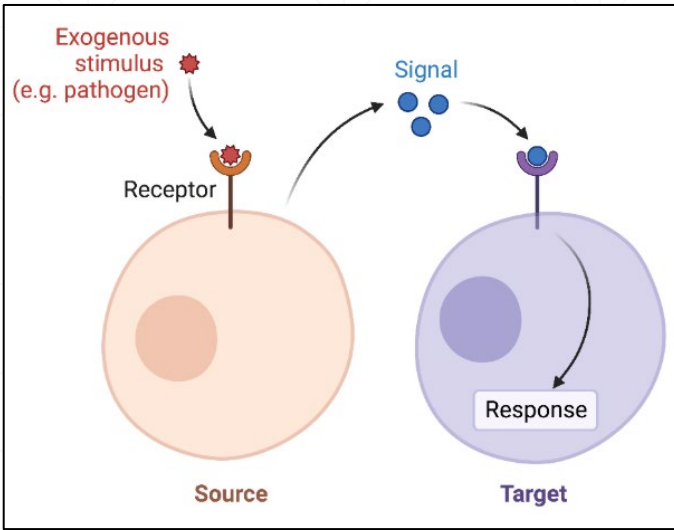
**designing experiments**



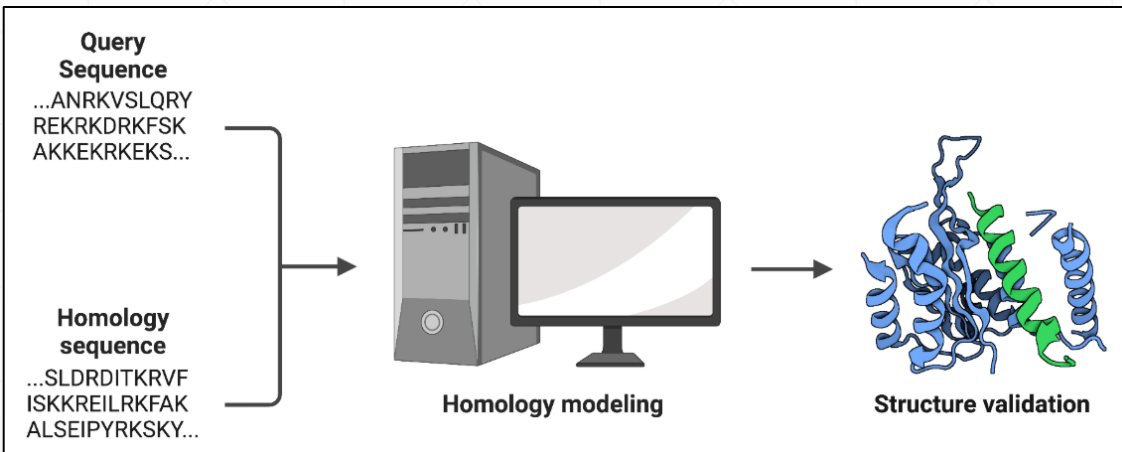
**teamwork**

# Plans for future lab work placements

## Using logic gates to understand cell signalling & metabolism

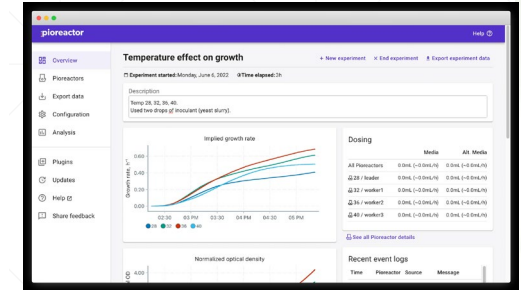
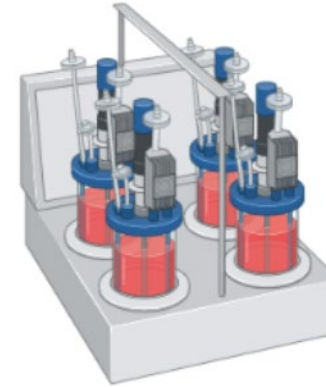


## Protein homology modelling






<https://www.nature.com/articles/nrm2904>; [www. Biorender.com](http://www.Biorender.com)

## Bioprocess engineering

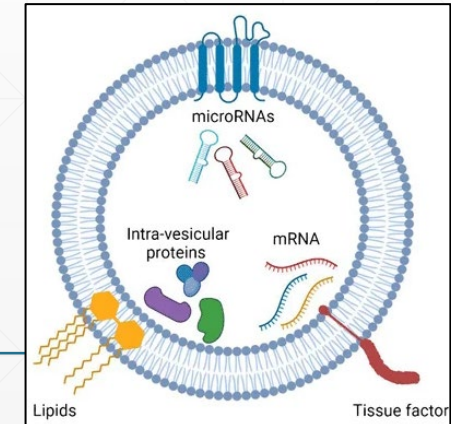


## molecular docking



| Compound  | Score  |
|---|--------|
|  | -154.8 |
|  | -20.8  |
|  | 141.5  |

## Extracellular vesicle processing



- UCL Engineering Foundation Year - <https://www.ucl.ac.uk/prospective-students/undergraduate/degrees/engineering-foundation-year-2026>
- RESILIENCE Skills - <https://www.resilience-skills.com/>
- UCL International Foundation Year - <https://www.ucl.ac.uk/languages-international-education/preparation-courses/upc-foundation>
- RESILIENCE Benefits - <https://www.resilience-skills.com/for-educators/benefits/>
- UCL Biochemical Engineering - <https://www.ucl.ac.uk/engineering/biochemical-engineering>

