

## Our Vision

We will pioneer the development of the tools and technologies needed to realise the full potential of synthetic biology and the principles of engineering in mammalian systems.

These will deliver unprecedented biological insights, advances in human and animal health and wellbeing, and ultimately drive economic growth and new job creation.

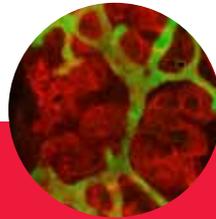


## Tools and Technologies

We are using the power of high-throughput and combinatorial synthetic approaches to design new tools and technologies (e.g. synthetic transcription factors; artificial chromosomes; chromatin regulators) that provide exquisite levels of control of cell behavior not possible today. Researchers will use these tools to gain deeper insight into cellular mechanisms and to engineer useful new functions into host cells. Data generated in these studies can then be used to build or improve mechanistic models that predict cellular behaviour and so provide additional tools with which to engineer new networks in host cells.

## Learning by Building

We can apply the tools we have developed to (re)build biological systems and so gain deeper understanding about how nature works – so-called learning by building. For example, we can use synthetic circuits to control and programme differentiation in stem cells to better understand developmental processes or to generate self-assembling organoids of value for drug screening.



## Standards

A lack of standardisation could hinder growth of the field and ultimately slow the commercialisation of synthetic biology longer term. We are working in collaboration with the National Physics Laboratory to help define and develop workable standards for the field.



## Our Focus

In the near term, our Centre will apply the power of synthetic and systems biology to two areas of research excellence at Edinburgh – epigenetics and regenerative medicine.

This will equip us with the tools and expertise needed to explore and exploit the many possible applications of mammalian synthetic biology, from developmental biology through to drug discovery and cell therapies.

## Our Impacts

The applications of mammalian synthetic biology will benefit many aspects of the life sciences and healthcare including the development of:

**Research Tools and Technologies** – Developing suites of valuable resources for academic and industrial researchers.

**Biosensors and Diagnostics** – Engineering cells to provide a richer and more informative read-out for drug screening or *in situ* biosensors.

**Epigenetics Research** – To generate new insights into the role of the epigenome in health and disease.

**Regenerative Medicine** – Predictable, tuneable control of cell lineage for developmental biology, drug discovery, cell therapy and tissue repair.

**Biomanufacturing** – New tools for optimising production yields and reducing the cost of next-generation biologics.

## Insights for Medicine

We can implement synthetic and systems biology approaches to accelerate biomedical research in areas such as neurodegenerative conditions and cancers. There is also great potential for the diagnosis and treatment of disease: For example, re-engineered cells could be used as biosensors, detecting disease biomarkers and activating the release of a therapeutic agent.



## Responsible Research and Innovation

The engineering of mammalian systems opens up novel questions for social scientific research and provides a unique opportunity to further the development of the concept of Responsible Research and Innovation.



## Our Capabilities

We offer access to a range of platforms that underpin research and innovation in synthetic and systems biology, bringing together state-of-the-art equipment with in-house expertise to provide bespoke solutions. Many of our experimental facilities are accessible on a fee-per-service basis.

Capabilities include:

**The Edinburgh Genome Foundry** – A BBSRC-funded, fully-automated facility to design and assemble DNA up to chromosome size.

**Metabolomics and Fluxomics** – A core experimental resource containing specialist equipment for measuring multiple parameters of cell physiology.

**Microscopy Lab** – A range of novel microscopy techniques including confocal microscopy (OPERA™ system), optical imaging and single-cell analysis.

**Bioreactors** – Medium-throughput benchtop fermentation systems for the culture of a variety of cell types.

**Data Management and Modelling** – We have a repository of network models linked to diverse data sets and can offer bespoke modelling expertise.



## For Further Information

### Contact Us

 @SynthSysEd  
[www.synbio.ed.ac.uk](http://www.synbio.ed.ac.uk)



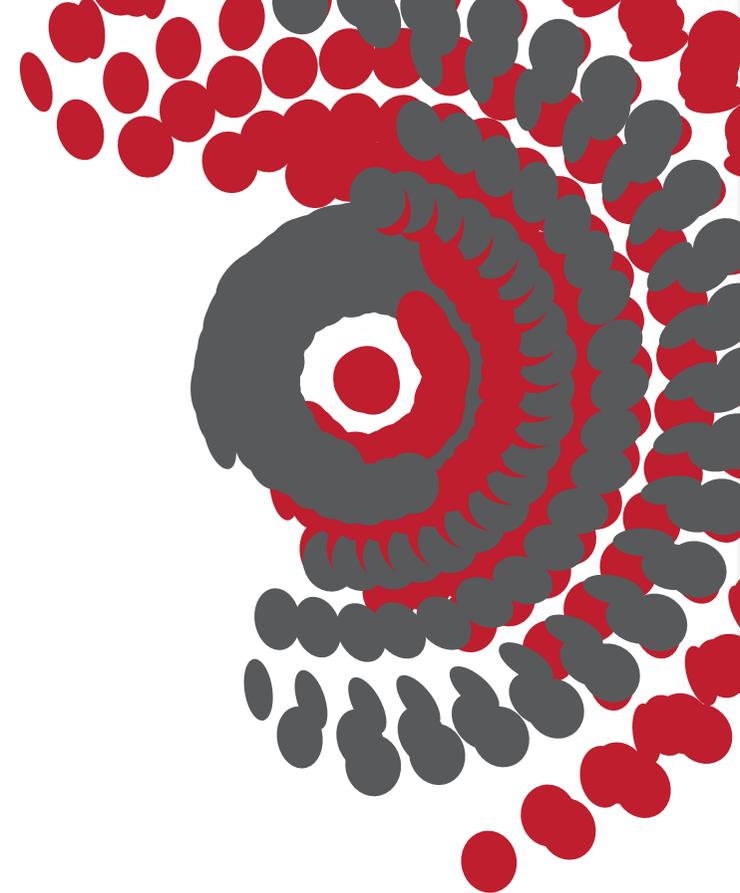
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UK Centre for  
**Mammalian  
Synthetic Biology**

Realising the potential of  
synthetic biology for health



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