

Impact Report

2024-2025

**TRANSFORMING
HUMAN HEALTH**



The Cambridge Stem Cell
Institute in the University of
Cambridge is a world-leading research
centre with a mission to transform
human health through a deep
understanding of stem
cell biology.

Our Principal Investigators

Prof Maria Alcolea
Dr Johannes Bargehr
Prof Roger Barker
Dr Thorsten Boroviak
Dr Harry Bulstrode
Dr Maria Duque-Correa
Prof Cédric Ghevaert
Prof Bertie Göttgens
Prof Tony Green
Dr Brian Hendrich
Dr Daniel Hodson
Prof Brian Huntly
Prof Ragnhildur Thóra Káradóttir
Prof Walid Khaled
Prof Elisa Laurenti
Prof Andrew McCaskie
Prof Simón Méndez-Ferrer
Dr Jyoti Nangalia
Prof Anna Philpott
Dr Fotios Sampaziotis
Prof Ben Simons
Prof Sanjay Sinha
Prof Mekayla Storer
Prof Sarah Teichmann
Dr Richard Tyser
Dr Konstantinos Tzelepis
Prof George Vassiliou
Prof Matthias Zilbauer



Professor Bertie Göttgens

“ We stand at the cusp of a transformative era in stem cell research and regenerative medicine. With advancements in technology, a deeper understanding of stem cell biology’s role in disease pathology, and a growing momentum towards translational research, the opportunities before us are truly exciting. ”

MESSAGE FROM THE DIRECTOR

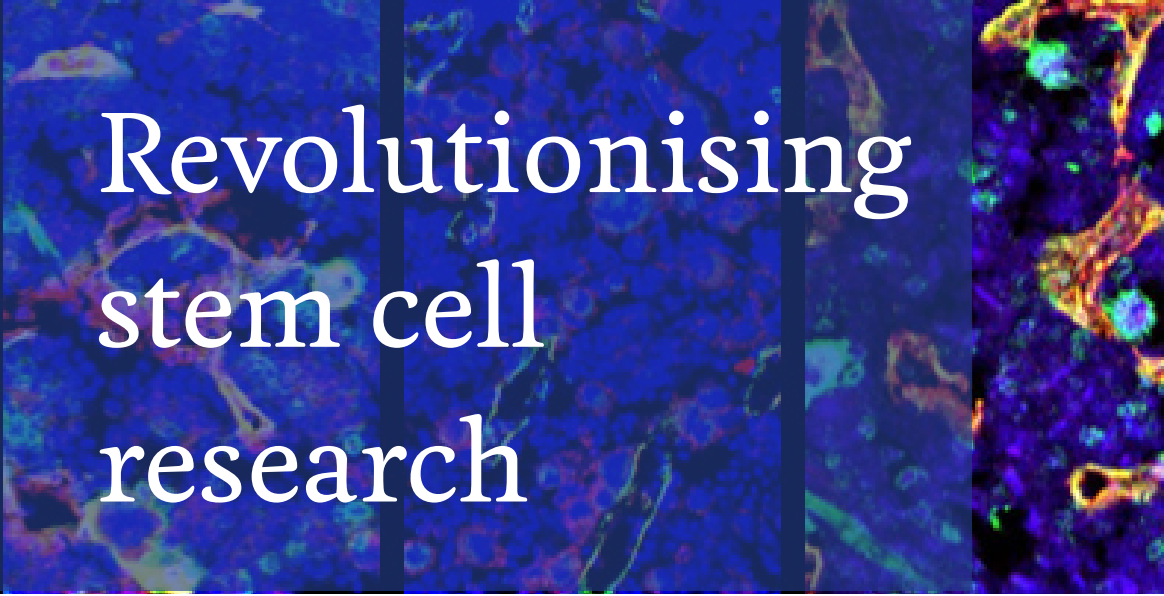
Welcome to the Cambridge Stem Cell Institute. Stem cells have the remarkable ability to develop into any cell type in our bodies, offering insights into how life begins, grows, and heals. By exploring these fundamental processes, we are answering some of biology’s most profound questions and opening new paths for innovative medicines and therapies.

Our research aims to understand not only how cells function individually, but also how they work together to form tissues and organs. This understanding is crucial in developing regenerative therapies that can repair damaged tissues, treat chronic diseases, and potentially reverse conditions that were once thought irreversible. Stem cell research is also crucial in the fight against cancer because it helps us understand how normal cells transform into cancerous ones. This in turn opens up opportunities to develop innovative treatments that target cancer at its roots, potentially leading to more effective and less harmful therapies.

At the Cambridge Stem Cell Institute, we are a thriving community of students, postdocs, senior researchers, technology experts and professional support staff, all driven by the belief that exploring the science of stem cells will deliver medical breakthroughs. Combining cutting-edge technologies with creativity and interdisciplinarity, our research into regenerative medicine and cancer prevention provides hope for patients worldwide.

Thank you for sharing our excitement for stem cell research!

Warm regards,
Bertie Göttgens



Revolutionising stem cell research

Stem cells are uniquely able to make the many specialised cells in the body, they have the capacity to self-renew, and they hold incredible therapeutic potential to improve the lives of millions.

At the Cambridge Stem Cell Institute (CSCI), researchers are working -- **between disciplines, across various organs, and at multiple scales** -- to better understand, develop, and deploy research and treatments to maximise the potential of stem cells and to **transform human health**.

CSCI IN NUMBERS

400

members of the
Institute

99

postgraduate students

30

clinical staff

28

research groups

39

Affiliate research
groups

9

new and ongoing clinical
trials using stem cell
therapies in 2024

100

CSCI publications on
new breakthroughs
in stem cell science
in 2024

£20m

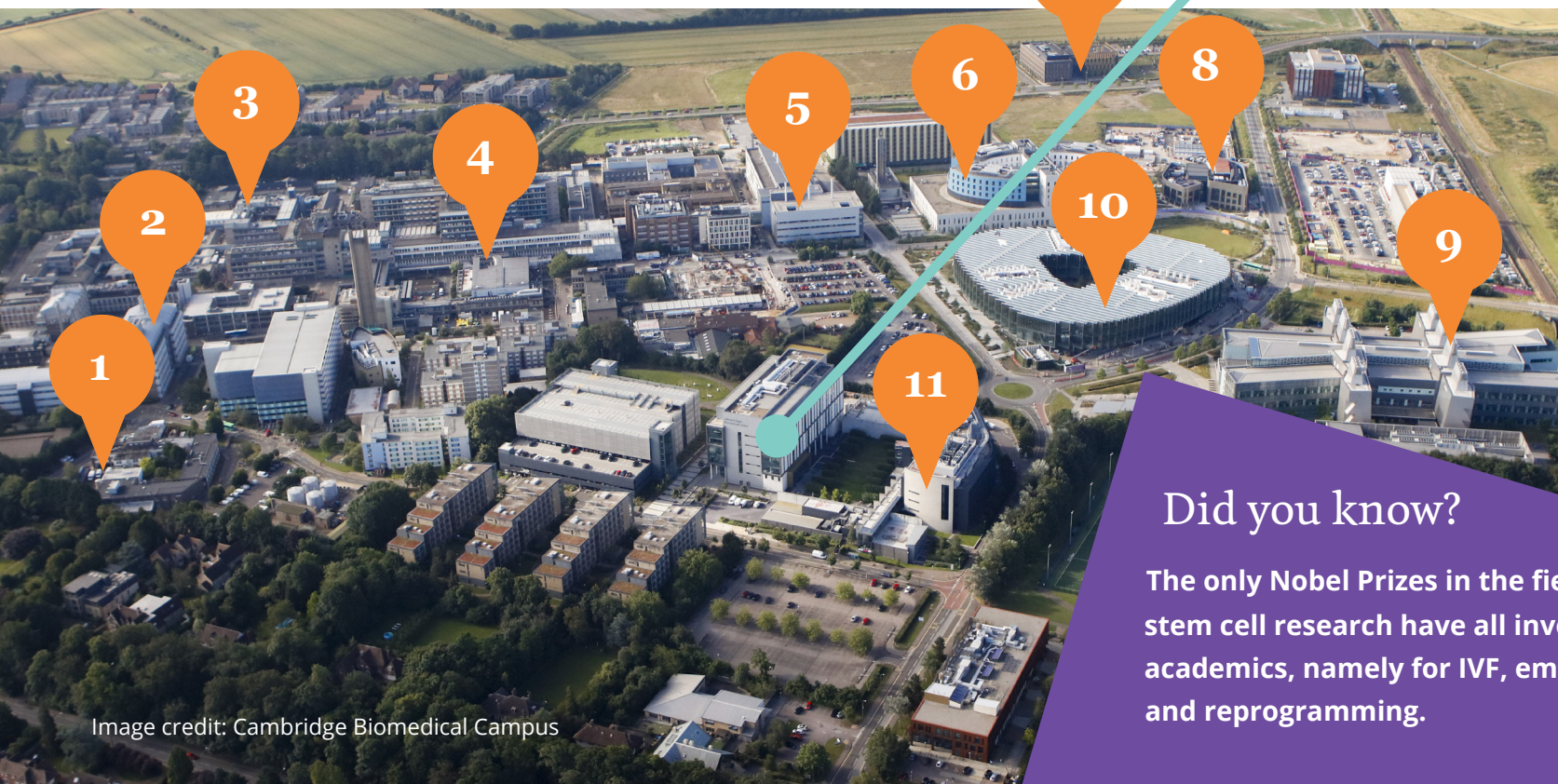
average annual grant income
since 2020

A CAMBRIDGE RESEARCH HUB

The Cambridge Stem Cell Institute is the **largest of its kind in Europe** and is internationally renowned for world-leading research that transforms how we diagnose, treat, and ultimately prevent disease.

Based in the Jeffrey Cheah Biomedical Centre, the Cambridge Stem Cell Institute brings together **28 research groups** to deliver tangible impact around three themes: **Stem Cell States, Stem Cells in Disease, and Stem Cells & Therapeutics**.

Situated amidst colleagues and collaborators at hospitals, research institutes, and pharmaceutical companies on the Cambridge Biomedical Campus, **CSCI is ideally poised at the forefront of cutting-edge research to deliver new therapies**.



1. NHS Blood & Transplant
2. Cambridge Institute for Medical Research
3. John van Geest Centre for Brain Repair
4. Addenbrooke's Hospital
5. Institute of Metabolic Sciences
6. Royal Papworth Hospital
7. Abcam
8. Heart & Lung Research Institute
9. MRC-LMB
10. AstraZeneca
11. Cancer Research UK

Did you know?

The only Nobel Prizes in the field of stem cell research have all involved Cambridge academics, namely for IVF, embryonic stem cells, and reprogramming.

Healthcare of the Future

INNOVATIVE THERAPIES

Lab-grown blood

Professor Cédric Ghevaert is leading the current RESTORE clinical trial that offers lab-grown blood for patient transfusions. The trial is the first step towards making lab grown red blood cells available as a future clinical product. In the future, patients requiring regular transfusions may not be dependent on blood stocks in donation centres, and may require fewer transfusions because of the source of the blood.

NOVEL TECHNOLOGIES

Patching damaged hearts

Professor Sanjay Sinha's research on cardiovascular health has resulted in ongoing animal trials - and hopefully someday human trials - for a heart patch. This feat of medical engineering uses stem cells to create a patch that can replace and restore damaged tissue following a heart attack, leading to better recoveries and healthier hearts.

REAL-WORLD IMPACT

Advancing clinical practices

Haematologist **Professor George Vassiliou's** work led to the establishment of a new clinic in Cambridge that focuses on early interception and future prevention of blood cancer development in susceptible individuals, identified through a new platform for disease prediction.

Professor Roger Barker's research on Parkinson's disease is now in clinical trials, with 4 patients in the UK and several in Sweden. This tests the efficacy of cell-replacement therapy for Parkinson's patients.

IMPROVED CONNECTIVITY

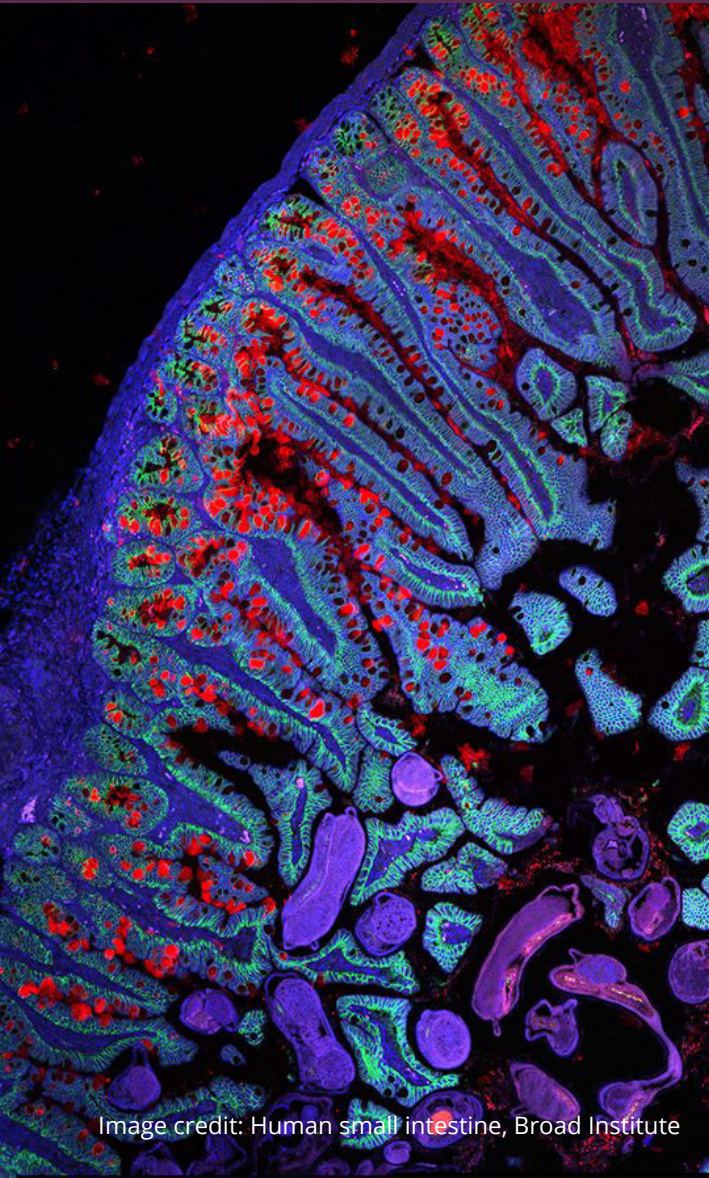
Public and patient involvement

Professor Matthias Zilbauer and his team distribute a regular family-friendly patient newsletter to his adolescent patients suffering from Inflammatory Bowel Disease. By also hosting family days, where children can learn and play, and parents can connect, Matt's team is bringing patients into the research.

In 2024 **Professor Anna Philpott** and her former postdoc Dr Kirsty Ferguson identified that efforts in the lab often feel disconnected from human experiences and established *You, Me and Us* - a collaborative creative writing project exploring diverse personal and professional experiences of neuroblastoma with scientists, clinicians, patients and their families.

RESEARCH HIGHLIGHT - STEM CELL STATES

Stem cells have the extraordinary ability to develop into any type of cell in the body. At CSCI, researchers study the fundamentals of stem cell biology in order to better understand the mechanisms by which they self-renew, maintain their states, and commit to differentiate into all cell types of the body.



Mapping the human body, cell by cell

Professor Sarah Teichmann is one of the two founders of the Human Cell Atlas (HCA), an ambitious project to map each of the 37 trillion cells in the human body which aims to have a fully drafted map in the next few years.



Since the HCA was founded in 2016, Teichmann - alongside co-founder Dr Aviv Regev, and over 3,600 other members in 100 countries around the world - made incredible strides in creating this map, culminating in the 2024 publication of a tranche of papers that detail different cellular systems, from a developing skeleton, to the thymus, to blood vessels, and beyond.

Using new and developing genomics technologies, Teichmann and other researchers are working to map the 'molecular fingerprint' of each cell in order to eventually create a readable map of the body. They are now able, with new technologies, to measure cells at single cell resolution, allowing them to look closer at different cell types and more closely monitor what they do.

By understanding the fundamentals of how tissues, organs, and human bodies are built, researchers can more effectively research and understand disorders, disease, and drug development.

Image credit: Human small intestine, Broad Institute

RESEARCH HIGHLIGHT - STEM CELLS IN DISEASE

Stem cell dysfunction underpins a range of diseases and health challenges that face the global population today. From neurodegenerative and cardiovascular diseases to cancer and ageing, stem cell dysregulation is implicated across a broad spectrum of diseases. Our researchers work hard to uncover the underlying mechanisms to identify new ways to detect and cure disease.

Discovering pathways to prevention

Professor Walid Khaled and his team recently created the largest catalogue of human breast cells in his team's efforts to understand the early steps of tumour initiation, and how that can be used for early detection and prevention of cancer.



Everyone has BRCA1 and BRCA2 genes, but it's when mutations occur in these genes that the risk of breast and ovarian cancers increase. In a 2024 paper, Khaled's team found that in otherwise healthy carriers of BRCA1 and BRCA2 gene mutations, there were 'exhausted' immune cells, normally only found in late-stage tumours. They believe that this suggests that in carriers of these mutations, the immune system is failing to fight off damaged breast cells, which in turn inhibit the immune cells further. Discovery of this vicious cycle could lead to the repurposing of existing immune drugs as a preventative measure. The team are committed to working with patients and people with lived experience throughout the project.

Through research like this, and data collected from around the world contributing to the Human Breast Cell Atlas, Khaled hopes to understand how breast tumours develop as a way to prevent them from occurring in the first place. Early detection is vital for early intervention, and hopefully someday, for prevention.

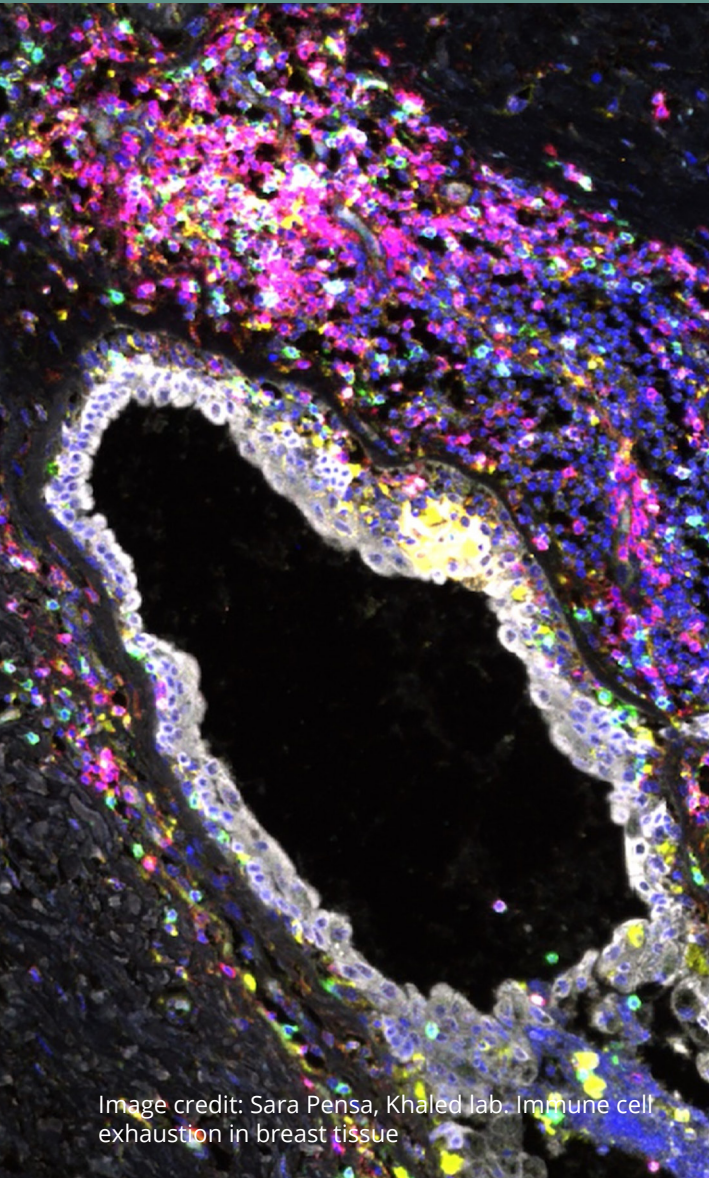


Image credit: Sara Pensa, Khaled Lab. Immune cell exhaustion in breast tissue

RESEARCH HIGHLIGHT - STEM CELLS & THERAPEUTICS

Building on the research undertaken into stem cell states and stem cells in disease, Institute researchers are using stem cells to model disease in vitro or to develop new cell therapies, allowing them to generate new diagnostic and therapeutic approaches to transform treatments and outcomes for patients.

Improving therapeutic practices

Professor Elisa Laurenti studies blood stem cells in health and disease. The human body produces one trillion blood cells per day, and as blood stem cells are the only cell types in our body capable of producing all blood cell types in our lifespan, they have immense regenerative potential. Blood stem cells also have the potential to be used in gene therapy, a ground-breaking treatment that currently provides the only cure to more than 10 debilitating genetic diseases.



However, existing gene therapy protocols lose over 50% of blood stem cells during the culturing steps performed during gene correction, due to a loss of function of the cells outside their environment, which means they can no longer be used for treatment. In 2024, Laurenti and her team were able to pinpoint the timeline for this loss of stem cells, and find an intervention that increased the shelf life of the cells, thereby improving their ability to function in a therapeutic setting.

By repurposing an existing cancer growth blocker drug (Ruxolitinib), the team found that they could improve stem cell function by threefold. They are now aiming to modify current gene therapy protocols to include this drug, providing patients with the highest number of high-quality blood stem cells and improving patient outcomes.



Expanding the Network

CSCI connects **interdisciplinary researchers** and **industry partners** through our Stem Cell Institute Technology & Innovation Forum (SCI-TIF), Interdisciplinary Research Centre, and Wellcome Discovery Research Platform for Tissue Scale Biology, resulting in collaborations, connections, new patents and innovative technologies.

Most importantly, we are leading and expanding the network of local and international researchers leveraging innovative models and technologies to make the **greatest research impact on human health.**

10 new and existing startup companies from CSCI developing new treatments and technologies

CSCI Industry collaborations as of 2025 **44**

4 new patents from CSCI in 2024

Industry members of the Stem Cell Institute Technology & Innovation Forum (SCI-TIF) **12**

9 Departments and Institutes in the Stem Cells Interdisciplinary Research Centre

600+ life sciences companies in Cambridge, from start-ups to multinationals

A place of possibility

a poem created by Dr Kirsty Ferguson with the words of those who work and study at the Cambridge Stem Cell Institute at the 2024 retreat.

A place to create interactions,
Collaborations and champions
Exploring early development,
Uncovering the basis of life,
In a supportive niche.
Discovery, through the colourful lens of science.

A place
Of lifelong learning
Where we discover potential,
Sharing knowledge, together.
A place to grow personally and professionally,
To grow cells and friendships.
A place to have fun.

A refuge,
To feel safe and supported,
To heal,
To develop ideas and careers.
A place rich in expertise, experience and openness.
A community.

A place
That gives hope
To generations to come.
Passionate people pursuing a better future.

A place of possibility.



From top left: lab space at JCBC; facilities staff at Annual Retreat; PhD students at symposium; researcher at work; roundtable event; imaging facilities.

Cover image credit: Thomas Dennison, Zilbauer group, human intestinal organoid.

Get Involved

Make a gift to support stem cell research: comms@stemcells.cam.ac.uk

Patient & Public Involvement & Engagement: engage@stemcells.cam.ac.uk

Acknowledgements

We would like to thank our funders for their continued support.



www.stemcells.cam.ac.uk