MILNER
THERAPEUTICS INSTITUTE

LIVES CAN BE TRANSFORMED WHEN THE STRENGTH OF ACADEMIA & BUSINESS COMBINE

As a biomedical institute,
we act as a catalyst and a driver,
forming dynamic partnerships to unlock
the power of emerging discoveries.
We galvanise science into life-changing
treatments.

BRINGING DISCOVERIES TO LIFE

INTRODUCTION

Our biomedical research institute is fully open again, providing a physical hub that combines the strength of academia and business to accelerate the development of therapies. Our own in-house research programme in the **Centre for Pathway Analysis** *(p6)* continues to build a mass of expertise in computational research and functional genomics, with a growing network of collaborative research partners. We are particularly thrilled that strategic partnerships with both **LifeArc** *(p9)* and the **CRUK Cambridge Centre** have been renewed this year *(p10)*.

The support we provide for entrepreneurs has expanded through the Frame Shift Bio-incubator, which now includes seven companies based in the institute *(p16)*, and our continuing partnership with the **Start Codon Venture Builder and Investor** *(p15)*. And through the growth of **Connect: Health Tech** *(p18)*, we are working with other University organizations to create a wealth of resources and commercial support for academics seeking to put ideas into practice.

The institute is the headquarters of the **Milner Therapeutics Consortium**. Now with eleven pharma partners and three academic partners, this provides a unique and diverse set of ways for our partners to engage with **Cambridge academics and entrepreneurs** *(p21)*. By creating innovative models of cross-sector collaboration locally, the Milner community can provide a leading international example of how academic discoveries can be brought out of the lab towards effective therapies.

Professor Tony Kouzarides
Director

Dr Kathryn Chapman
Deputy Director

CONNECT ENTREPRENEURS WITH VENTURE CAPITALISTS

- VENTURE CAPITAL FIRMS: 7
- INSTITUTE-BASED START-UP COMPANIES: 12
- >£25M INVESTMENT
- 55 JOBS CREATED

BRINGING DISCOVERIES TO LIFE

CONNECT ACADEMICS WITH PHARMA & BIOTECH

- PUBLICATIONS: 35
- £10.4M RESEARCH FUNDING
- 37 ACADEMIC-INDUSTRY PROJECTS
- 415 ACADEMIC INTRODUCTIONS
- PHARMA COMPANIES: 11
- AFFILIATES: 64
- 110 PROJECT PROPOSALS

Expand the capabilities of our unique physical institute environment for commercial and academic collaboration

Increase support for start-ups through Frame Shift bio-incubator and our Affiliated Venture Partner network

Make Cambridge easier to navigate, promoting an entrepreneurial and cross-sector collaborative culture

OUR STRATEGIC PRIORITIES

Discover new drug targets and work with clinicians and pharma to ensure benefit to patients

Create new long-term partnerships of mutual benefit between academics and pharma companies in the Milner Therapeutics Consortium

Support organizations globally to adopt and build on demonstrated models of success


CORONAVIRUS
GOT SYMPTOMS?
GET TESTED

The Milner Therapeutics Institute encompasses both a research institute and a global therapeutic alliance for collaboration between academia and business.

RESEARCH INSTITUTE

The research institute is based in the Jeffrey Cheah Biomedical Centre (JCBC) on the Cambridge Biomedical Campus, providing a physical environment for collaboration between academia and business, and acting as a hub for industry initiatives extending throughout the University. We provide a unique setting where pharma, biotech, start-ups and academics work together in a common space, creating a research environment that breaks down barriers between these sectors. We have strong links with the two other biology institutes based in the Jeffrey Cheah Biomedical Centre, the Wellcome MRC Cambridge Stem Cell Institute and the Cambridge Institute for Therapeutic Immunology and Infectious Disease.

The institute provides two paths for partnering and driving academic collaboration with business:

1 ACADEMIC RESEARCHERS PARTNERING WITH PHARMA AND BIOTECH

- Centre for Pathway Analysis (*p6*)
- Joint AstraZeneca-Cancer Research Horizons Functional Genomics Centre (*p12*)
- Milner Therapeutics Consortium (*p21*)
- Cancer Research UK Cambridge Centre (*p10*)
- Connect: Health Tech (Hub at the Biomedical Campus) (*p18*)

2 ACADEMIC ENTREPRENEURS PARTNERING WITH VENTURE PARTNERS

- Start Codon Venture Builder and Investor (*p15*)
- Frame Shift Bio-incubator (*p16*)
- Connect: Health Tech (Hub at the Biomedical Campus) (*p18*)
- Affiliated Venture Partners *(p26)*

GLOBAL THERAPEUTIC ALLIANCE

The Milner Therapeutics Institute has built a Global Therapeutic Alliance of 95 affiliated organizations comprising of pharma, biotech, venture companies and research institutions. The Milner Therapeutics Institute connects these affiliates with the Cambridge ecosystem, highlighting partnership opportunities at our annual Therapeutics Symposium and our events throughout the year.

- Milner Therapeutics Consortium (*p21*)
- Affiliated Companies (*p24*)
- Affiliated Venture Partners (*p26*)
- Affiliated Research Institutions (*p26*)

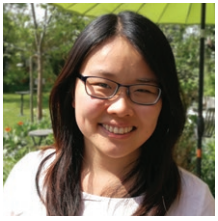
CENTRE FOR PATHWAY ANALYSIS

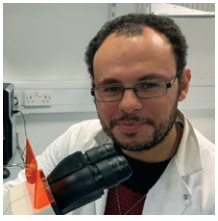
In the Centre for Pathway Analysis, we are developing our own research programme and target discovery pipeline *(p6–9)*. The methods and approaches we are fostering are disease-agnostic and we are currently applying these in oncology, infectious disease, inflammatory bowel disease and CNS diseases.

Dr Namshik Han
Head of Computational Research & AI

DISEASE SIGNATURE IDENTIFICATION THROUGH AI

The aim of our computational research and artificial intelligence team, led by Dr Namshik Han, is to create an atlas of disease mechanisms through the integration and interrogation of large multi-omic datasets. The team are using bespoke machine learning methods to identify new signatures of disease and therapeutic targets, as well as network analysis to gain a deep understanding of the underlying causes of disease. The team have experience and a track record of collaboration with industry (e.g. JW Pharmaceuticals and Storm Therapeutics) and drug discovery partners (e.g. LifeArc and Cancer Research Horizons-AstraZeneca Antibody Alliance Laboratory) through which they have developed and validated methodology with clear applications in drug discovery. The team works closely with researchers and clinicians throughout Cambridge who have unique patient datasets and disease models. It is this sharing of cross-sector expertise that ensures results are biologically interpretable and can inform go/no go decision making in drug discovery. The team's approaches have been applied to target identification and repositioning and are applicable across many areas of healthcare including early detection and personalised medicine.





Computational team. Top: left to right Greta Baltusyte, Dr Woochang Hwang, Nicholas M. Katritsis, Winnie Lei, Anika Liu, Dr Meabh MacMahon, Dr Sanjay Rathee, Dr Georgia Tsagkogeorga, Dr Gehad Youssef

DISEASE SIGNATURE INTERROGATION

The Target Discovery Team, led by Dr Rebecca Harris, focuses on the optimisation of complex cellular or patient-derived disease models, and through their application, the identification of clinically relevant, high confidence targets for disease therapy. The team combine academic discovery with industry rigour, defining end-goal criteria and building go/no go decision-making points into all projects. Working in collaboration with academics and clinicians in Cambridge who have expertise in specific disease areas (e.g. inflammatory bowel disease, see image) and who have developed biologically relevant cell-based models, the team strive to lower the barriers associated with adoption of these complex disease models into drug discovery workflows. The team focus on establishing robust models and screening outputs that will generate commercial interest and meet end-user needs. Many projects involve an exchange with the Computational Research team to interpret and interrogate datasets, and apply an AI and machine learning methodology into their target discovery approach.

Dr Rebecca Harris
Head of Target Discovery

Dr April Foster

Dr Tannia Gracia

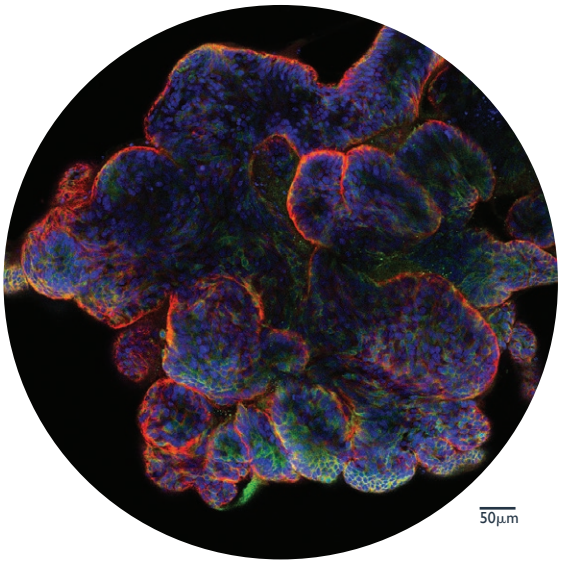


Image: An intestinal organoid grown from patient-derived cells of the terminal ileum, stained for the stem cell marker LGR5 (green), the membrane marker E-cadherin (red) and nuclei (blue).

Key publications

- Yim WS *et al.* Intercellular CRISPR screens enhance the discovery of cancer immunotherapy targets. *Frontiers in Immunology* https://doi.org/10.3389/fimmu.2022.884561 (2022)
- Rathee S *et al.* DILIc: an AI based classifier to search for drug-induced liver injury literature. *Frontiers in Genetics* (2022 – in the press)
- Han N *et al.* Identification of SARS-CoV-2 induced pathways reveal drug repurposing strategies. *Science Advances* doi: 10.1126/sciadv.abh3032 (2021)
- Edgar RD *et al.* Culture associated DNA methylation changes impact on cellular function of human intestinal organoids. *bioRxiv* 2022.04.25.489354; doi: https://doi.org/10.1101/2022.04.25.489354

ACADEMICS IN RESIDENCE

Junior academic research groups whose research interests are aligned with ours are housed in the Centre for Pathway Analysis.

KONSTANTINOS TZELEPIS

The *Tzelepis group* (Wellcome MRC Cambridge Stem Cell Institute and Milner Therapeutics Insitute) focus on the discovery of novel therapeutic targets and the bench-to-clinic transition of new treatments for aggressive malignancies including acute myeloid leukaemia (AML). Their recent work has led to the development of sophisticated CRISPR screening platforms, which formed the basis for follow-up studies that identified the role of several new cancer vulnerabilities including the RNA methyltransferase METTL3 and the splicing kinase SRPK1. Now, the Tzelepis group is investigating how the structures and modifications of RNA regulate disease initiation and progression.

Key publications

- Yankova E, Blackaby W *et al.* *Nature* 593, 597-601 (2021).
- Orellana EA *et al.* *Mol. Cell* 81, 3323 (2021).

MANAV PATHANIA

The *Pathania group* (Dept of Oncology and CRUK Cambridge Centre) have a central focus on developing new mouse models of paediatric brain tumours, to better understand the interplay between genetic and phenotypic heterogeneity in different brain tumour types. By applying single cell sequencing to identify tumour microenvironmental dependencies and CRISPR screening to test genetic and epigenetic weaknesses in these immune-competent tumour models, they hope in the longer term to pave the way to more targeted, precise treatments that can be tailored to the combination of mutations unique to each tumour. Key areas of interest include identifying and functionally validating the precise type of neural stem or progenitor cells that lie at the root of different brain cancer types, and using mouse models to investigate how brain tumours respond and develop resistance to first-line therapies.

Key publications

- Pathania M *et al.* 32(5):684-700.e9 *Cancer Cell* (2017).

MILNER – LIFEARC PARTNERSHIP EXTENDED FOR FIVE YEARS

We are thrilled to announce that the Milner collaboration with the medical research charity LifeArc has been expanded into a 5-year strategic partnership until 2026.

The Milner Computational Research team, led by Namshik Han, have been collaborating closely with the medical research charity LifeArc over the past four years to develop and apply bioinformatics tools to identify novel therapeutic targets, biomarkers and drug repositioning opportunities. By applying cutting-edge computational methods including AI and machine learning for analysis of multi-modal biomedical datasets, the team have identified new or better drug targets across a range of therapeutic areas.

LifeArc brings a rich oncology drug discovery programme to this collaboration. By developing methods to integrate LifeArc proprietary datasets with public cancer databases, the team have created a bespoke AI platform and computational pipeline to reveal novel disease signatures and then conducted agnostic pathway analysis to uncover new targets. This work has identified new disease signatures for six cancer types in the LifeArc programme, and repositioning of an existing LifeArc target as a potential therapeutic strategy for an unanticipated cancer type.

With the support of LifeArc, the Milner group have also applied their bespoke AI methods and network analysis to uncover hidden pathways and reposition 200 already approved drugs against COVID-19. These SARS-CoV-2 induced pathways define a resource for repurposing of drugs against COVID-19, either as monotherapies or in combination therapy. The teams are now poised to develop together a bespoke Artificial Intelligence platform and infrastructure for revolutionising target identification and biomarker discovery. This platform will be used to: (1) identify new therapeutic targets in a variety of diseases; (2) discover biomarkers for stratifying or diagnosing of patients to improve personalised medicine; and (3) predict efficacy and safety of new and existing drugs, thus allowing the identification of drug positioning/repositioning opportunities.

"Our collaboration with the Milner Therapeutics Institute allows us to combine LifeArc's translational expertise with the Milner's cutting-edge bioinformatics. By continuing to work together, we can further our understanding of the fundamental biology of disease pathways that informs our patient-focused programmes."

Dr Dave Powell, Chief Scientific Officer at LifeArc

Key co-authored publications:

- Han N *et al. Science Advances* doi: 10.1126/sciadv.abh3032 (2021)
- Hwang W *et al. Advanced Drug Delivery Reviews.* doi: 10.1016/j.addr.2021.02.004 (2021)

THE CANCER RESEARCH UK CAMBRIDGE CENTRE

The Cancer Research UK Cambridge Centre (CRUK CC) unites more than 1,000 researchers and healthcare professionals across the academic and industrial sectors within the Cambridge area. The Centre's common mission is to end death and disease caused by cancer, through research, treatment and education. With the renewal of the CRUK Cambridge Centre this year, the Milner has become an Affiliated Institute, reflecting the evolution from a virtual CRUK CC Onco-Innovation programme and our central role in supporting researchers across Cambridge.

Dr Rebecca Harris

Professor Tony Kouzarides

Over the past five years, the Onco-Innovation programme has been co-led by our Director Tony Kouzarides and Susan Galbraith (AstraZeneca) and managed by Rebecca Harris, our Head of Target Discovery. The Onco-Innovation programme has established innovative collaborations between CRUK Cambridge Centre researchers and pharma partners in the Milner Therapeutics Consortium, and initiated inter-disciplinary pilot projects. Our events have also launched oncology focused funding challenges and highlighted innovative clinically-relevant research within the local scientific community.

Our affiliated status now offers additional opportunities for researchers and clinicians throughout the CRUK Cambridge Centre to engage with the Milner through collaboration with our in-house Computational Research team led by Namshik Han and the Target Discovery team led by Rebecca Harris *(p6–7)*.

"It's fantastic to see what the Onco-Innovation programme has achieved and we encourage researchers across the Centre to engage with the Milner Institute to see how they can benefit from our unique capabilities and environment." Tony Kouzarides

Collaborate with our Computational Research and Artificial Intelligence Group

Collaborate with our experimental Target Discovery group

Engage with others based in the MTI
(e.g. joint AstraZeneca-Cancer Research Horizons Functional Genomics Centre)

HOW CRUK CAMBRIDGE CENTRE MEMBERS CAN ENGAGE WITH US

Collaborate with our pharma partners through the Milner Therapeutics Consortium

Access enterprise opportunities and space for start-ups
(e.g. Frame Shift bio-incubator)

Join in with our programme of seminars and networking events

CANCER RESEARCH UK | CAMBRIDGE CENTRE

JOINT ASTRAZENECA–CANCER RESEARCH HORIZONS FUNCTIONAL GENOMICS CENTRE

The Functional Genomics Centre (FGC) was established in 2019 as a collaboration between AstraZeneca and Cancer Research UK to build a centre focused on developing and applying genetic screening in the field of oncology. In 2022, Cancer Research UK launched Cancer Research Horizons, incorporating all of Cancer Research UK's drug discovery and commercialisation initiatives, including the FGC, under one banner. Based at the Milner Therapeutics Institute, the FGC is developing novel CRISPR technologies to better understand the biology of cancer, creating biological models that may be more reflective of human disease and advancing computational approaches for better analysis of big datasets. The mission of the FGC is to use these technologies to deliver projects to AstraZeneca and Cancer Research Horizons scientists that will:

- Increase our understanding of the **basic biology** of cancer
- Identify **novel target** opportunities for therapeutics
- Improve understanding of **drug resistance** in order to support **patient stratification** or better treatment **combination** options.

With 21 projects completed across the collaboration and a portfolio of 40 active projects on-going the value of these two organisations coming together to create the FGC is now being demonstrated.

*A world-leading **centre of expertise** in genetic screens, cancer models, CRISPR vector design and computational approaches to big data, whose goal is to **identify novel targets** and resistance mechanisms to create **new cancer medicines***

World-leading technology

Sophisticated screening platforms

Advanced analysis tools

Leveraging data and critical mass

AstraZeneca and Cancer Research Horizons have independent use of the FGC facilities but are jointly developing state-of-the-art functional genomic technologies. Our scientists work alongside each other and on projects across the different organisations, facilitating a truly collaborative environment focused on technical innovation and scientific progress.

Our Technology Development is focused on creating small and better libraries, which will allow us to probe models of increasing complexity, such as human primary immune cells and patient derived organoids. Another focus is the implementation of assays to study more complex phenotypes, such as the modulation of gene expression signatures and protein abundancies enabled by single cell RNA sequencing and FACS sorting. All development is co-owned and so is free to flow back into either organisation, democratising access to this powerful technology. The Milner Therapeutics Institute provides a unique collaborative space and environment on the Cambridge Biomedical Campus which is convenient for both AstraZeneca and Cancer Research Horizons.

TECHNOLOGY DEVELOPMENT

Vectors and libraries

- Better and smaller libraries
- Combinatorial screening
- New modalities, e.g. PRIME editing

Disease relevant models and deeper phenotypes

- FACS-based screening
- Single-cell genetic perturbation
- Organoid models of cancer

Computational methods

- Enhanced QC
- Translatability and disease understanding

CANCER RESEARCH HORIZONS | AstraZeneca | FUNCTIONAL GENOMICS CENTRE

CASE STUDY PROFESSOR TYSON V. SHARP, CANCER RESEARCH UK BARTS CENTRE

" The focus of our lab is understanding the function of the tumour suppressor protein LIMD1, which is lost in more than 40% of lung cancers diagnosed in the UK. We were keen to make a step change using omics approaches to understand new susceptibilities associated with LIMD1 negative cancers. Working with FGC has provided access to CRISPR screening capabilities that we would not have been able to replicate independently with regard to assay design, diligence and speed. The FGC team understood the biological questions that I was looking to answer, which has made the collaboration effective and straightforward. The insight that these screens have provided is incredible. Not only did the screen identify hits and pathways associated with known biology that validated results that my group has previously generated, the screens also revealed new exciting biology that is targetable therapeutically. It's very exciting that we have identified a possible new targeted treatment approach for patients with LIMD1 deficient cancer."

START CODON VENTURE BUILDER & INVESTOR

The life science and healthcare venture builder Start Codon (the vision of which was conceived and created together with the Milner Therapeutics Institute) is the first in Cambridge to provide support and significant seed investment to high-potential start-up companies across the UK. Based at the Milner Therapeutics Institute, Start Codon invests a minimum of a quarter of a million pounds in each start-up and enrolls the founders onto its bespoke entrepreneurship development programme. Start Codon and its dedicated team provide a combination of business support services, facilities, and access to an extensive network of industry leading pharma, biotech and venture capital executives. Since its first investment in April 2020, Start Codon, represented by Dr Jason Mellad (CEO and co-founder), Daniel Rooke (COO and co-founder), Dr Michael Salako (Investment Director), and Emma Plowman (Talent Director), has amassed a portfolio of nearly 20 companies based across Cambridge, London, Oxford, Warwick and Birmingham.

Start Codon successfully raised a £15 million venture fund and is supported by several strategic partners including Cambridge Innovation Capital, Genentech/Roche, Novartis, Meltwind and the Babraham Bioscience Technologies, as well as a wider network of leading commercial organisations including legal, finance and IP experts. Cancer Research Horizons and Start Codon have also co-developed an entrepreneurial training programme to educate the multidisciplinary oncology research community about company formation, operations and fundraising. The venture builder deploys capital and supports ambitious founders all year round so aspiring founders and early-stage life science companies are encouraged to contact the team via the website.

Jason Mellad, CEO & Daniel Rooke, COO

FRAME SHIFT BIO-INCUBATOR

The Milner Therapeutics Institute provides space for start-ups and SMEs through the Frame Shift Bio-incubator. Frame Shift provides a unique environment for companies to work side-by-side with startups, pharma and academic scientists in an ecosystem physically and culturally designed to spark collaboration and entrepreneurship. Frame Shift has a particular focus on R&D intensive companies working in areas related to the institute's expertise (e.g. functional genomics, early target discovery, therapeutics). Frame Shift complements other programmes such as Start Codon, providing flexible options for start-up companies at different stages in their development.

Frame Shift began with the successful model of companies such as Xap Therapeutics (previously Rockend Ltd) who have been located in the institute during the past two years and expanded significantly as to require expansion to another site. Companies in the incubator will have access to space in the MTI environment for 12 months to conduct critical R&D work and successfully grow so that they are ready to scale-up at one of the science parks in Cambridge.

Benefits for companies in the Frame Shift Bio-incubator include:

- Potential for interactions with clinicians, researchers and drug discovery scientists at the University and hospitals on the biomedical campus.
- Advice and research input from the Centre of Pathway Analysis *(p6)*.
- Know-how and expertise of representatives of the eleven Milner affiliated pharma companies that are part of our consortium *(p21)*.
- Membership of an exclusive network of 70+ affiliated global pharma and biotech companies *(p20)*, and access to Milner internal and external events including the annual Milner Therapeutics Symposium.

Current companies in the Frame Shift bio-incubator:

CoSyne Therapeutics is a computational drug target discovery company whose mission is to develop next generation therapeutics to help patients with devastating diseases including brain cancer.

Enhanc3D Genomics is a functional genomics company, leveraging a disruptive technology to profile three-dimensional (3D) genome folding at high resolution for unlocking disease-related genetics for therapeutic discovery.

Epitopea is a new transatlantic cancer-immunotherapeutics company, which builds on the recent discovery of an abundant new class of tumour specific antigen.

Shift Bioscience is developing safe cellular rejuvenation by machine learning to help you live longer, not die longer.

Stroma Biosciences is utilising a proprietary stroma-focused discovery platform to identify novel targets within the tumour microenvironment which are critically relied upon by various cancers.

Virothera (formerly Virokine Therapeutics) is engineering novel virus inspired human gene immunotherapy for new cures for infections, autoimmune disease and cancer.

Xap Therapeutics will develop life-changing treatments for patients with a wide range of severe diseases by creating a new multimodal, off-the-shelf cell therapy platform.

CONNECT: HEALTH TECH

Connect: Health Tech is Cambridge University's Enterprise Zone, the gateway into the University's life sciences and health tech community for collaborators, companies and investors. We join the dots between medicine and technology across the Cambridge ecosystem and beyond.

Connect: Health Tech creates a bridge between biomedical research, cutting-edge technology and clinical need to accelerate the design, development and testing of diagnostics and therapies with real world applications.

We have developed a bespoke navigation system and online community which brings together the best resources and brightest minds in a digital space to solve the biggest health challenges of our time. Founded and populated by Cambridge 'super-connectors', Connect: Health Tech provides an efficient navigation system to improve access to knowledge and expertise and increases communication between health tech researchers, entrepreneurs and clinicians globally.

Dr Paula Rogers-Brown
Connect: Health Tech
Business Community Manager

Dr Alex Samoshkin
Translational Technology Manager
Office for Translational Research
and Maxwell Centre

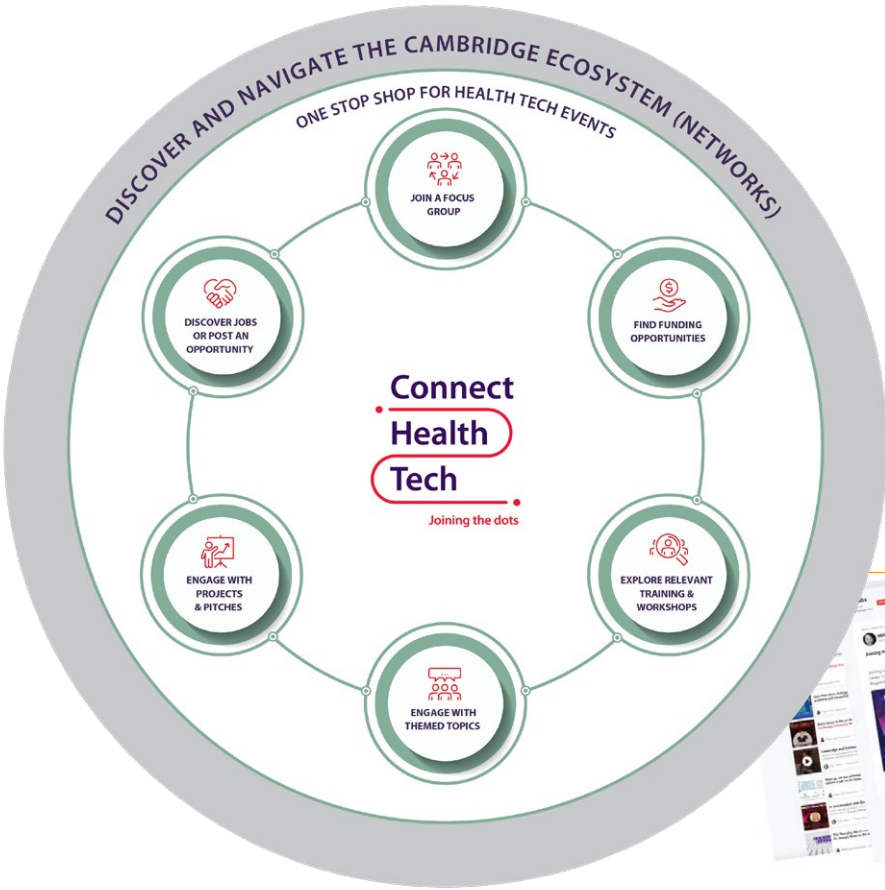
As an accessible and inclusive digital platform, Connect: Health Tech brings communities together in one place so they can connect and collaborate with new partners in different disciplines and sectors with common scientific aims. The platform amplifies the reach of events and training opportunities, enhances the search for relevant research partners and enables knowledge-exchange on topics related to health tech. This new way of working will speed up the development and adoption of new healthcare innovations and technologies that healthcare providers will use in years to come.

To date we have:

- Established an online navigation system and community across therapeutics, med tech and digital health, which provides 24/7 access to the wealth of knowledge and expertise in Cambridge and aids navigation of sector networks, sparks connections and catalyses collaborations (as a network, Connect: Health Tech currently reaches circa 8,000 people directly with the actual figure likely to be far higher).

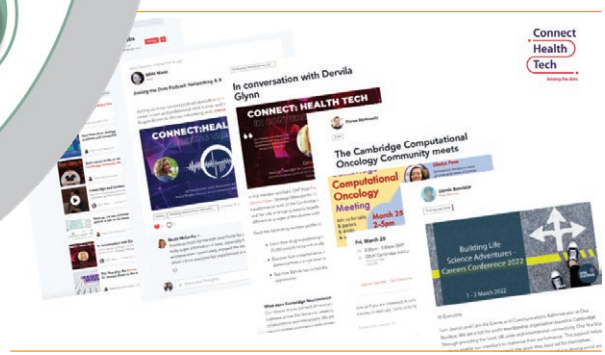
- Secured £6.7m in funding for interdisciplinary projects within the identified healthcare areas, a return on investment so far of >60x that spent on research facilitation.
- Set out an ambitious but realistic roadmap for the University and its partners in the Cambridge cluster to deliver transformative therapies at the interface between medicine and technology.

What is on the Connect: Health Tech platform and what can you do?



Join us at:
www.connect.cam.ac.uk/health-tech

Milner alliance members are invited to join and use this community to connect with each other and more widely in Cambridge.



GLOBAL THERAPEUTIC ALLIANCE

The Global Therapeutic Alliance, led by Dr Alison Schuldt, aims to build a global research community working together across academia and industry, with Cambridge providing a hub of expertise. The Milner Therapeutics Consortium is central to this aim (*p21*), and the Affiliated Company and Affiliated Research Institutions scheme brings complementary expertise and resources to the community, and provides opportunities to extend collaborative links within and beyond Cambridge.

95 ORGANIZATIONS ACROSS FOUR CONTINENTS

The Milner annual symposium is a key event for bringing our network together and building new collaborations. This is complemented by the monthly Milner seminar series, smaller workshops and partnering events on industry prioritised research topics. These have led to new collaborative projects, successful academic–industry funding applications for shared equipment and investment of industry into biotech.

MILNER THERAPEUTICS CONSORTIUM

The Consortium has been active since June 2015 and is based on a research agreement signed by three academic centres in Cambridge — the University of Cambridge, the Wellcome Sanger Institute and the Babraham Institute — and eleven pharmaceutical companies: Astellas, Astex, AstraZeneca, Bristol Myers Squibb, Eisai, Eli Lilly and Company, Ferring, GSK, Janssen R&D, Pfizer and Shionogi.

Our pharma partners are working through the Innovation Board to solve therapeutic challenges across the broad spectrum of human disease. Many have research and development interests that overlap, enabling them to propose common research themes related to targets, technologies and therapeutic areas that could be ideal for pre-competitive projects. These themes are also an essential part of the Consortium call, launched in 2021, whereby academics can suggest potential projects that would benefit from pharma input. These collaborative projects are expected to lead to joint publications and to provide mutual benefit. Outside of the Consortium call, the Milner continues to work with each company to identify academics working in research areas that are of specific interest to them.

There have been **29 Consortium projects across 15 Departments and Institutes** of the University, the Babraham and the Sanger to date, involving an **investment of >£6 million** by 8 of our industry partners *(p22)*. The projects are broad in remit and can include access to compounds, datasets, equipment or know-how in a particular technique. In some cases, an industry scientist has come to work in the academic's lab *(p23)*, and in others an academic post has been funded specifically for the project. The emphasis in all our collaborations is on mutual sharing of expertise.

CONSORTIUM PROJECTS

Lucy Colwell (*Dept Chemistry*)
The use of artificial intelligence technologies in fragment based drug discovery (*Astex*)

Martin Welch (*Dept Biochemistry*)
Advancing disease understanding and drug discovery in infectious diseases (*Shionogi*)*

Trevor Robbins (*Dept Psychology*)
Rodent models for remediating attention, working memory and impulsivity (*Shionogi*)*

Ludovic Vallier (*Wellcome MRC Cambridge Stem Cell Institute*)
Novel therapeutics for liver disease (*Ferring & GSK*)

David Belin (*Dept Psychology*)
Towards the identification of novel biobehavioural markers related to addiction (*Shionogi*)

Marghertia Turco (*Dept Pathology*)
An organoid library of the human endometrium (*Ferring*)

John Skidmore, Alex Whitworth and Nicholas Ktistakis (*ALBORADA Drug Discovery Institute, MRC Mitochondrial Biology Unit and Babraham Insitute*)
Autophagy targets in neurodegeneration (*Astex, Eisai, and Eli Lilley and Company*)

Mathew Garnett *(Wellcome Sanger Institute)*
Use of saturation gene editing to identify new druggable protein domains *(Astex)*

Daniel Fazakerley *(Wellcome MRC Institute of Metabolic Science-Metabolic Research Laboratories)*
Use of immortalized human adipocytes to identify novel regulators of GLUT4 trafficking *(AstraZeneca)*

Andres Floto *(Dept Medicine)*
The role of *Pseudomonas aeruginosa* in pulmonary inflammation and microbiome dynamics of Cystic Fibrosis patients *(Shionogi)*

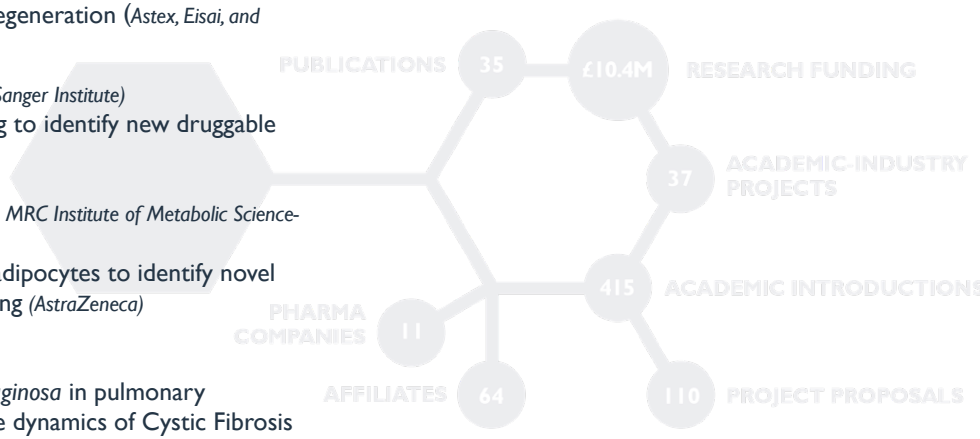
Projects with Cancer Research UK Cambridge Centre

Frank McCaughan (*Depts Biochemistry & Medicine*)
Identifying potential therapies for early squamous lung cancer (*Janssen R&D*)

Tony Kouzarides (*Wellcome CRUK Gurdon & Milner Institutes*)
Insights into the use of PROTAC molecules as a therapeutic strategy (*GSK*)

Charlie Massie, Simon Pacey & Vincent Gnanapragasam (*Early Detection Programme, CRUK Cambridge Centre, Dept Oncology; Depts Oncology and Surgery*)
Developing a pathway for precision medicine in early stage prostate cancer, to reduce radical treatment in active surveillance populations and improve outcomes for patients with aggressive disease (*AstraZeneca*)

Susana Ros and Kevin Brindle *(CRUK Cambridge Centre)*
Metabolic imaging to identify drug combinations that overcome drug resistance *(AstraZeneca)*



*Recently completed projects

CONSORTIUM CASE STUDY

When introducing academics to our pharma partners, we stress the importance of collaboration: how will both parties benefit from an potential project? Although the publication of high-quality papers can be a joint goal, there are other less public, but no less valuable benefits.

Shionogi Pharmaceuticals joined the Milner Therapeutics Consortium in 2016 and has been involved in 5 academic–industry collaborations to date. For a company based in Japan, enabling scientists to visit and work with Cambridge academics is a key benefit. Martin Welch (Dept Biochemistry) has collaborated with Shionogi in this way on a project centred around infectious disease. *"This has been a brilliant project and it was great to have a postdoc from Shionogi visiting the lab. They contributed substantially to the project and the lab,"* Martin commented. Angela Roberts (Dept PDN) and Trevor Robbins (Dept Psychology), experts in networks of the frontal lobes and basal ganglia involved in cognition and behaviour, initiated collaborations with Shionogi to test novel and first-in-class compounds on specific models of cognition and behaviour. A Shionogi scientist worked in the Robbins lab, and this has fostered a longer-term working relationship. This project was extended in 2019 and the Shionogi scientist — now a team leader in Japan — is initiating a new project with Trevor Robbins and Amy Milton looking at the impact of specific drugs on cognition and behaviour.

This exchange of scientists is not just one way: a Shionogi iCASE studentship with David Belin (Dept Psychology) focused on biobehavioural markers of addiction will see a PhD student from the Belin lab visiting Shionogi in Japan later this year. Enabling Shionogi scientists to experience the culture in Cambridge and vice versa brings substantial value, breaking down barriers between academia and industry.

"As a research-intensive pharmaceutical company, we believe that academic collaborations and partnerships are critical in discovering innovative medicines that ultimately benefit patients. Via the Milner Therapeutics Consortium, we have developed a number of research collaborations in Cambridge, which already delivered valuable outcomes for both parties. We would like to further expand and deepen our activities in Cambridge as a partner of choice for future collaborations."

Ryuichi Kiyama, SVP, Head of Pharmaceutical Research Division

AFFILIATED COMPANIES

The Affiliated Company scheme, established in October 2016, now includes 64 organizations which bring diverse expertise and resource to the Milner network. The institute promotes interactions between affiliated companies and academic, pharmaceutical or biotechnology partners, with the aim of building a cohesive community with an aligned vision. Our annual symposium is a key event — supported by the affiliated companies — for catalysing new opportunities for collaboration.

The affiliated companies include global pharma and biotech companies as well as a significant number of start-ups and SMEs with their own drug pipeline, many of which have arisen from research in Cambridge. Our activities are supported by a broad range of life science companies providing essential drug discovery expertise. The affiliate companies span disease areas from cancer and neurodegeneration to rare disease and there is a strong cohort of companies focusing on AI and data science, emphasizing the rapidly increasing application of this technology in biomedical research.

LIFE SCIENCE TOOLS & SERVICES

DRUG DISCOVERY ASSAYS & CONSUMABLES

AXOL
PELAGO BIOSCIENCE
abcam
Selvita
Cell Signaling TECHNOLOGY
bit bio
bio:ascent
diagenode
Domainex
Sai
o2h discovery
TWIST BIOSCIENCE
CELL guidance systems

AI & DATA SCIENCE

Biomax INFORMATICS
intellegens
healx
Genestack
AI VIVO
VIVAn THERAPEUTICS
Standigm
BenevolentAI
eagle genomics
Genedata
GENOME BIOLOGICS
CYCLICA
ARCTORIS

LIFE SCIENCES

OBRIZUM
cytiva

PHARMA & BIOTECH

PHARMA & BIOTECH

AMGEN
YUHAN
JW Pharmaceutical
DAEWOONG

START-UPS & SMEs*

STORM THERAPEUTICS
microbiotica
AltemisLab
SomaServe
NEMESIS BIOSCIENCE
immundnz
PHOREMOST DRUGGING THE UNDRUGGABLE
sengenics
HAPLN SCIENCE
Spliceor Ltd
verinnogen
lifebit
METISOX
OPPILOTECH
Medannex
semarion
Qkine
Biorelate
Vernalis RESEARCH
TAGOMICS
CANTABio PHARMACEUTICALS
DRISHTI Discoveries
absci

START-UPS IN FRAME SHIFT BIO-INCUBATOR

EPITOPEA
Virothera
Shiftbioscience
COSINE THERAPEUTICS
Xap Therapeutics
Enhanc3D Genomics
Stroma Biosciences

INDUSTRY ASSOCIATION

KPBMA

* *Small and medium-sized enterprises*

AFFILIATED RESEARCH INSTITUTIONS

The Affiliated Research Institutions programme, established in October 2017, now includes 14 academic institutions across four continents. These partners share our vision of developing new models for research collaboration across industry and academia to transform pioneering science into therapies. They have free access to our annual symposium and themed events; we also provide them with contacts throughout the Global Therapeutic Alliance, by fostering research opportunities and supporting engagement with industry in their own institutions.

VENTURE PARTNERS

The Affiliated Venture Partners programme, operational since October 2017, provides mentoring and potential funding for the start-ups within the Start Codon Venture Builder and Investor and the Frame Shift Bio-incubator.

AFFILIATED SOCIETIES & CHARITIES

We work with and support various societies and charities throughout Cambridge and beyond.

OUR ORGANIZATIONAL STRUCTURE

INNOVATION BOARD

- Dr Bradley Hardiman, *Astellas*
- Dr Nuno Alves, *Astellas*
- Dr Alexa Smith, *AstraZeneca*
- Dr David Wilson, *AstraZeneca*
- Dr John Lyons, *Astex*
- Dr Rab Prinjha, *GSK*
- Victoria Higgins, *GSK*
- Dr David Shields, *Pfizer*
- Dr Ryuichi Kiyama, *Shionogi*
- Dr Yoshiro Shiba, *Shionogi*
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- Dr Hugh Nuthall, *Eli Lilly and Company*
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- Dr Andy Takle, *Eisai*
- Dr Adrian Ibrahim, *Wellcome Sanger Institute*
- Dr Mathew Garnett, *Wellcome Sanger Institute*
- Dr Simon Cook, *Babraham Institute*
- Professor Greg Hannon, *CRUK Cambridge Institute*
- Professor Ludovic Vallier, *University of Cambridge*
- Dr Kathryn Chapman, *Milner Therapeutics Institute*
- Professor Tony Kouzarides, *Milner Therapeutics Institute*

GOVERNANCE BOARD: UNIVERSITY OF CAMBRIDGE

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- Dr Kathryn Chapman

UNIVERSITY INNOVATION REPRESENTATIVES *(2021–22)*

- Dr Stephen Smith
- Dr James Richards
- Dr Hiran Prag
- Dr Qianxin Wu

OUR FUNDERS

CANCER RESEARCH UK

lifeArc

MILNER THERAPEUTICS INSTITUTE CONSORTIUM

JW Pharmaceutical

Standigm

STORM THERAPEUTICS

CANCER RESEARCH HORIZONS

AstraZeneca

ANTIBODY ALLIANCE LABORATORY

FACILITIES & OPERATIONS TEAM






Top left:
Dr Richard Hill,
Business Operations Manager
Saffron Murfitt,
Administrative & Personal Assistant
Anna Sechenykh,
Research Laboratory Technician

Chloe Caley,
Finance, HR, & Administration Coordinator
Ben Pearson,
Assistant Facilities Coordinator
Larissa Richardson,
Scientific Facilitites Coordinator

WHAT WE OFFER

Please write to us (contact@milner.cam.ac.uk) if you would like to engage with the Institute for a new partnership, research project, Consortium membership or Affiliated partnership. We can provide for:

ACADEMICS

- Opportunities to partner with industry for early stage research collaborations
- Pre-agreed T&Cs to accelerate contracts
- Access for selected projects to advanced platforms in Centre for Pathway Analysis
- Links to AZ Cancer Research Horizons Functional Genomics Centre

PHARMA

Consortium membership

- A gateway to academics and other industry members for research collaboration
- Pre-agreed T&Cs to accelerate contracts
- Board seat for strategic input into drug discovery pipeline and first sight of projects
- Priority access to Centre for Pathway Analysis
- Dedicated company profile at annual symposium and throughout Cambridge

INDUSTRY

Affiliated partnership

- Opportunities to partner with academics and pharma companies
- Visible profile as Alliance partners and as sponsors of annual symposium
- Access to and presentation opportunities at biotech-focused events (e.g. bespoke workshops and Milner seminar series)

ENTREPRENEURS

- Research space and support in the Frame Shift Bio-incubator
- Significant investment, research space and mentorship through Start Codon accelerator

INVESTORS

Affiliated partnership

- First sight of Cambridge start-ups at pitch events
- Access to research community, companies and start-ups at annual symposium, seminars and workshops
- Potential deal flow for companies inside and outside Milner

Bringing discoveries to life

UNIVERSITY OF CAMBRIDGE

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