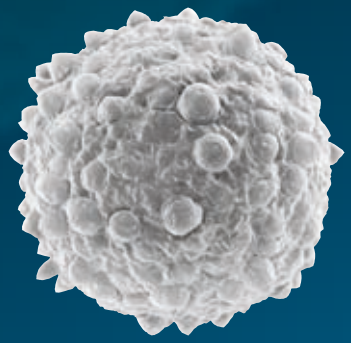
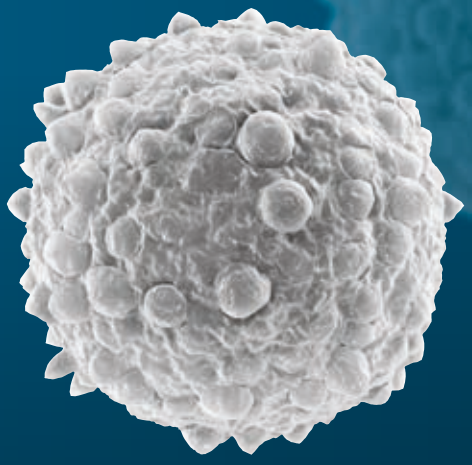
UNIVERSITY OF Southampton



The cure for cancer? You're it



Support our campaign to build a world-leading
Centre for Cancer Immunology at Southampton

"Seeing how cancer affects you makes you feel all the more strongly that something has to be done – it's not just your life it wrecks but your whole family's. If the new Centre can stop that in just one family, then that's pretty fantastic."

Tom Worthen, clinical trial patient

Tom Worthen

In July 2012, Tom, a barrister, went to the doctor after his parents noticed a strange-looking mole on his back. At just 28, Tom was diagnosed with melanoma, a cancer that starts in the skin and often spreads to other organs. "From having my life stretching out in front of me, I was literally sitting there planning my own funeral," he says.

In October 2012, Tom went on a clinical immunotherapy trial at Southampton. Results show that Tom's body is now fighting the cancer. Engaged to be married, Tom is now looking forward to the future.

Visit **www.southampton.ac.uk/youreit** to read Tom's full story.

Saving more lives from cancer

"Reaching our goal is not about the bricks and mortar of a building; it's about the life-changing research that the new Centre will enable, and each and every one of us already has an important part to play."

Professor Iain Cameron,
Dean of Medicine,
University of Southampton

The University of Southampton leads the UK in cancer immunology research. Building on this unrivalled expertise, we have launched a major fundraising campaign to raise £25m to open the UK's first dedicated Centre for Cancer Immunology at Southampton General Hospital in 2017. We are on the cusp of exciting breakthroughs in curing cancer and with your support we can save more lives.

Our groundbreaking research is enabling the body's immune system to recognise and eradicate cancer. We are seeing some amazing results in clinical trials. As many as half of our patients with difficult and terminal cancers, including lung and skin cancer, are showing dramatic improvements with immunotherapy. Treatments are proving so powerful they can last a lifetime.

Revolutionary facilities

Revolutionary research needs revolutionary facilities and this is where we need your help. We are raising money to fund a new, purpose-built, state-of-the-art Centre for Cancer Immunology. The Centre will act as an interdisciplinary hub, linking existing teams at Southampton and attracting leading global research talent. Working side by side in a creative, interactive environment, specialist staff will generate and apply new knowledge – from discoveries in the lab to the development of new treatments.

By pooling our understanding and extending our resources, we will accelerate progress and save more lives from cancer. Your support can make this a reality.

A cure for cancer is now in sight. Please support our campaign.

Cancer immunotherapy named the number one global scientific breakthrough of the year by the world-leading journal *Science*, January 2014

A breakthrough in cancer treatment

Cancer immunotherapy harnesses the body's immune system to fight and provide lasting defence against cancer. By boosting, targeting or restoring the immune system, we can stop or slow the growth of cancer cells and prevent them from spreading to other parts of the body.

There has been a revolution in cancer research over the past few years and many experts believe that most cancers will soon be controllable or curable. Southampton researchers have been central to these advances.

Cancer immunology

The immune system is one of our main defences against the outside world. It fights infections, repairs injuries and uses various strategies to protect us from harm. Cancer has to escape the surveillance of our immune system to develop.

Some cancers are able to evade our natural defences by switching off, or confusing, our immune system's killer T cells, which allows them to grow exponentially.

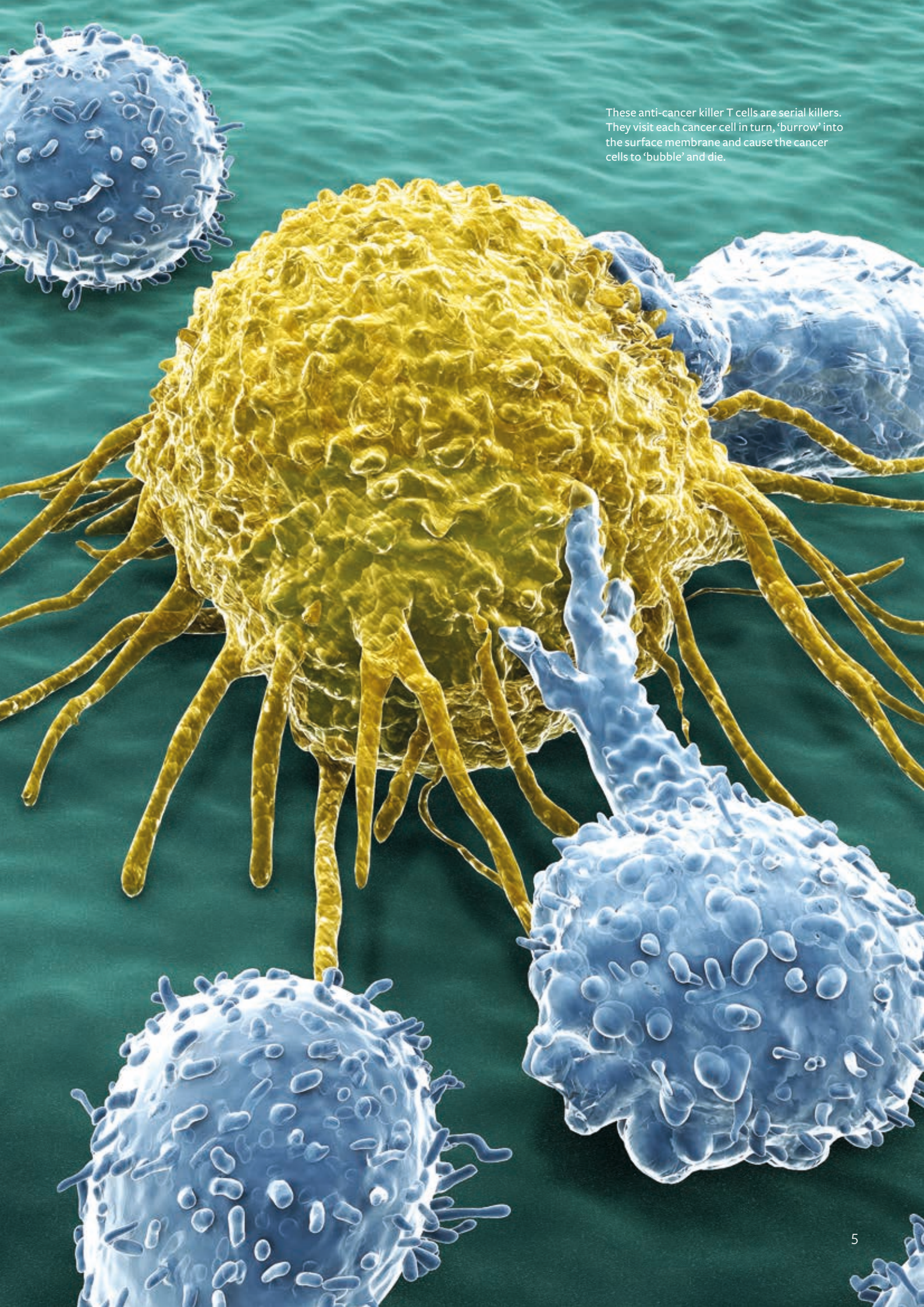
Immunotherapy is a revolutionary approach to treatment that supercharges the body's natural defences to switch our killer T cells back on, either improving their function or enabling them to 'see' the invasive cancer cells and eliminate them. The treatments developed at Southampton not only destroy visible cancer cells but also seek out and eradicate hidden cancers in other parts of the body. Potentially, they give us a lifetime of immunity.

One of our main challenges is to find out why some patients respond well to immunotherapy and others do not. Building on the fast-moving developments in the field of immunology, the new Centre aims to develop tailored treatments for patients so that everyone can benefit.

"We are seeing unprecedented success against different cancers using antibodies that can throw the switches in the immune system. Our new vaccines and antibodies direct special immune cells against cancers. These 'killer' cells can control and shrink cancer and give long-lasting protection."

Professor Peter Johnson,
Professor of Oncology,
University of Southampton
Chief Clinician, Cancer Research UK

More than 90% of our patients who have been treated with antibody immunotherapy and survived more than two years remain cancer free.



These anti-cancer killer T cells are serial killers. They visit each cancer cell in turn, 'burrow' into the surface membrane and cause the cancer cells to 'bubble' and die.

Pioneering new treatments

"In the future, we believe immunotherapy will treat over 100 different types of cancer. With continued research, vaccines for certain cancers could be just 15 years away."

Professor Martin Glennie,
Head of Cancer Sciences,
University of Southampton

For 40 years, the University of Southampton has been at the forefront of cancer immunology research in Europe and worldwide. A true pioneer in the discovery and application of immune-based therapies, including antibodies and vaccines, we have played a significant part in developing:

- ipilimumab, one of the first approved immunology drugs, extending the lives of patients with melanoma; this was the first treatment to improve survival in melanoma since surgery was invented;
- more powerful antibody treatments to treat lymphoma;
- a new generation of engineered super-antibodies. These antibodies will be used to treat a range of different cancers. We are already planning trials in pancreatic, lung and head and neck cancers, but, if successful, these could be extended to many others;
- ofatumumab, the first fully human antibody capable of replacing rituximab for the treatment of leukaemia. 'Fully human' means it may talk to the human immune system better than older antibodies like rituximab, and may therefore be less likely to cause side effects.

Using the University's supercomputer, one of the largest in Europe, we have also established how the shape and mobility of immunological molecules indicate whether or not they will deliver an immune response.

Outstanding results

Southampton is truly a world player. Our current clinical drug trials involving people with advanced and terminal cancers are achieving outstanding results. As many as 50 per cent of our patients diagnosed with lung, skin cancer (melanoma), lymphoma, pancreatic cancer and neuroblastoma who have been given new antibody treatments are showing significant improvements. And an amazing 20 per cent are living cancer free.

"Sometimes you find yourself in the right place at the right time! I am so lucky to be living in Southampton where, quietly, there is so much cutting-edge research right under our noses. We need to tell the whole world about it."

Julie Davis, clinical trial patient

Julie Davis

In February 2011, Julie found a lump in her neck and was diagnosed with advanced follicular lymphoma. Multiple tumours were growing in various parts of her body. The prognosis using traditional therapies was not promising.

Julie took part in an immunotherapy trial and after 18 months of treatment the largest of the tumours had reduced from 10 cm to 0.5cm. Julie is now living drug free and has returned to the activities she loves, including walking her neighbours' dogs.

Visit **www.southampton.ac.uk/youreit** to read Julie's full story.

Southampton research and achievements

1975 Founders of the Tenovus Immunochemistry Laboratory, Professor Freda Stevenson and Professor George Stevenson, described how antibodies could be used as treatments.

First description of the use of antibodies in patients at Southampton. Hamblin TJ, Abdul-Ahad AK, Gordon J, Stevenson FK and Stevenson GT (1980). 'Preliminary experience in treating lymphocytic leukaemia with antibody to immunoglobulin idiotypes on the cell surfaces'. *British Journal of Cancer*, 42(4): 495-502.

1980 Southampton becomes the first centre to use antibody treatments to remove leukaemia cells from the blood of patients.

1982 First to show that it is possible to enhance the cancer-killing properties of an antibody by molecular engineering.

Glennie MJ and Stevenson GT (1982). 'Univalent antibodies kill tumour cells in vitro and in vivo'. *Nature*, 295 (5851): 712-714.

1982 George Stevenson receives the Armand Hammer Prize of $50,000 for pioneering work in 1980.

The Armand Hammer Prize for this work was given in 1982: www.nytimes.com/1982/12/04/us/2-doctors-win-50000-each-for-work-on-a-cancer-drug.html

1987 First to show why some anticancer antibodies are better than others in therapy.

Elliott TJ, Glennie MJ, McBride HM and Stevenson GT (1987). 'Analysis of the interaction of antibodies with immunoglobulin idiotypes on neoplastic B lymphocytes: implications for immunotherapy'. *Journal of Immunology*, 138(3): 981-988.

1994

One of the first DNA cancer vaccines is developed in Southampton.

Hawkins R.E., Zhu D., Ovecka M., Winter G., Hamblin T.J., Long A. & Stevenson F.K. (1994) Idiotypic vaccination against human B-cell lymphoma. Rescue of variable region gene sequence from biopsy material assembly as single chain Fv "personal" vaccines. *Blood* 83:3279-3288.

1997 First to suggest that molecular shape-shifting could be important for dictating which antigens are presented to killer T cells.

Elliott T (1997). 'How does TAP associate with MHC class I molecules?'. *Immunology Today*, 18(8): 375-379.

2004

Southampton researchers help develop the first fully human monoclonal antibody, ofatumumab, for the treatment of lymphoma and leukaemia.

Teeling JL, French RR, Cragg MS, van den Brakel J, Pluyter M, Huang H, Chan C, Parren PW, Hack CE, Dechant M, Valerius T, van de Winkel JG, Glennie MJ. *Blood*. 2004 Sep 15;104(6):1793-800.

2013

Southampton and Cancer Research UK scientists at the University develop antibodies that are shown to attack neuroblastoma – a form of childhood cancer that grows from undeveloped tissue of the nervous system.

2015

First to link the molecular structure of a therapeutic antibody to its enhanced function.

White AL, Chan HT, French RR, Willoughby J, Mockridge CI, Roghanian A, Penfold CA, Booth SG, Dodhy A, Polak ME, Potter EA, Ardern-Jones MR, Verbeek JS, Johnson PW, Al-Shamkhani A, Cragg MS, Beers SA and Glennie MJ (2015). 'Conformation of the human immunoglobulin G2 hinge imparts superagonistic properties to immunostimulatory anticancer antibodies'. *Cancer Cell*, 27(1): 138-148.

1999

Southampton researchers publish research on a group of antibodies that boost the immune system to make a strong response to cancer.

1999

Southampton researchers develop a new test which defines two types of leukaemia: those which must be treated quickly and those which can be left untreated.

Hamblin T.J., Davis Z., Oscier D.G. & Stevenson F.K. (1999) Unmutated immunoglobulin VH genes are associated with a more aggressive form of chronic lymphocyte leukaemia. *Blood* 94(6):1848-1854.

2011

Southampton becomes one of the first centres in the world to develop and test a DNA cancer vaccine and to demonstrate how this could activate the immune system to recognise cancer.

2014

First to demonstrate that molecular shape-shifting is important for dictating which antigens are presented to killer T cells.

Bailey A, van Hateren A, Elliott T and Werner JM (2014). 'Two polymorphisms facilitate differences in plasticity between two chicken major histocompatibility complex class I proteins'. *PLOS One*, 9(2): e89657.

2017

Opening of the UK's first dedicated Centre for Cancer Immunology.

A state-of-the-art centre

Our Centre for Cancer Immunology will bring together world-leading specialists from a range of disciplines to harness the power of immunity in the fight against cancer. Scientists, clinicians, technical experts and patients will collaborate in a creative, interactive environment, generating new knowledge and applying it seamlessly in exciting new treatments.

The new 4,000m², four-storey building will house state-of-the-art equipment to support the development of new cancer immunotherapies – from discovery in the lab through to clinical trials. The Centre will be home to world-class research facilities and a specialist clinical trials unit. A suite of molecular biology laboratories will enable researchers to investigate the complex interactions between cancer and the immune system and use genetic engineering to develop new vaccines and antibodies.

The new Centre will accommodate existing immunology teams from different research bases and welcome at least 50 new staff, including important recruits in discovery science. Building on the exciting progress already made, it will serve as a focal point for nurturing future generations of scientists and clinicians.

Thanks to significant philanthropic gifts, plans for the Centre for Cancer Immunology are already under way. Your support will ensure its success.

Our research programme

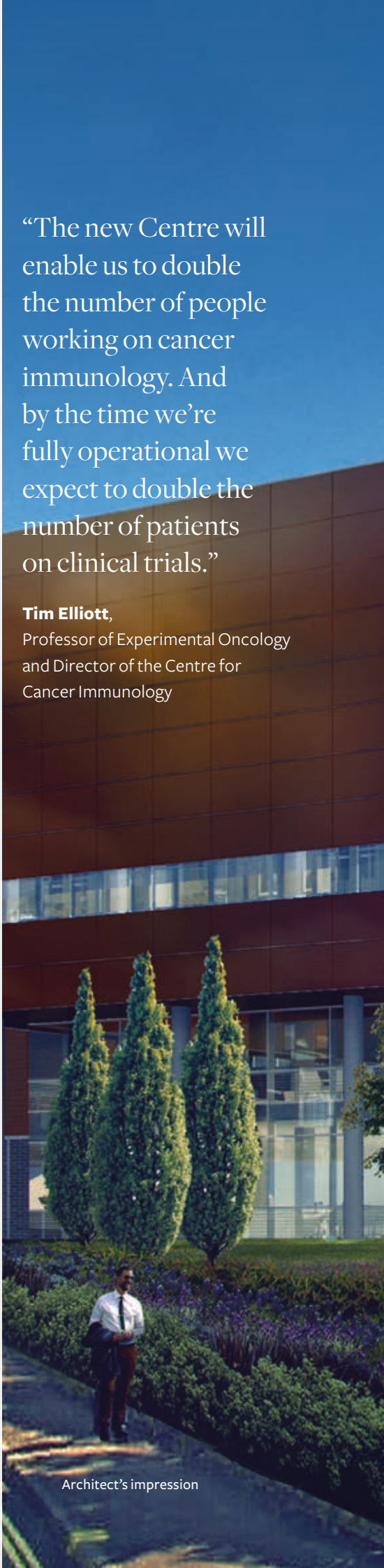
The Centre will expand and accelerate Southampton's programme of immunology research. Research will encompass a broad range of activities, spanning basic discovery of the precise mechanisms involved through to clinical trials of new types of treatment.

Going forward

Most of the immunology research at Southampton is funded by research councils, charities such as Cancer Research UK, and by industry. The new Centre will greatly expand our capacity for research, which will in turn bring in more grants and attract commercial funding, notably from pharmaceutical companies.

"The new Centre will enable us to double the number of people working on cancer immunology. And by the time we're fully operational we expect to double the number of patients on clinical trials."

Tim Elliott,
Professor of Experimental Oncology and Director of the Centre for Cancer Immunology



Architect's impression

"I am delighted that the University will be locating this research centre on the Southampton General Hospital site, further strengthening the deep and longstanding partnership between the Trust and the University."

Fiona Dalton,
Chief Executive, University Hospital Southampton NHS Foundation Trust

"Through more collaboration, putting immunology at the centre, pooling our knowledge and plugging the gaps, we will be able to speed up our research tremendously."

Dr Edd James, Associate Professor in Cancer Immunology, University of Southampton

Connected research

Bringing together internal teams and drawing on local and national partnerships, we will also act as a hub for international collaboration. The Centre will work with academic and industry partners worldwide to expand clinical trials, explore new areas and develop lifesaving drugs. This is a global undertaking, connecting many disciplines and many collaborators.

Our cancer immunologists are already working on transformative interdisciplinary projects with researchers across the University in the fields of mathematics, chemistry, electronics and computer science.

We also work closely with several external groups, including the Southampton Centre for Biomedical Research (SCBR), the NIHR Wellcome Trust Clinical Research Facility, Microsoft Research UK, the Experimental Cancer Medicine Centre and the Wessex Investigational Sciences Hub (WISH) Laboratory, which carries out immunomonitoring and genomics.

We collaborate with UCL and the universities of Oxford, Cambridge, Birmingham, Manchester and Leeds, and internationally with BioInvent International, the renowned La Jolla Institute for Allergy and Immunology in California, the University of Notre Dame, Indiana, University Medical Center Groningen, Melbourne's Walter and Eliza Hall Institute of Medical Research and A*STAR in Singapore.

Our partnership with the **Francis Crick Institute** in London (due to open in 2016) will foster the best translational science and encourage shared training programmes and joint scientific projects.

Working with national cancer charities

The University is home to one of **Cancer Research UK**'s 15 centres, which bring together world-class research and medical expertise to provide the best possible outcomes for cancer patients nationwide. The charity looks to us to lead their strategic focus on immunology and biotherapeutics.

Southampton is a **Leukaemia & Lymphoma Research** Centre of Excellence. Southampton is known around the world as a leading centre for the treatment of Hodgkin and non-Hodgkin lymphoma, and for the breadth of its research that is bringing real benefit to patients touched by other blood cancers such as leukaemia and myeloma.

"The connection between Southampton and the Crick will bring benefit to both parties, and continue to build the UK's outstanding reputation for medical research and translation to patient treatment and care."

Sir David Cooksey, Chairman of the Francis Crick Institute

The Centre's research links to the Crick provide exciting new opportunities for translating discoveries into the clinic.

The cure for cancer? You're it

This is the most ambitious fundraising campaign the University of Southampton has ever undertaken and you can be a part of it. Your immune system holds the key to a cure for many cancers and your support will make this life-changing project possible.

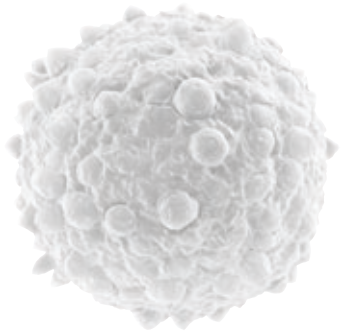
Your contribution will fund the first dedicated Centre for Cancer Immunology in the UK. Our new Centre will maximise our research power and enable us to accelerate the development of immunotherapy treatments and deliver cures for cancers more quickly.

We have already received significant gifts from our supporters that have allowed us to plan the new Centre with confidence. Developments are progressing well. But we are not there yet.

All gifts make a difference – from personal gifts to recognising loved ones through a legacy or a naming opportunity in the new Centre. Please join our campaign. Together we can save more lives from cancer.

"We are proud to support a project that will change the way cancer is treated across the world. We encourage other donors to join us in taking this significant step towards finding new treatments."

Philip and Angela Greatrex, donors and University of Southampton alumni



"If it wasn't for the trial, Xano honestly wouldn't be here. If clinical trial research is going to help us and lots of other people, it has to be a good thing"

Sonia Basilio,
mother of Xano de Sousa,
clinical trial patient

Xano De Sousa

Xano was five when he was diagnosed with advanced neuroblastoma (an aggressive form of childhood cancer) in 2014. The news was devastating – typically, children at this stage have a 40% chance of survival. Xano's parents were told about Southampton's immunotherapy trials. "We were told that chemotherapy only gets rid of what's visible, but immunotherapy teaches the body to fight off any remaining cancer," says Xano's mother, Sonia. "It reduces the chances of it coming back."

Amazingly, after completing a five month trial, Xano is now in complete remission and happy to be back at school.

Please visit **www.southampton.ac.uk/youreit** to read Xano's full story.

www.southampton.ac.uk/youreit

Support the campaign:
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youreit@southampton.ac.uk

Registered charity no X19140