ICR The Institute of Cancer Research

Issue 33 Spring 2016

search

For supporters of The Institute of Cancer Research

New era in microscopy
The next generation of cancer researchers
Bowel cancer's genetic secrets

Our mission is to make the discoveries that defeat cancer.

Written and produced by the ICR

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Editorial

The last six months have been an exciting time at the ICR. I'm delighted to tell you that we have just had our 20th drug candidate since 2005 enter preclinical development. We are proud of this achievement, not for its own sake but because of the impact our work has on the lives of people with cancer.

Around the world, patients are being treated with drugs discovered by us. But there is still more we need to do to defeat cancer. It often still takes many years to translate discoveries made in the lab into new treatments for patients in the clinic.

At the ICR, we are determined to find new ways for our research to reach patients sooner. And we're doing it by making more discoveries, translating them into the clinic as soon as possible, and taking care to ensure that the projects and people we invest in now will deliver positive results in the future.

However, we can't do it without your support. Last year, you helped us raise an impressive £12 million, our largest annual total to date. But in 2016, with your support, we would like to raise even more so we can continue making the discoveries that will defeat cancer.

Thank you.
Lara Jukes
Director of Development
The Institute of Cancer Research, London

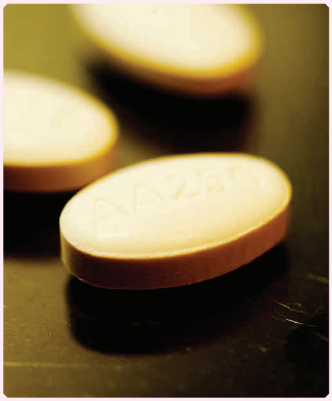
New test could help predict survival chances in high-grade breast cancers

Researchers in our Centre for Evolution and Cancer have developed a highly innovative new test called the Ecosystem Diversity Index – which could be used to assess how aggressive a breast cancer is likely to be, and help to tailor treatment accordingly.

Our scientists combined software used by ecologists with a powerful cancer imaging technique and found that the new test identified several particularly aggressive subgroups of breast cancer, and was a stronger predictor of survival than many other known markers for the disease.

Team Leader Dr Yinyin Yuan said: "We hope that by combining test scores with other factors, such as genetics and tumour size, we will be able to tell apart patients with more or less aggressive disease so we can identify those who might need different types of treatment."

Green light for prostate cancer drug

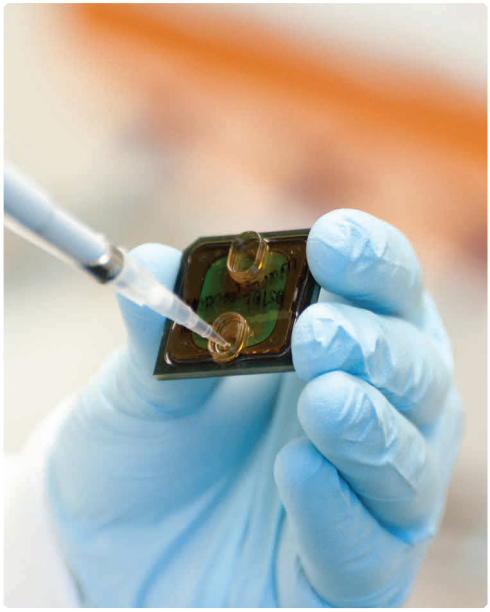


The life-extending prostate cancer drug abiraterone – discovered at the ICR – will now be made available for men earlier in the course of their treatment.

NICE, the body that determines which treatments can be made available on the NHS, has announced that it can now be used before chemotherapy.

Since 2012, abiraterone has been standard treatment for advanced prostate cancer after chemotherapy, extending the lives of many thousands of men in the UK. Abiraterone will now be available for men earlier in their treatment – delaying chemotherapy and helping to avoid its side-effects for as long as possible.

Children with cancer to get new gene test



Our research gained national media coverage in March, with the launch of a new genetic test to help personalise treatment for children with cancer.

Around 400 children with solid tumours at 21 hospitals across the country will start to receive the test, which is designed to pick up key mutations in tumours that drive cancer's growth and spread. The test was developed by our scientists here at the ICR and in partnership with The Royal Marsden.

The charity Christopher's Smile funded the development of the test, which works by sequencing 81 different cancer genes. Christopher's Smile has raised over £1 million for our childhood cancer research. The charity was set up by Kevin and Karen Capel after their son passed away from medulloblastoma, a type of brain tumour.

Laws of nature predict cancer evolution

Dr Andrea Sottoriva, from our Centre for Evolution and Cancer, has developed a mathematical model that could help to predict how a cancer will grow and spread.

His team used genetic data from tumours and state-of-the-art computing to discover that some elements of cancer's progression closely follow a mathematical pattern known to describe many other natural processes, such as the flow of a river and the brightness of stars.

Dr Sottoriva explains: "The information could tell us how a given cancer will develop over time, which genetic changes could make the tumour more aggressive, and therefore which drugs will work best against it."

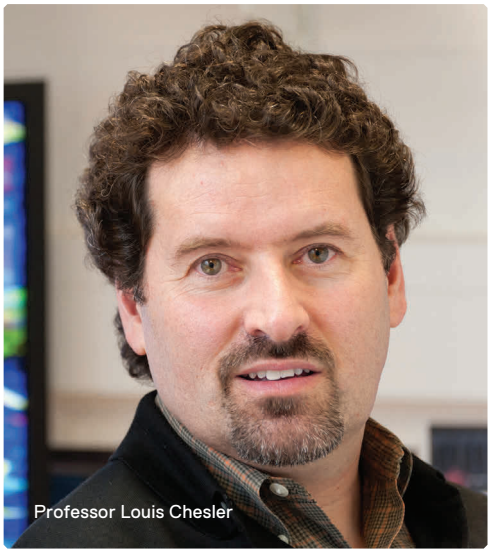
The Freemasons' Grand Charity makes new grant to the ICR

The Freemasons' Grand Charity has made a substantial gift towards our research into childhood cancer.

The donation of £72,000 will help fund Professor Louis Chesler, and his team here at the ICR, develop new treatments for children with cancer. They are developing a blood test that will identify the genetic make-up of a child's cancer, reducing the need for a child to undergo an invasive and uncomfortable tumour biopsy.

Professor Chesler said: "I'm so grateful to the Freemasons' Grand Charity for their recent gift. They are helping us improve the outlook for children with cancer and I can't thank them enough."

Since 2000, The Freemason's Grand Charity has contributed more than a million pounds to the ICR's work.



Professor Louis Chesler

Professor Janet Shipley featured in our Christmas appeal

Christmas Appeal raises £85,000 for our research

We at the ICR are very grateful to everyone who donated to our Christmas Appeal. Collectively you raised a brilliant £85,000.

Your funds will go towards important research projects here at the ICR to improve treatment for liver cancer, childhood brain tumours, and a rare form of sarcoma which affects young people.

More than 1,000 of you supported our research for the first time. And many of you donated, as you have been doing, for several years or more now. Thank you very much for funding our research. We will update you on our progress through Search magazine.

Headhunters take on TrekFest

Executive search boutique Marlin Hawk is just one of the groups preparing for a gruelling 'TrekFest' charity hike to raise funds for our research.

Twenty-two of their team members will be pushing themselves to the limit by trekking the Brecon Beacons this June. And with every step they take, they will be one step closer to reaching their fundraising target of £7,000.

With its camping facilities, celebratory meals and festival-like atmosphere, it's no surprise that TrekFest is fast becoming one of our most popular events. In September, you can also trek in the beauty of the Peak District in support of the ICR.

If you and your colleagues would like to take part in TrekFest, visit icr.ac.uk/challenge

House and Garden fairs choose ICR as charity partner

We have been selected as the charity partner for two very special retail fairs taking place at Olympia London this summer.

The Spirit of Summer Fair and the House Fair, in association with House and Garden magazine, showcase some of the very best in British and international interior design. Taking place on 22-25 June, The Spirit of Summer Fair is the perfect place to discover beautiful accessories for the home and garden, striking summer fashion and children's clothing, as well as original gifts and artisan food and drink.

Charlotte Orrell-Jones, our Head of Events, said: "We are thrilled to be this year's charity partner. It's an exciting opportunity for us to engage with a new and wider audience."

For more information and to buy your tickets visit:
www.thehousefair.com
www.spiritofsummerfair.co.uk

Developing targeted treatments to help people with sarcoma

Professor Winette van der Graaf joins the ICR as a Team Leader in Clinical and Translational Sarcoma research and Professor of Personalised Oncology. She is driven by the desire to find personalised treatments and combination therapies, and new ways to adapt treatment and care to the needs of cancer patients of different ages.

From the Netherlands, Professor van der Graaf says she was attracted to the ICR by the opportunity to work alongside the successful Drug Development Unit at the ICR and The Royal Marsden – and to work in the hospital's successful sarcoma unit.

Seeking to improve the outlook for younger patients, Professor van der Graaf will be investigating new targets and treatment combinations in sarcomas. A new project will use a novel and promising concept called 'synthetic lethality', which selectively targets weaknesses inherent in cancer cells. The concept – likened to attacking one of cancer's Achilles' heels – was developed by Dr Chris Lord and Professor Alan Ashworth at the ICR to target breast cancers that carry mutant *BRCA* genes. The discovery underpinned the development of a class of drug called PARP-inhibitors. Professor van der Graaf regards working together with Chris and his team, and the team of Professor David Thomas from the Garvan Institute in Sydney, as a great opportunity to exploit synthetic lethality in sarcomas too.

Professor van der Graaf said: "In our Drug Development Unit, colleagues are already undertaking phase I studies relevant for this concept, but until now, there have been very few studies into the possibility of utilising synthetic lethality against different forms of sarcomas. If we can show this approach works, it could provide clinicians with a new strategy to treat patients with these cancers."

Name
Professor Winette van der Graaf

Joined the ICR
September 2015

Specialist subject
International expert in research on sarcomas and also research on age-related aspects of cancer

Greatest achievement
"I led the pivotal phase III drug trial of pazopanib for the treatment of soft tissue sarcoma. The success of the trial led to the drug being registered by the US Food and Drug Administration and the European Medicines Agency as a treatment against soft tissue sarcomas."

In her own words
"I want to do more to translate research into benefits for patients. Working at a highly ambitious and world-class institute such as the ICR provides a stimulating, state-of-the-art environment and the focus that will help me to achieve this."

Collaboration is the key to treating childhood brain cancer

Professor Chris Jones, who has featured in our recent fundraising appeals, says he is hugely motivated by the fact that there is an unmet clinical need for children with high-grade gliomas.

Sadly, with no effective treatments, children with these terrible tumours have some of the worst survival rates of any cancer.

Recently it has become clear that these tumours have completely different biology to tumours in adults. Therefore, we need to create new treatments designed specifically for their unique biology.

Projects in Professor Jones's lab are supported by parents who have tragically lost children to high-grade gliomas, and are bringing together scientists and clinicians from across Europe to collect samples from as many rare glioma tumours as possible. Professor Jones and his team can study the genetic make-up of these tumours and help to identify new druggable targets. Professor Jones said: "It's crucial that we collaborate with other groups across the globe so that our collective progress can allow other families to avoid such a tragedy.

"But collaborations closer to home are equally important. Working at the ICR I am in close contact with drug discovery colleagues, clinicians at The Royal Marsden and experts in cancer imaging – it is especially important to develop new imaging techniques that show us how new treatments are working, as brain biopsies are not always possible. The ICR is one of the few places around the world where this multidisciplinary work can take place."

"Our understanding of childhood brain cancers is rapidly improving thanks to unique collaboration."

Name
Professor Chris Jones

Joined the ICR
May 2001

Specialist subject
Using cutting-edge technology to understand the genes which drive the development of childhood brain tumours – particularly high-grade glioma.

Greatest achievement
Discovery of mutations in the gene ACVR1, which unexpectedly links two terrible diseases – an incurable cancer of the brainstem called DIPG and the so-called 'stone man syndrome' where soft tissue turns to bone.

In his own words
"Our understanding of childhood brain cancers is rapidly improving thanks to a unique collaboration between scientists, clinicians, funding bodies and families around the world who are determined to defeat these diseases. I truly believe that we are on the cusp of real improvements in the survival of kids with brain cancer."

A new era in microscopy

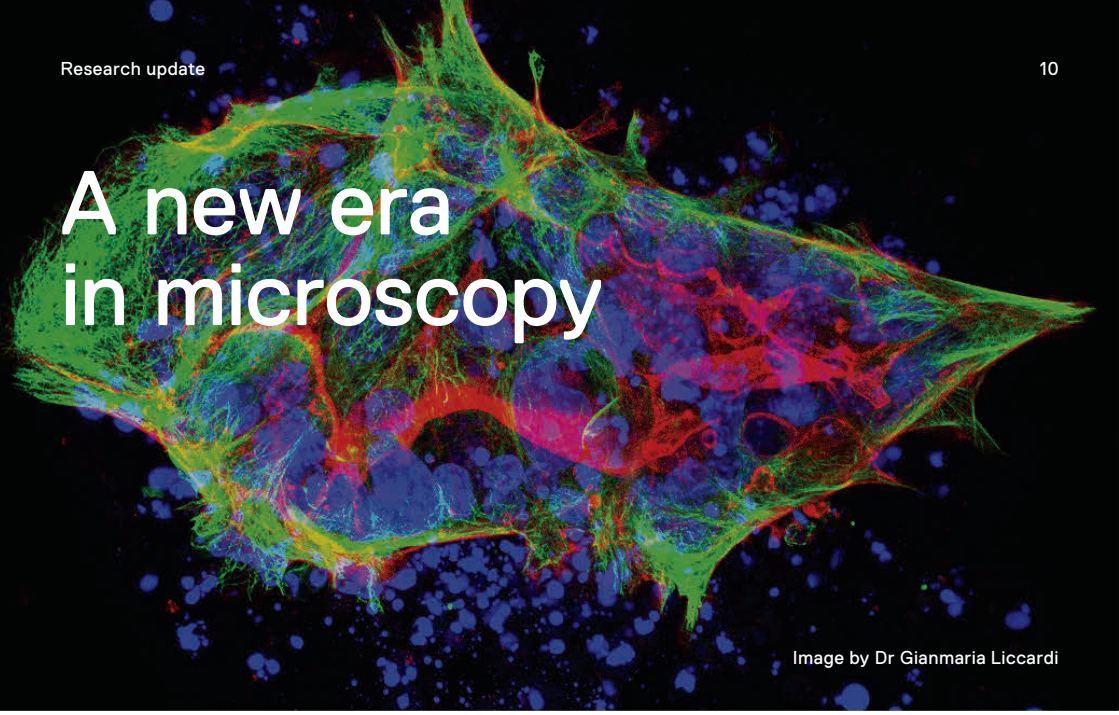


Image by Dr Gianmaria Liccardi

Professor Jonathon Pines, world-leading cell biologist, joins the ICR to target cancer cell division.

Cancer is caused when cells within the body accumulate genetic errors and start to grow in an uncontrolled manner. Understanding how cells divide, and what goes wrong in this process when cancer develops, is vital for the discovery of new targeted cancer treatments.

The ICR has a rich history of research into the biology of cancer, and we have made game-changing discoveries that revolutionised the way cancer is studied and treated. World-leading cell biologist Professor Jonathon Pines aims to build on these discoveries with the use of state-of-the-art microscopy to drive forward understanding of how cell division goes wrong in cancer, and open up new approaches to cancer treatment. As the new Head of our Division of Cancer Biology, Professor Pines is responsible for a wide programme of research into the fundamental biology of cancer.

Coming to us from the renowned Gurdon Institute in Cambridge, Professor Pines has already made many important discoveries in the field of mitosis – the process of cell division which goes awry in cancer. One of his most significant contributions was making the first link between proteins called cyclins (key regulators of mitosis) and cancer. This type of fundamental discovery is vital if we are to exploit cancer's weaknesses and find new therapies.

Speaking about his hopes and aspirations for his new role, Professor Pines said: "I am very excited about joining the ICR and becoming part of its incredibly successful model of scientific discovery and translation for patient benefit. Our knowledge of the mechanisms controlling mitosis has increased dramatically in the last five years and the wealth of expertise at the ICR in both drug discovery and patient-centred research means that we may be able to exploit our knowledge in exciting new ways."

As Head of Division, Professor Pines will also be looking to guide and develop our

up-and-coming cell biologists. He said: "I'm keen to mentor the next generation of cancer researchers, helping them develop the skills and expertise needed to make important discoveries in the future."

Under the microscope

Researchers working with Professor Pines in the Division of Cancer Biology are researching the inner workings of cancer cells, including how the mechanism that controls cell division is regulated. And they are using powerful microscopes to do it.

The challenges

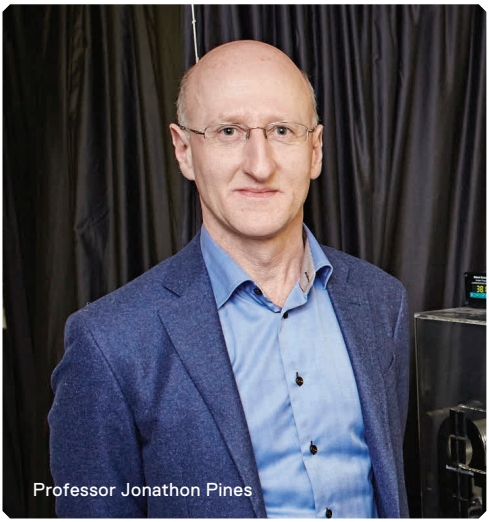
Traditional microscopy only allows researchers to view static cells. But with advances in microscopy, it is now possible to view live cells in real time and in 3D.

However, if scientists want to view the internal workings of a cell during complex processes like cell division for significant amounts of time, things get trickier. There are issues with glare emanating from around the area of focus and as living tissues are very sensitive to light, they will not behave normally if the light levels are too high. This, combined with the need to image processes within the cells more quickly and in ever greater detail, means that there is a real need for faster and more accurate microscopes that use less light.

A promising development

Recently a new type of microscope has been developed that promises to fulfil these requirements. Invented by the Nobel laureate Dr Eric Betzig, the lattice light sheet microscope uses Bessel beams – which don't behave in the same way as normal light – to allow scientists to watch the tiny proteins that move within a cell, see how they are activated, and test which drug molecules stop their activity. The new microscope will provide another dimension to our microscopy.

We hope that by observing what is happening within cancer cells in real time and in exquisite detail, we will be able to identify more and better targets for new therapies.


Professor Jonathon Pines

Bessel beams explained

Bessel beams are already used in science as optical tweezers – highly focused laser beams to provide an attractive or repulsive force – and are being studied for use as tractor beams, an invisible force used to move large objects seemingly without any effort.

In the lattice light sheet microscope, they are being used because they are so narrow they reveal details unseen using normal light, and can be swept across the cell sample, rapidly switching on and off to avoid damaging the cell.

Unravelling bowel cancer's genetic secrets

Understanding more about the genetics of bowel cancer is helping us to find novel ways to treat it.

Bowel cancer – also known as colorectal cancer – is the fourth most common cancer in the UK. Survival rates are improving and around 60% of men and women will now live beyond ten years following a diagnosis. Part of the reason for this improvement is that we now understand bowel cancer and its genetics much better, helping doctors to tailor the way they treat the cancer in each patient. Now, the ICR's research promises to deliver new advances against the disease.

Changing the way we look at bowel cancer

Bowel cancer isn't just one disease – each cancer is genetically different and so the outcome for patients varies. By analysing the world's largest set of data on bowel cancer, scientists at the ICR, alongside colleagues in the US and Europe, were able to classify tumours into four distinct groups.

Study co-leader Dr Anguraj Sadanandam, Team Leader in Precision Cancer Medicine at the ICR, explains: "Our study has identified four distinct types of bowel cancer, each with a definite set of genetic and biological characteristics, and some of which are more aggressive and more likely to be fatal than others."

The results showed that 87% of bowel cancers could be robustly assigned to one of the four 'consensus molecular subtypes' (or CMSs). Patients with one particular type of bowel tumour – CMS4 – were often diagnosed late, and had significantly worse survival rates than the other types. Patients with another type, CMS2, had much better survival rates even if the

"Knowing which cancer gene has caused bowel cancer isn't just important for researchers – it's crucial for the treatment, counselling and surveillance of patients and their relatives."

Professor Richard Houlston, Professor of Molecular and Population Genetics at the ICR.

cancer had returned.

Identifying tumours in each of these four categories could allow doctors to find patients at risk of developing more serious, fast-growing disease that requires more intensive treatment. In the future it could lead to different treatment strategies for each type of bowel cancer – and drive the design of drugs targeted for each type.

Genetic changes driving disease

Understanding the genetic changes that occur as bowel cancer cells evolve and spread is also key to defeating it. Sometimes, a cancer will respond initially to a particular drug, only later to become resistant. We now know that resistance occurs because cancer cells accumulate mutations which open up escape routes against treatment. The cancer effectively sidesteps treatment and continues to grow.

Dr Marco Gerlinger, a Team Leader in our Centre for Evolution and Cancer, is unravelling the genetic code of individual cancer cells to reveal a detailed picture of what happens to the DNA of a cancer patient's tumour when treatment stops working. With this knowledge he hopes it may be possible to develop new treatments to reverse or even prevent the development of drug resistance.

Dr Gerlinger is developing novel highly sensitive liquid biopsy techniques that can detect the development of drug resistance early. His aim is to use this technology to enable drugs to be switched in a way that assures patients always receive the most effective drug combinations. This could also prevent the treatment resistant cancer cells from taking hold.

The Gerlinger group is also working on innovative immunotherapy approaches aiming to target specific genetic defects in bowel cancers. He is hoping that this approach will increase the number of patients with bowel cancer who will benefit from the latest immunotherapy drugs.

In your genes

Some people are at an increased risk of developing bowel cancer because they possess specific changes to their DNA that are inherited from their parents.

Professor Richard Houlston's research is analysing genetic predisposition to bowel cancer. Genetic mutations that are associated with a high risk of developing this cancer have been known for some time, but these tend to be rare. Recently though, genetic factors that are associated with modest increases in risk have been discovered and, although the individual effect of these variants is small, they are often more common in the population.

By identifying genetic variation associated with cancer risk, Professor Houlston is enriching our understanding of who is at the highest risk of developing bowel cancer. He said: "Knowing which cancer gene has caused bowel cancer isn't just important for researchers – it's crucial for the treatment, counselling and surveillance of patients and their relatives."

Knowing which genes are linked to bowel cancer also increases our understanding of how the disease develops, and could help identify novel drug targets to aid the creation of new therapies.

It is important that we further our understanding of how bowel cancer develops in order to combat drug resistance and discover more effective treatments. The ICR's unique, multi-faceted approach to bowel cancer research allows our researchers to collaborate easily, share discoveries and ultimately defeat it sooner.

41,000 people in the UK are diagnosed with bowel cancer each year

Around 6 in 10 of those will be living with the disease beyond ten years

54% of bowel cancer cases in the UK are preventable

500

PhD applications received for just 16 places

Dr Chris Bakal with PhD student Chloe Simpson

Supporting the next generation of cancer researchers

Groundbreaking research requires outstanding researchers, and the ICR has an excellent track record in developing the very best young scientists who have gone on to make important discoveries in cancer research.

As long-standing supporters of the ICR, Lucy and Justin Bull established The Bull Studentship Award in 2014. The award meets the total cost of training a PhD student.

Lucy explains why they decided to support our work through the studentship: "We have always been impressed by the work that the ICR does. Their record of discoveries is outstanding and many of their researchers are world leaders in their fields. The more we found out about the ICR, the more we realised just what an important part PhD students play – they really are the bedrock of the ICR's research capacity as well as being future cancer research leaders in training.

"After some discussion within the family, we decided to set up the Bull Studentship Award and we were thrilled when Chloe Simpson, a talented Oxford graduate, became the recipient. Working in Dr Chris Bakal's team, Chloe is studying how melanoma cells spread to other parts of the body.

"We enjoy meeting with Chloe and hearing how her research with Dr Bakal is progressing and how her skills as a researcher are developing.

"With the support and guidance of Dr Bakal and other renowned faculty members, we're certain Chloe will become an excellent – and potentially groundbreaking – cancer researcher."

For her part, Chloe feels honoured to be chosen as the very first recipient of the Bull Studentship Award and told us:

"The ICR was my first choice when it came to my PhD because I'm interested in cellular biology and it was an exciting opportunity to work with world-class scientists such as Chris, my supervisor.

"As a PhD student you are exposed to lots of new techniques and there is pressure to publish your research, so you want to work hard and make interesting findings.

"The Bull family have shown a real interest in my stand-alone research. It's great to be able to show them the tangible outcomes I'm making as a result of their generosity."

If you would like to find out more about supporting a studentship and helping us to train the next generation of cancer researchers, please contact Dr Shira Schnitzer, Head of Major Gifts, on 020 7153 5298 or email shira.schnitzer@icr.ac.uk

£40,000

per annum to fund a student through their four-year PhD

Leading ICR scientists take up the challenge

One of our most renowned cancer scientists took on the Virgin Money London Marathon this April for Oracle Cancer Trust, in support of our research here at the ICR.

Professor Kevin Harrington, who is a world-leading scientist in radiotherapy, donned his running shoes for Oracle Cancer Trust – supporters of our research for a number of years.

Professor Harrington said: "My research into head and neck cancer has been funded by Oracle Cancer Trust for many years. Their dedication to my work is helping me develop new treatments for patients with cancer. I wanted to give something back."

Professor Harrington ran the Royal Parks Half Marathon in October 2015. But his approach to training is rather unconventional.

"I really dislike running," he explains. "So I only train on my bike. People kept telling me that it wouldn't work for the Marathon. But I

always give everything my best shot."

Professor Harrington isn't our only member of staff giving up his spare time in support of our research. Our colleagues across the ICR have put on their running shoes, jumped on their bikes and laced up their hiking boots to take part in everything from cycle rides to overseas treks.

Professor Janet Shipley, our Head of the Division of Molecular Pathology, and a team of seven of her colleagues, climbed Mount Snowdon last autumn to raise funds for our childhood cancer research.

The team were inspired to take on the challenge by the work of two charitable trusts – the Chris Lucas Trust and Rob's ARTTT. The trusts were both founded by families in memory of their sons who died of rare types of cancer. Both trusts are committed to finding a cure for cancer.

They are funding scientists in Professor Shipley's laboratory to develop better cancer treatments with fewer side-effects. The trusts have raised more than £1 million towards Professor Shipley's research.

Lara Jukes, Director of Development, said: "It is a real sign of our scientists' dedication and commitment that they are so keen to take part and raise funds."

If you would like to take on a challenge, please contact the Events Team on 020 7153 5307 or by email at sports@icr.ac.uk or visit icr.ac.uk/challenge

Clockwise from L-R; Professor Kevin Harrington running the 2015 Royal Parks Half Marathon; Amelia Sewell, Events Officer, at the 2015 RideLondon; Dr Fiona Hemsley, Director of Research Operations, after successfully completing the 2015 London Marathon; Professor Janet Shipley and her team climbing Mount Snowdon.

Focus on Wills

Mrs Mair Robinson's legacy to fund a studentship.

Research students play a vital role at the ICR, and thanks to a supporter's generous legacy, we can provide a student with the world-class support and training they need to become a first-class cancer researcher.

When Mrs Mair Robinson sadly passed away last year, she left the ICR more than £110,000 in her Will and requested that it be spent on a studentship – The Mair and Franklyn Robinson Research Scholarship.

Lara Jukes, Director of Development, said: "We are honoured that Mrs Robinson remembered us in her Will. The size of her gift allows us to fund a studentship over a number of years, affording another bright and talented student the opportunity to train alongside our distinguished cancer researchers."

Legacies are an exceptionally important source of funds for the ICR. Large legacies, often residuary gifts – a share of an estate once all other bequests and costs have been settled – allow us to plan for the future. By its very nature cancer research is a long-term endeavour – and we need to train the research leaders of the future now – so that's why gifts like Mrs Robinson's are so vital.

If you have any questions about leaving a legacy to the ICR, our legacy team are here to help.

You can contact them on
020 7153 5387 or
legacy@icr.ac.uk

Events calendar

Whether you like to run, cycle, trek, or simply enjoy festive carols, we have an event for you. By taking part this year, you'll be helping us make the discoveries that defeat cancer.

Run

Vitality British 10K London Run
10 July 2016

See some of London's best-known sights as you take on the world's greatest road race route.

Royal Parks Foundation Half Marathon
9 October 2016

One of our most popular events, this beautiful 13.1 mile route through four London parks is a must for every runner.

Cycle

London to Paris Cycle Ride
8 June 2016
20 July 2016
14 September 2016

Pedalling through picturesque countryside and Parisian streets, this is the perfect challenge for every cycling enthusiast.

Trek

TrekFest - The Beacons
4 & 5 June 2016
This challenging trek through the beautiful Brecon Beacons will test your limits and uncover hidden strengths.

TrekFest - The Peaks
3 & 4 September 2016

Set in the picturesque Peak District, this ultimate endurance challenge will prove to be a truly life-changing experience.

Social

Carols from Chelsea
6 December 2016

In Christopher Wren's beautiful chapel at the Royal Hospital, Chelsea, we invite you to join us for an evening of traditional Christmas carols, music and readings.

If you are already taking part in an event, get in touch and use your own place to raise funds for us.

See our website for our full events calendar icr.ac.uk/challenge, or contact the team on 020 7153 5307 or email sports@icr.ac.uk

www.icr.ac.uk