Over the past 50 years at the University of Dundee we have pioneered innovations as diverse as flat screen technology and minimally-invasive, or ‘keyhole’, surgery.

That spirit of innovation and impact continues. We are home to one of the United Kingdom’s largest life sciences research complexes and an internationally renowned medical school based within one of Europe’s largest teaching hospitals. The impact of our research is felt around the world.

Through our innovative Drug Discovery Unit – the only fully operational, fully integrated drug discovery group working across multiple diseases based within a UK university – we have made discoveries such as a compound with the potential to treat malaria in a single dose.

Our forensic scientists produce new technologies and techniques that are helping save lives and support the justice system, such as a new form of smoke alarm that is massively more efficient at waking up children than existing models, an innovation that can save the lives of thousands.

Our School of Medicine is one of the leading centres of medical education in the UK, while all the time producing research breakthroughs which improve our understanding, treatment and prevention of diseases such as cancer.

We are a partner of the CMS Collaboration at CERN, the European Organisation for Nuclear Research, the first Scottish university to join the collaboration and one of only a handful in the UK. Dundee’s involvement is based around our expertise in materials engineering, mechanical engineering, civil engineering, and computing, including the development of a new laser technique that can help raise the efficiency of the Large Hadron Collider at CERN.

Our forensic scientists produce new technologies and techniques that are helping save lives and support the justice system, such as a new form of smoke alarm that is massively more efficient at waking up children than existing models, an innovation that can save the lives of thousands.

We are a leading centre for the development of assistive technologies, bringing the benefits of the digital age to those people who suffer from the most severe communication disabilities.

Discover Dundee and find out how we are changing lives every day.
Dundee – a city of discovery, creativity and innovation

We are a research-intensive university, delivering excellence and impact that is changing and saving lives. We do this at the centre of the 'coolest little city in Britain', which has also been named in 2019 as one of the best places to live in the UK.

Those are the accolades recently directed towards Dundee. The opening of V&A Dundee, the first design museum in the UK outside of London, an idea sparked here at the University, and the £1 billion redevelopment of the central waterfront area, in the UK’s only UNESCO City of Design, have won the praise of Lonely Planet, Bloomberg, Vogue, GQ, the Wall Street Journal and National Geographic.

The Sunday Times named the city the ‘Best Place to Live in Scotland’ – and one of the best in the UK – in April 2019. We offer what is consistently rated one of the best student experiences in the UK. Seamus Heaney, the Nobel Prize-winning poet and honorary graduate of the University, described Dundee as ‘having its head in the clouds and its feet firmly on the ground’.

This is a place where exciting things are happening, a centre of creativity, a city of discovery, delivering innovation for societal good.

The University is at the heart of a city whose reputation is growing all the time.
What could be more powerful than giving someone a voice? Someone who from birth or as the result of an acquired disability has been left without the means to communicate. That is what lies at the heart of our work in Augmentative and Alternative Communication. AAC is a field of research dedicated to helping people with little or no functional speech to communicate. An estimated quarter of a million people in the UK alone are unable to speak and are at risk of isolation.

Dundee has been one of the pre-eminent centres internationally for research in this area over the past 30 years. Our researchers were present at the very first international meetings that established this field of research in the early 1980s. That was what first attracted Professor Annalu Waller, Chair of Human Communication Technologies, to come to Dundee.

“The reason I initially came to Dundee in 1984 to do my PhD was that the University was at the forefront of developing predictive communication aids for non-speaking people,” said Professor Waller.

“We have remained a world leader in this field, principally I think because we have always involved people who need to use these aids in the development of new tools. We are working with the most severely disabled people in society and giving them a voice in research.”

Key to the development of Dundee’s expertise was the realisation, first observed by the Dundee group, that individuals using AAC did not normally engage in personal narrative; they seldom told stories within conversations. The work of Professor Waller and colleagues in Dundee has not just given a voice to those with the most severe communication difficulties, it has allowed them to develop and share narratives, enjoy more natural conversations and even learn about the essence of communication using computer generated jokes. The difference to those people’s lives is immeasurable.

“This is a fundamental part of how we communicate with each other, not just as a series of statements but a rich narrative that intertwines stories, opinion, jokes and reaction to other people’s stories,” said Professor Waller.

“So we have given the ability to children to tell us how their day went at school and empowered all of our users to tell jokes and stories. That is a powerful ability to give someone.”

One of the keys to enabling that level of interaction through communication is to speed up communication rates. Many people with severe communication difficulties depend on Speech Generating Devices (SGDs) for independent communication. However, these can still prove too slow to provide a natural flow of conversation.

AAC is a field of research dedicated to helping people with little or no functional speech to communicate. An estimated quarter of a million people in the UK alone are unable to speak and are at risk of isolation.
Excellence in drug discovery

For some users who are unable to use a keyboard, rates are exceptionally slow. For example, Professor Stephen Hawking at one point doubled his spoken communication rate to only two words per minute by incorporating a more efficient word prediction system and common shortcuts into his communication software.

Rolf Black, a rehabilitation engineer and member of the AAC group at Dundee who has done extensive work in this area, said, “Despite three decades of developing Voice Output Communication Aids, face-to-face communication rates remain prohibitively slow. Compared to the average of 150–180 wpm for typical speech, aided communication rates make conversation almost impossible. It is immensely frustrating for both the user and the listener.

“We are working, with colleagues at the University of Cambridge, to improve that situation and give much better speed of conversation for people using SGDs. Compared to communication rates of 8–10 wpm, we are working with prototypes allowing nonspeaking individuals to reach more than 50 wpm with systems structured to support the pragmatic flow of conversation, which is a major, life-enhancing difference.”

The Dundee group have put people at the heart of their research, working closely with children, young people and adults with disabilities, involving service users in the research and development of innovative technologies.

“We are working with the most severely disabled people in society and giving them a voice in research,” said Professor Waller. “They are individuals who experience spoken and/or receptive communication difficulties due to congenital disabilities such as Cerebral Palsy, Autism Spectrum Condition, Developmental Delay, and Down’s Syndrome; acquired communication impairments, such as aphasia post-stroke or head injury; Locked-in-Syndrome and degenerative communication disorders, for example as a result of Parkinson’s Disease, Multiple Sclerosis, Motor Neurone Disease and Dementia.

In contrast to many other AAC research groups, which tend to have a clinical base, our work has also viewed AAC within the wider challenge of designing accessible technology to support social inclusion.

“Everyday technology such as tablets and mobile phones are now enabling us to do even more, but it is always about the people rather than the technology. Technology provides us with a platform, but we have to make sure that technology works for everyone and removes barriers rather than creating new ones.”

Dundee’s immense contribution to this field of research was recognised with the award in 2016 of an OBE to Professor Annalu Waller for services to people with complex communication needs. Professor Waller and colleagues are also engaged with organisations, universities and companies around the world, all aimed at giving more people a voice.
Our Drug Discovery Unit (DDU) is widely recognised as one of the world’s premier drug discovery centres of excellence. The DDU, based in the University’s School of Life Sciences was established to help address the unmet medical needs for infectious diseases of low and middle-income countries which kill millions of people every year and threaten almost half of the world’s population – the half that can least afford it.

For these diseases, there is a need for new, safe and efficacious medicines, not least to stay one step ahead of the rising tide of drug-resistance prevalent in diseases like tuberculosis (TB) and malaria.

Professor Sir Mike Ferguson, co-founder of the Drug Discovery Unit with Professor Alan Fairlamb, said, “When we decided to set up the Unit we were widely seen as going out on a limb in trying to establish a ‘biotech-style’ drug discovery capability within an academic setting. There was, frankly, quite a bit of scepticism but something innovative needed to be done if we were to be serious about tackling these diseases.”

Over the last 13 years the DDU has already made a significant contribution to treating these diseases, proving the vision was correct. Significant breakthroughs include the discovery of a novel anti-malarial compound now in clinical trials with Merck and Medicines for Malaria Venture (MMV) and a new potential treatment for leishmaniasis in trials with GSK and the Drugs for Neglected Diseases Initiative (DNDi).

Professor Ian Gilbert, Head of Chemistry, said, “There is a lot of excitement around our malaria candidate in that it has the potential to treat malaria patients in a single dose, including those with malaria parasites resistant to current medications.”

Based on Dundee’s success, in April 2017 the Wellcome Trust invested £13.6 million to create the Wellcome Centre for Anti-Infectives Research (WCAIR). WCAIR integrates expertise in parasitology, modern drug discovery methods and drug mode of action to create a continuum of innovation from discovery sciences to candidate drugs. WCAIR recognises that science needs to keep moving forward to be successful. It focuses on developing new innovative methodologies and technologies to improve drug discovery.

Professor Paul Wyatt, Head of the Drug Discovery Unit and WCAIR Director, said, “We anticipate that our research and development over the next decade will generate a legacy of new therapeutics, based upon improved drug discovery approaches that will impact patients and benefit the wider scientific and medical communities. The great thing about putting together all the technologies needed to make new medicines for tropical diseases is that the same expertise and infrastructure can also support the translation of innovative discovery science in areas closer to home, including inflammation, skin diseases, cancer and Alzheimer’s disease.”

Expertise from the biopharmaceutical industry combined with a powerful academic environment and outstanding facilities has created a unique environment for industry-ready drug discovery research.

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The DDU Innovative Targets Portfolio group does exactly that by collaborating with leading scientists from universities around the world to convert ideas for new therapies into medicine prototypes. These can then be partnered with the pharmaceutical industry or used as the basis of spin-out companies to take them closer to candidate medicines and clinical trials. Intellectual property licensed from Dundee is helping to support the development of both Scottish biotech such as Iommet Pharma (acquired by Merck in 2016) and international biotech such as Germany’s HepaRegenix GmbH, and Canadian-based Pacylex Inc and Corbin Therapeutics. Projects from this portfolio have also been partnered with GSK, Pfizer and AstraZeneca.

Two recent and notable successes are multi-year funded partnerships looking to develop effective medicines to treat neurodegenerative diseases. The first is a collaboration between the DDU, the Medical Research Centre Laboratory for Molecular Biology, the University of Cambridge and Japanese pharmaceutical giant Takeda to develop possible new therapeutic treatments for tau pathology, an underlying feature in several forms of neurodegeneration including Alzheimer’s disease. The second is looking to treat Parkinson’s Disease and involves the South Korean company Bukwang Pharmaceuticals and the University of Oxford.

The success of the Drug Discovery Unit is attributable not only to its people but to its core ethos of collaboration. The Unit forms collegiate and active partnerships with pharmaceutical and biotech companies, Product Development Partnerships (PDPs), academic groups and funding bodies – public, private and charitable.

Something very special is taking place in Dundee. A unique mix of a wide range of skills and expertise, from academia and industry, is making the translation of life sciences research into therapeutic applications efficient and successful.
Researchers at Dundee are helping take the Large Hadron Collider at CERN – the world’s largest science experiment – to a new level with pioneering laser technology.

Researchers at Dundee are helping take the Large Hadron Collider at CERN – the world’s largest science experiment – to a new level with pioneering laser technology.

It is the biggest science experiment in the world, looking to find the tiniest traces of particles that may explain how the universe is formed. The Large Hadron Collider (LHC) at CERN, the vast 27km particle accelerator that runs underneath the French-Swiss border, is the place where the existence of the Higgs boson particle was confirmed. It is also where, almost incidentally, the world wide web was invented.

There are further secrets that CERN hope the LHC can uncover, for example probing for evidence of the existence of dark matter, the elusive material that theoretically accounts for much of the matter of the universe. To be able to do that the LHC needs to be upgraded to allow scientists to smash together chains of protons at higher speeds and in greater quantities, creating more powerful collisions.

This is where Professor Amin Abdolvand and colleagues at the University of Dundee step in. They have developed new laser technology which solves one of the fundamental problems the LHC faces.

“This is a cloud of negative particles which can form in the vacuum of the LHC and affect the proton beam, basically acting as interference. They need to get those electrons out of the way at key points in the collider. This is very challenging but with the new techniques we have developed we have now tested and proved a method that can be used.”

This is LESS, or Laser Engineered Surface Structures. By using lasers, Professor Abdolvand and team are able to reformulate the surface of metals. In the laboratory this means they can perform neat tricks such as printing colourful designs on metal without using any inks or scratching the surface.

The process is based on understanding how different metal surfaces react when they are subjected to varying levels of laser intensity. In the context of the LHC it means using the lasers to design the surface of the metal tube to ensure it can capture electrons and take them out of the way of the proton beam. Under a microscope this design resembles the type of sound padding seen in music studios.

The technique has been successfully tested at CERN and will be deployed as part of the High Luminosity LHC upgrade to crank up the performance of the LHC in order to increase the potential for discoveries after 2025.
Fundamentally it is exciting to be part of research that is asking the questions of how the universe was formed and how it works. These are the biggest questions we have, and the answers when we find them may change our thinking completely.

While the laser technique has been proved to work, it still requires further ingenuity to see it fully deployed. Professor Abdolvand and colleagues at Dundee have had to build a robot that can fit inside the LHC’s particle accelerator tube and use the laser to remodel kilometres of the inner surface.

“One of the thrills of working with CERN and the LHC is that this is the very cutting edge of science and it requires new solutions and new techniques to make it work,” said Professor Abdolvand. “The invention of the world wide web is just one example of how pushing at the boundaries of science at CERN leads to other discoveries and developments.”

“We have had to find a solution to changing the inside of the LHC, it isn’t something you can pull apart and start again, we have to work against the limitations of the machine’s design. We have had to design small robots that can carry a laser and allow us to operate it with an extremely high level of precision. We have been able to do that but now we are looking at different and possibly even more effective ways we can deliver this system.”

“It is tremendously satisfying as a research team to be working on this. We are publishing research papers with CERN which does grab people’s attention a little more than normal. It has also been very encouraging to us as an engineering and physics group to be working with CERN. Many people’s first instinct when thinking about CERN is that it is a particle physics experiment so what you need are a lot of particle physicists. But around 75% of the people working on the project are engineers and they are among the very best in the world. To be in that company is very satisfying for us.

“Fundamentally it is also just exciting to be part of research that is asking the questions of how the universe was formed and how it works. These are the biggest questions we have, and the answers when we find them may change our thinking completely.”

Note: The LESS technology has been developed in collaboration with the Science and Technology Facilities Council.
The problem is that the science in the courts is not as scientifically robust, reliable and properly communicated as it needs to be. We want to change that. And that is what we are doing here in Dundee.

The £10 million Leverhulme Research Centre for Forensic Science has a central aim of ‘disrupting the forensic science ecosystem’ and ensuring it is fit for purpose for the 21st century.

Forensic science is facing something of a crisis. A recent report by the UK House of Lords Select Committee on Science and Technology was damning in its criticism of the field and listed a number of ‘embarrassing’ failings in its use within the criminal justice system.

The report is not the first to highlight concerns about forensic science as a discipline. Ten years ago the US National Academy of Science published a report which questioned the scientific robustness of evidence being put before the courts. These concerns were raised again in 2006 by the US President’s Council of Advisors on Science and Technology while back in the UK, the House of Commons Select Committee on Science and Technology has also raised the alarm.

For Professor Niamh Nic Daéid, an internationally acclaimed Forensic Chemist who specialises in fire investigation, drug chemistry, explosives and fingerprint enhancement, the criticism comes as no surprise and indeed, reflects a degree of frustration at the way forensic science has developed. It has also provided the driving force for change and acted as a catalyst in the creation of the research centre she now leads and the work it carries out.

“The problem is that the science in the courts is not as scientifically robust, reliable and properly communicated as it needs to be,” she explains. “We want to change that. And that is what we are doing here in Dundee.”

Following the 2009 US report, Professor Nic Daéid and Professor Dame Sue Black, formerly at Dundee and now Pro-Vice Chancellor for Engagement at the University of Lancaster, organised a ground-breaking event at the Royal Society in London bringing together senior judges and leading figures in science and forensic science.

A collaborative approach, they believed, was key to addressing the challenges facing the discipline. It was this belief in interdisciplinary working that led to the establishment of the Leverhulme Research Centre for Forensic Science, a £10 million, 10 year initiative providing a ‘transformative’ space where thinking outside the box is positively encouraged.

In this respect Dundee is ahead of the curve. One of the main recommendations of the House of Lords Select Committee is the adoption of just such a collaborative, interdisciplinary approach.

“The report urges a new way forward for research in forensic science that embraces an interdisciplinary approach and brings all parts of the community together to discuss, co-create and prioritise research questions,’” says Professor Nic Daéid, who has acted as an expert witness in a number of high profile court cases including the Grenfell Inquiry.

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“This is what we are already doing. We bring scientists, the judiciary, police and forensic practitioners together with others from outside of science to create bright spots of activity and develop innovative ways of looking at the challenges facing forensic evidence.

“Conversations between judges and forensic scientists have not happened before in this way. There has always been a separation between the different communities and cultures across the justice space and we have to change that because we have to be able to understand each other’s needs and communicate effectively together.”

The invitation to collaborate has been well-received. The most senior judicial figures in the UK, including the Lord President of Scotland and the Lord Chief Justice of England and Wales and Northern Ireland, have engaged with the discussions co-ordinated by Professor Nic Daéid and her team.

She added that the strategic conversations conducted in these sessions at the LRCFS in Dundee have already begun to articulate the research needs of the community around DNA, digital evidence, artificial intelligence and machine learning for pattern recognition in forensic evidence, transfer – how things move from one surface to another – and persistence – how long things stay on the surface they have moved to.

“We are laying the groundwork for ‘ground truth’ databases which will allow us to detect and recognise different materials using the analytical equipment available to us and calculate error rates for doing so. To know what is unusual about a sample or within a crime scene we have to know what is ‘normal’ so these databases allow researchers to test and validate current and emergent technologies or algorithmic models by generating data using controlled experiments.”

Three years into the project, Professor Nic Daéid is acutely aware of making the best use of time.

“We have unprecedented support from our forensic practitioner communities, from scientists outside of forensic science, and from inventors, entrepreneurs, school teachers, educators, science centres, national scientific academies, crime writers, film makers, science communicators, policy makers and members of the public. It is time to do things differently and to work together collectively, to be bold and to be brave and to seize the opportunity to change.”

Oral health – promoting inclusion and social justice
Comics at Dundee

Dundee is one of the great powerhouses of comics production, not just in the UK, but internationally. Publisher DC Thomson sits at the heart of the city and publishes The Beano, the world’s longest running weekly comic (1938 to present).

The University of Dundee is now an established part of that impressive history, with the world’s first Masters in Comics Studies (launched in 2011), a range of innovative undergraduate comics modules, and the world’s first Professor of Comics Studies (Professor Chris Murray).

As part of a mission to develop the creative economies in the city, the University, through the Scottish Centre of Comics Studies (SCCS), runs a comics imprint, UniVerse, run by Phillip Vaughan, which publishes student work and comics that emerge from collaborative research projects. SCCS also runs Dundee Comics Creative Space (DCCS), coordinated by Dr Damon Herd, which houses Ink Pot Studio.

The comics team specialises in interdisciplinary research work, such as recently funded research on comics and bereavement (awarded to Dr Golnar Nabizadeh), and research into comics visual language, measured using eye-tracking software (Murray and Vaughan).

The comics research environment is greatly enhanced by a large cohort of Arts and Humanities Research Council funded comics PhD students.

Comics graduates have been launched into successful careers as researchers, editors, and comics creators, some of them working for major publishers such as Marvel, DC Comics, Image, DC Thomson and Rebellion.

The University has also been a leader in using comics as a method of communicating serious messages, with publications illustrating issues as diverse as fibromyalgia, organ donation, heart disease, tropical diseases, and coeliac disease.

In telling the story of research into oral health and inclusion, where we are working with prisoners and homeless people, a comic strip is an innovative and eye-catching way of presenting a sensitive and important subject.

For more on our comics work see: dundee.ac.uk/english/comics

Parkinson’s Disease – a new approach
I had a problem I wanted to solve and Dundee was the only place I could solve it. I was told that the PINK1 problem was too hard, that it was too difficult to solve. But Dundee provided an environment where I could focus.

The problems facing researchers tasked with understanding the mechanisms involved in the development of Parkinson’s Disease are stark. More than 200 years have passed since the disabling neurodegenerative disease was first identified and still there is no cure and no way of slowing its progress.

Professor Miratul Muqit, a researcher at the University of Dundee’s School of Life Sciences and a consultant neurologist, describes the scale of the difficulty by noting that the only treatments he can offer his patients are the same ones that were being prescribed by doctors before he was born.

This is something he and colleagues Professor Dario Alessi, Director of the Medical Research Council Protein Phosphorylation and Ubiquitylation Unit (MRC PPU) and Dr Esther Sammler, consultant neurologist and Principal Investigator at the Unit, are doggedly working to change.

“We want to find better treatments for patients,” comments Professor Muqit, “And we want to be able to find new ways of refining the process and making diagnosis more timely. The way we diagnose Parkinson’s Disease is the same as it was 100 years ago.”

He and his colleagues have already made progress. Professor Muqit was part of the team that identified and characterised the first mutations of the PINK1 gene in families with early onset Parkinson’s Disease. He has continued to focus his efforts on PINK1 with the goal of developing new therapies for patients.

Recent successes have included finding the PINK1 protein substrates parkin and ubiquitin, discovering that parkin and ubiquitin form a complex to cope with mitochondrial damage, solving the atomic structure of PINK1 with Prof Daan van Aalten, and confirming the central importance of the PINK1-parkin switch mechanism in Parkinson’s patients.

Meanwhile Professor Alessi has directed his attention to LRRK2, an important target enzyme that is activated in Parkinson’s. He co-ordinated a major multi-disciplinary international collaboration to identify the physiological endogenous substrates of LRRK2. This resulted in the discovery that LRRK2 directly phosphorylated a subset of the Rab GTPases, a class of protein, including Rab8, Rab10 and Rab12.

In 2016 Professor Alessi’s lab developed new methods to assess LRRK2 phosphorylation of endogenous Rab isoforms that enables the activity of endogenous LRRK2 to be monitored. So far more than 14 Rab proteins have been identified as substrates for LRRK2. This work has also allowed Professor Alessi and Dr Sammler to develop assays and reagents for measuring LRRK2 activity and they are now working on developing new therapeutics targeting the enzyme to treat the disease.

For Professor Muqit, who developed his interest in PINK1 while based at the National Hospital for Neurology and Neurosurgery in London, moving north to Dundee was vital to his ambitions of finding solutions to the Parkinson’s treatment problem although he acknowledges his decision was greeted with surprise by some of his colleagues.

“When I told them I was moving to Dundee they thought I was crazy,” he laughs. “Once you are in London it is easy to get comfortable in that environment and stay there. There is a career path where you become a clinical expert, work in the NHS and maybe in private practice. There is the opportunity for research but it is a different kind of research.

“The expertise in the National Hospital in Neurology is mainly clinical. I needed to come to an environment where the expertise is at the molecular level and where there is research into proteins and I am very lucky to have that in Dundee.

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“I had a problem I wanted to solve and Dundee was the only place I could solve it. I was told that the PINK1 problem was too hard, that it was too difficult to solve. There have been plenty of good people who have given up on PINK1. But Dundee provided an environment where I could focus.

“The advances we have made could only have been done here and there are more discoveries to be made. Understanding how PINK1 enzymes function will provide new therapies for PD patients. Many companies are now developing drugs that can activate parkin and there is also work being done on PINK1.

A supportive environment and a belief and trust in the work being carried out by research teams have also been key factors in the progress made in the field by Professor Alessi, whose work on protein kinases has won him a host of prestigious scientific awards including the Colworth Medal and the EMBO Gold medal as well as making him one of the world’s most cited biochemists.

He decided to switch the focus of his research from diabetes, cancer and high blood pressure to Parkinson’s Disease after the 2004 discovery by Gasser and Singleton that protein kinases, and LRRK2 specifically, were mutated in some cases of the condition.

“Until then no one had considered that protein kinases were implicated in Parkinsons,” explains Professor Alessi. “We recognised that what was needed was to roll up our sleeves and look at this at the molecular level. We know how to study kinases here.

“That’s what we do. We had one question which was to find out what proteins LRRK2 targets.” Finding an answer proved a long, frustrating but ultimately successful journey resulting in the discovery of Rab isoforms.

“It took far longer than we anticipated. A total of 12 years from 2004 to 2016. We tried everything we had ever tried before and it did not work. It was the hardest problem I had ever worked on.

“There was always the chance funders would pull out. We had to work very hard to persuade funders to believe in us. It was very, very difficult.”

Professor Alessi added that there was more to his motivation than simply solving a scientific puzzle.

“There are many, many people with Parkinson’s Disease. It is the second most common neurodegenerative condition with millions affected worldwide. As the years went by it took on added urgency. We had to keep going but it was very, very painstaking work. We threw the kitchen sink at it. And when we discovered Rabs we didn’t celebrate. We just moved straight on to the next problem.

“We have a lot of patient contact and it is meeting the patients that keeps us going. They are very inspirational. That is what drives us. We put our heart and soul into it.”

We want to find better treatments for patients. We want to be able to find new ways of refining the process and making diagnosis more timely.

School of Life Sciences, University of Dundee
The importance of cancer prevention became clear to Professor Bob Steele, Director of the Scottish Colorectal Cancer Screening Programme and Chair of the UK National Screening Committee, through his work as a colorectal surgeon. As a senior registrar in Aberdeen many of the patients he operated on already had an advanced stage of the disease and there was little he could do to save them.

A move south to Nottingham where one of the first bowel screening trials was taking place in 1990 highlighted how well patients could do if their cancer was detected at an earlier stage. It became more curable and more survivable. It was, he says, “highly motivating for a surgeon to see a public health intervention having such an effect.”

Since then Professor Steele has coordinated the roll out of a national screening service for bowel cancer first in Scotland and then throughout the UK. It is estimated the screening programmes have saved around 2000 lives a year in the UK.

However, the fact that so many people being screened already had the disease raised another question.

“I was seeing an endless stream of people with bowel cancer,” he says. “And yes, screening meant that many of them had early disease which could be cured by surgery but it made me think. Wouldn’t it be better to prevent it in the first place?”

The award-winning Scottish Cancer Prevention Network, co-founded by Professor Annie Anderson and Professor Bob Steele, is built on decades of clinical experience and research in cancer care and facilitating healthier lifestyle choices.

Professor Annie Anderson, a dietitian who holds a chair in Public Health Nutrition within the School of Medicine, has devoted much of her career to understanding the factors that influence lifestyle change, and is a passionate advocate for cancer prevention.

Together she and Professor Steele pooled their expertise and established the Scottish Cancer Prevention Network, which is run from the University’s Centre for Research into Cancer Prevention and Screening, and is dedicated to disseminating information about cancer prevention to individuals, health professionals, policy makers and government.

They provide advice on how to stack the odds against developing cancer and encourage policy makers to build legislative and environmental structures to enable change rather than inhibit it.

“We wondered could we put prevention work and screening together,” explains Professor Anderson. “I’m a nutritionist and I could see that the evidence for lifestyle factors on cancer was very strong. Up to 50% of cancers could be prevented through lifestyle factors. The problem is how do we raise awareness of this and help people engage with that information.

“We are always looking for that teachable moment when someone is more likely to take the information on board. We see lots of people coming for screening and it seemed to make sense to try to reach out to them there.”

Policy makers often don’t recognise the significance of the research being presented to them. We have direct access to governance groups and we are able to feed research directly into these groups which means research results can be put into practice much more rapidly.
Together they launched the BeWEL study where patients, discovered through bowel screening to have pre-cancerous lesions, were offered weight loss and physical activity support. The study demonstrated an increase in awareness of risk factors as a result of participation. The Scottish Government is now funding a feasibility study in Tayside and Clydeside to see if the programme can be rolled out.

Other programmes have followed. ActWELL provides life coaching sessions to women attending for breast cancer screening. Also funded by the Scottish Government, the study has enlisted the help of more than 500 women to date and seeks to reduce their risk of developing breast cancer by helping them make sustainable lifestyle changes.

“We’re looking for interventions that will appeal to people,” explains Professor Anderson. “It is about trying to tip the balance. Behaviour change takes time. If you look at smoking it took a generation to change minds and behaviours. And it has to come from people. When they start making little changes and demanding alternatives then politicians and local authorities take notice."

What we have here is a unique approach. It is very collaborative and very interdisciplinary. We are bringing preventative public health measures and cancer screening together."

Professor Steele believes the collaborative nature of their work has direct benefits for patients. "We are feeding directly into public health interventions," he believes. "Policy makers often don’t recognise the significance of the research being presented to them or there may be delays in bringing research to their attention."

“Exercise regularly helps lower the chances of getting cancer."

What we have here is a unique approach. It is very collaborative and very interdisciplinary. We are bringing preventative public health measures and cancer screening together.

“We have direct access to governance groups and we are able to feed research directly into these groups which means research results can be put into practice much more rapidly.”

He cites the recent introduction of a new Faecal Immunochemical Test (FIT) kit for bowel screening introduced in Scotland in 2017.

“We knew the original test, the gFOBT test, had limitations. It required three samples, it didn’t find all cancers and there was a false positive rate. It also didn’t have as high a take up rate as we would have liked so we used that information and set about introducing a new kit.”

As a result the new FIT kit, which requires only one sample from patients, was developed and introduced, sparking an increase in take-up by 50%. It also picks up more cancers and has fewer false positive results.

“The reason we can make changes like this so quickly is because the system is joined up,” he explains. “We have a very clear route to translation and putting things into practice.”
Cybersecurity isn’t just about high-tech computer solutions. Understanding how people behave online is just as important – without people we wouldn’t have cybersecurity issues.

We are constantly being made aware of the benefits of an increasingly connected world, where we can get health advice through online forums, invest money through FinTech vehicles such as crowdfunding, find a new partner through online dating, and tell our friends in another country how many steps it took to walk home and how quickly we did it.

Technology such as this is bringing society many benefits, but it also presents us with some significant issues to address. How in this ocean of data do we retain our privacy and security? How much can people find out about us from the trail of data we create and then leave behind? And what happens to all of that data in the event of a tragic incident?

Professor Wendy Moncur is Interdisciplinary Chair of Digital Living, a position which spans our School of Art and Design and our School of Nursing and Health Sciences. Her work is looking at these big cybersecurity issues, engaging with individuals and major institutions including big tech companies and governments.

“The work we are doing is unique,” said Professor Moncur. “Cybersecurity isn’t just about high-tech computer solutions. Understanding how people behave online is just as important – without people we wouldn’t have cybersecurity issues. The knowledge that we develop is used to build new digital tools that enable people to manage their online identities in such a way as to stay safe online, to make informed decisions on who to trust, and to choose what to reveal about themselves.”

Professor Moncur continued, “Our recent work, Keeping Secrets Online, focused on strategies used online when people are highly motivated to conceal their activities. We examined strategies used in the purchase and supply of illegal drugs - which are enabled by secret online channels and cryptocurrencies like BitCoin - facilitation of infidelity, and escape from intimate partner violence. The strategies uncovered were shared as a set of transferable skills with UK security agencies, to enable staff to keep themselves safe online whilst they work to protect the UK.”
Professor Moncur leads the Living Digital Group whose work extends beyond how people behave online, to consider the consequences of the rising tide of data we all produce.

An important question for everyone who has a presence online is what will happen to their data when they die. As Professor Moncur explains, “People often don’t realise the value that is buried in their data. This might be emotional value – such as precious memories and photos posted on Facebook – or perhaps an eBay trading account that has both financial and reputational value. Practical information such as contact details for all your friends might be held on a password-protected account. But this data can’t easily be bequeathed in a will. The law is not set up to cater for passing data on when we die. We work with charities such as Marie Curie to give people strategies for how to pass on their data to loved ones. We also provide input to Facebook on designing their systems to cater for end of life.”

It’s not just the final ending that is a focus for the Living Digital Group. They have also explored romantic breakup in a digital age.

“Online services and apps are set up for beginnings, and for the status quo,” said Professor Moncur. “They are not set up for endings. Whilst death presents many challenges, romantic breakup can also cause problems. After a breakup, it can be distressing to receive inappropriate reminders of happier times via social media ‘push’ messages, and difficult to control. Further, couples tend to share online services, even when the account is in just one person’s name. Failing to change your Amazon account password post-breakup leaves you exposed to your ex going on a surprise shopping spree in your name. Losing access to the Netflix account could have you at a loss as to what episode of your favourite TV series you were watching. We have delivered new ways to design social media applications, to reduce these problems.”

International coverage of the Group’s work on romantic breakup has been featured in publications as diverse as the Daily Mail and Diva!, Europe’s most popular lesbian and bisexual magazine. “We are always careful to design our research to embrace a wide range of human experiences and perspectives. We were particularly pleased to see this reflected in the diversity of publications that report on our research.”

This inclusive approach is also reflected in the make up of the team. Professor Moncur explains, “To understand how people behave online, and to design digital services to fit them, we need a range of skills that include human computer interaction, psychology, sociology and design. Computer science alone is not enough. An interdisciplinary approach is essential. The membership of the team, and our collaborations with academic, industry and government partners reflect that.”
Professor Abdulovand is Associate Dean (Research) in our School of Science and Engineering and also leads the Materials Science & Engineering Research Cluster. An applied physicist, he is a Fellow of the Institute of Physics (IoP) and senior member of the Optical Society (OSA). His research interests are in the fabrication and functionalisation of nanocomposites and high precision laser materials engineering.

Professor Dario Alessi is Director of the Medical Research Council Protein Phosphorylation and Ubiquitylation Unit and the Division of Signal Transduction Therapy Unit (DSTT) in our School of Life Sciences. He has received many awards and honours, including the Colworth Medal in 1999 (Biochemical Society), membership of EMBO (2000), the EMBO Gold Medal (2005), Fellowship of the Royal Society of Edinburgh (2002), the Royal Society of London (2006) and the Medical Academy of Science (2011).

Professor Gilbert is Head of Chemistry in our School of Drug Discovery and also leads the Materials Science & Engineering Research Cluster. An applied physicist, he is a Fellow of the Institute of Physics (IoP) and senior member of the Optical Society (OSA). His research interests are in the fabrication and functionalisation of nanocomposites and high precision laser materials engineering.

Professor Ian Gilbert is Professor of Medicinal Chemistry and head of division of Biocatalysis, Biotechnology and Drug Discovery, School of Life Sciences. Professor Gilbert is Head of Chemistry in our Drug Discovery Unit, which he helped set up. As a medicinal chemist, Ian's research interests are primarily in the design and synthesis of potential drugs with a particular focus on infectious diseases such as malaria and visceral leishmaniasis that affect low and middle-income countries, novel approaches to and paradigms for drug discovery, and studies to understand the mechanisms by which compounds are biologically active, work.

ProfessorIROCHKERZAKEMATERIALSANDPHOTONICS, SCHOOLOFSCIENCEANDENGINEERING

Professor Waller has worked in the field of Augmentative and Alternative Communication (AAC) since 1989, designing communication systems for and with non-speaking individuals. Her primary research area is human computer interaction, natural language processing, personal narrative and assistive technology. She is on the editorial boards of several academic journals and sits on the boards of a number of national and international organisations representing disabled people.

Professor Mironut is Programme Leader in the Medical Research Council Protein Phosphorylation and Ubiquitylation Unit in our School of Life Sciences and an honorary Consultant Neurologist at Ninewells Hospital. He has won a number of awards including the European Molecular Biology Organization Young Investigator Programme award, the Francis Crick Medal and Lecture by the Royal Society, the 2018 Graham Bull Prize in Clinical Science and the Goulstonian Lecture of the Royal College of Physicians.

Professor Ricci is Professor of Forensic Science, School of Science and Engineering (Computing) Rolf is a member of the Augmentative and Alternative Communication (AAC) Research Group at the University and holds an honorary contract with NHS Tayside as a researcher. He has a professional background as a rehabilitation engineer and extensive experience of working with individuals who have complex disabilities.

Professor Annie Anderson is Professor of Public Health Nutrition, School of Medicine. Professor Anderson is a Public Health Nutritionist and dietician. She is co-director of the Scottish Cancer Prevention Network, President of the UK Society for Behavioural Medicine (UKSBM) and Fellow of the Royal College of Physicians (Edinburgh). Her research interests lie in understanding factors that influence lifestyle change: principally diet and obesity and the impact of theory based, behaviourally focused dietary interventions in relation to cancer and other chronic disease risk reduction.

Professor Ruth Freeman leads the interdisciplinary Living Digital Group. Professor Freeman is Director of the Oral Health and Health Research Programme and is Co-Director of the Dental Health Services Research Unit in our School of Dentistry. She is also an Honorary Consultant in Dental Public Health in the Public Health (Dental) Section of the British Psychological Society. She holds a post in the Public Health (Dental) Section of the British Psychological Society and is a member of the Oral Health Research Unit, a Centre of Excellence in Dental Public Health Research, in our School of Life Sciences.

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Professor Moncur is Director of the Medical Research Council Protein Phosphorylation and Ubiquitylation Unit and the Division of Signal Transduction Therapy Unit (DSTT) in our School of Life Sciences. He has received many awards and honours, including the Colworth Medal in 1999 (Biochemical Society), membership of EMBO (2000), the EMBO Gold Medal (2005), Fellowship of the Royal Society of Edinburgh (2002), the Royal Society of London (2006) and the Medical Academy of Science (2011).

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Professor Paul Wyatt is a medicinal chemist with extensive drug discovery expertise developed over 35 years of delivering multiple candidate drugs. His role is to develop translational research by bringing together his and others’ experience of drug discovery in the Pharma/Biotech sector with academic life sciences research to identify and de-risk novel targets for drug discovery, and develop new treatments for diseases including tuberculosis and cancer.
University of Dundee: making an impact, building connections

Collaborations

We have over 100 current industry collaborations, and have partnerships with institutions around the world. When we share knowledge and ideas, the impact of our research becomes stronger.

Our industry collaboration portfolio includes:

- UNESCO (The United Nations Educational, Scientific and Cultural Organization)
- UNHRC (The United Nations Human Rights Council)
- The World Bank
- The World Trade Organisation
- The World Health Organisation
- CERN
- GlaxoSmithKline
- Mozilla Foundation
- Boehringer Ingelheim
- Janssen
- AstraZeneca
- Merck
- Pfizer
- Storz
- Medtronic

TIMES HIGHER EDUCATION 2019 RANKS US AS ONE OF THE TOP 20 in the world in University Impact Rankings

Measured against contribution to delivery of the United Nations Sustainable Development Goals.

THE LAST RESEARCH EXCELLENCE FRAMEWORK RANKS US NO.1 in the United Kingdom for biological sciences

76% of our research rated as ‘world leading’ or ‘internationally renowned’.

THE 2019 CWTS LEIDEN RANKINGS PLACE US GLOBALLY 15TH for the highest proportion of highly cited publications

Just behind Oxford and Cambridge and the highest placed university in Scotland in this important marker of research quality.

THE COMPLETE UNIVERSITY GUIDE 2020 RANKS US NO.1 in the United Kingdom for forensic science

THE NATURE INDEX 2019 PLACES US IN THE WORLD’S №1 in biological sciences

TIMES HIGHER EDUCATION 2019 RANKS US AS ONE OF THE TOP 100 in their normalised ranking

This takes an institution’s size into account when calculating the output of high-quality research.

THE HIGHER EDUCATION STATISTICS AGENCY RANKS US 3RD in the United Kingdom for research intensity

76% of our research rated as ‘world leading’ or ‘internationally renowned’. 15TH for the highest proportion of highly cited publications Just behind Oxford and Cambridge and the highest placed university in Scotland in this important marker of research quality.

NO.1 in the United Kingdom for forensic science

 №1 in biological sciences