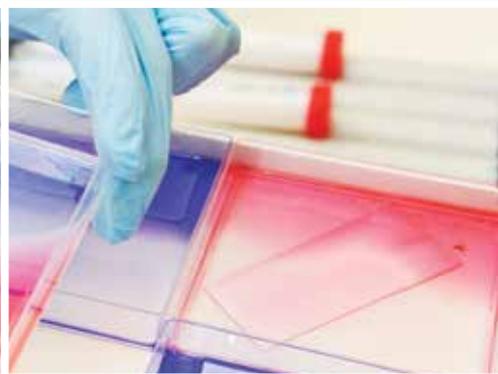
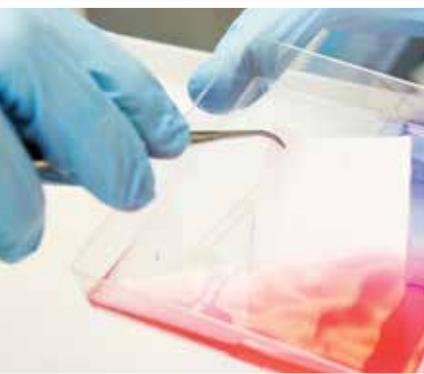


**CCRCB**  
Centre for  
Cancer Research  
& Cell Biology



# ANNUAL REPORT 2012 - 2013

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*We are exceptional!*



 Queen's University  
Belfast



# CONTENTS

<b>Director's Introduction</b>	4	<b>Education and Training</b>	25
Overview of Centre Strategy	5	Post Doctoral Programme	26
Launch of New Programmes	6	Seminar Programme	28
Centre Life	8	Postgraduate Programme	30
Research Awards	9	Clinical Academic Training Programme	33
		Undergraduate Programme	34
<b>Focus Groups</b>	11	<b>Public Engagement Activities</b>	35
Advanced Radiotherapy	12		
Breast	13	<b>Staff Listing</b>	38
Gastro-Intestinal	14	New Appointments	39
Genito-Urinary/Prostate	15	Current Staff	44
Haematological Malignancies	16	Obituary	47
Ovarian	17		
<b>Enabling Technologies</b>	18	<b>Major Sources of Funding</b>	48
Bioinformatics and Imaging	19	Funding Bodies	49
Drug Discovery	20	Research Grants Awarded	50
Molecular Pathology and Biobanking	22		
Northern Ireland Cancer Trials Centre	24	<b>Publications</b>	53
		<b>Acknowledgements</b>	62



# DIRECTOR'S INTRODUCTION

DAVID WAUGH, Director

**The Centre for Cancer Research and Cell Biology (CCRCB) forms the hub of the Belfast Cancer Research UK (CRUK) Centre and the Belfast Experimental Cancer Medicine Centre (ECMC).** Our integrated clinical and basic scientific research programmes address clinically unmet needs. Our knowledge is being applied through innovative clinical trials in order to underpin improved patient outcomes in high incidence solid tumours of Gastro-intestinal, Prostatic, Breast and Ovarian origin and adult Haematological Malignancies. Our unifying research theme is to develop translational outputs, i.e. biomarkers and/or novel therapeutic strategies that enable our Centre to be at the forefront of personalized cancer medicine in these prevalent diseases.

This report covering August 2012-December 2013 will update readers of the major events in which CCRCB has been engaged and seek to capture the dynamic nature of the research environment within CCRCB and pay testimony to the significant accomplishments of our scientists and clinicians during 2012 and 2013. We hope that reading this brochure will inspire you and your organization to support and/or partner with our teams to achieve our mission on behalf of cancer patients here in Belfast and across the world.



## Overview of Centre Strategy

After five years at the helm of CCRCB, Professor Dennis McCance stood down as Centre Director at the end of July 2012. During his tenure, the Centre launched several major research initiatives, was awarded CRUK Centre status, and was awarded Her Majesty's Jubilee Anniversary Prize in 2012. As his successor, I would like to take this opportunity to pay tribute to Dennis for his leadership and for laying the foundations that are now enabling the next phase of growth by the Centre.

The Centre's research strategy has been shaped to accelerate the translation of pre-clinical scientific discovery to clinical application. Investigators operating in multi-disciplinary teams through our disease-focus groups are driving important pre-clinical discovery. Our partnerships with Biotech and Industrial partners, drawn from within and outwith Northern Ireland, are bridging the innovation gap and informing the product development process and its subsequent clinical application. Through the expertise and capacity of the Northern Ireland Clinical Trials Centre, our Centre is now able to point to a substantive and exciting innovative early phase programme, populated by biomarker-enabled patient enrichment and biologically-informed trial design.

The Centre has dedicated and talented individuals within the Senior Management Team. Professor Kevin Prise and Professor Manuel Salto-Tellez have provided invaluable support as Deputy Directors of the Centre, while Professor Richard Kennedy and Dr Richard Wilson have re-focused our clinical trials and translational research programmes. In Professor Paul Harkin and Professor Tim Harrison, the Centre has a wealth of academic and commercial expertise focused on biomarker discovery and cancer therapeutic development, enabling scientific strategy to also consider the pathway by which our science can lead to patient impact. Finally, three industrious Associate Directors in Professor Ken Mills, Dr Karen McCloskey and Dr Dan Longley have worked to expand our training and education programmes at the undergraduate, postgraduate and post-doctoral levels. At the beginning of the 2013/2014 academic year, it was heartening to have a new intake of 40 undergraduate scientists and 24 postgraduate scientists and clinical fellows join the existing 200 research staff in the CCRCB laboratories. One exciting new initiative has been the leadership of the Centre in creating two new Masters Degree programmes offered by the School, one focusing on Translational Medicine and the second on Computational Biology, which are being led by Professor Dennis McCance and Dr Frank Emmert-Streib, respectively. In addition, Dr Emmert-Streib ran the Fourth International Conference in Quantitative Biology & Bioinformatics in Modern Medicine in September 2013, alongside the latest instalment of his successful Summer School in Computational Biology.



## Launch of New Programmes

In January 2013, the NI Minister for Health Mr Edwin Poots officially opened the NI Molecular Pathology Laboratory and the NI Biobank, led by Professor Manuel Salto-Tellez and Dr Jackie James, respectively. This state-of-the-art facility is a joint initiative of Queen's University and the Belfast Health and Social Care Trust and is revolutionizing the provision of molecular diagnostics for cancer patients in Belfast and Northern Ireland. In addition, this facility is providing access for researchers to pathologically and clinically-annotated material and the opportunity to use high-throughput platforms to link the genetic basis of disease to clinical outcome. The facility is home to Trust and University staff, and importantly is providing core training to the next generation of pathologists, cancer researchers and biomedical scientists. The undoubted success of this initiative, underpinned by the dedication of our research nurses and data managers, is creating the solid foundation to support the major disease focused research programmes ongoing within the Centre, while providing an attractive proposition to attract inward investment from external partners. The support of Cancer Research UK, the Research and Development Division of the Public Health Authority in Northern Ireland and the Friends of the Cancer Centre is gratefully acknowledged in establishing and developing the NI-MPL.

In September 2013, the Centre also launched a major initiative and partnership in the area of therapeutic development. The launch of the Almac Discovery/QUB

Cancer Drug Discovery Partnership in September 2013 by Arlene Foster, NI Minister for Enterprise, was enabled as part of a £13 million programme from Invest Northern Ireland. As a result, the Centre welcomed an experienced industrial team comprising 11 medicinal chemists, 6 biologists, and a computational chemist. This industrial-academic partnership creates a significant opportunity for both parties, aligning the medicinal chemistry expertise of the company to the target validation and pathology activities within the academic teams. The programme is led by Professor Tim Harrison, who was appointed as the first recipient of the McClay Chair in Cancer Therapeutics. This new programme was also consolidated by a simultaneous announcement and funding of a Phase I clinical trial to be conducted of an Almac Discovery product in the Centre's Clinical Trial programme. This novel anti-angiogenic peptide was discovered by Professor Tracy Robson at Queen's University, from which a subsequent clinical candidate known as ALM201 was developed by Almac Discovery. The trial will run from 2014, with the initial clinical focus concentrated on ovarian cancer. In addition, the therapeutic development programme has also prospered from the award of £3.9 million from the Wellcome Trust Seeding Drug Discovery Initiative to Dr Dan Longley, aimed at generating novel therapeutic inhibitors of c-FLIP, discovered by his team to serve as a key prognostic marker and a key predictor of therapeutic resistance in a range of high-incidence solid tumours.



*Professor David Waugh (Director, CCRCB), Alan Armstrong (CEO Almac) and Enterprise Minister Arlene Foster*



*Pictured left to right are: former Queen's Vice-Chancellor and President, Professor Sir Peter Gregson; Professor Manuel Salto-Tellez, QUB/BHSCT; Health Minister, Edwin Poots; Chief Medical Officer, Dr Michael McBride and Mr Colm Donaghy, Chief Executive, BHSCT*

The Centre has been successful in the renewal of both its CRUK Centre and ECMC status, with both programmes being funded for a further three years from 1 April 2014. This significant investment by CRUK follows an extensive process overseen by an international panel of experts, who chose the Centres from across the UK with the most exciting potential to deliver advances in cancer research to benefit patients.

The CCRCB programme captures the dynamic, innovative approach that we are now driving in Belfast to link scientific discovery as the underpinning element of innovative personalised cancer medicine trials. Harpal Kumar, Chief Executive of CRUK said: "funding these Centres of Excellence is one of the charity's priorities and will enable us to work towards the goals we have set to improve the treatment and survival of cancer patients." A further major achievement has been the success of the FASTMAN joint application from Belfast and Manchester for a Movember Centre of Excellence. The total funding of the FASTMAN programme is £5 million, with £2.5 million directly supporting the Prostate Cancer Research Programme in CCRCB over the next 5 years. This programme has given a very significant international stamp of approval to our radiation and biomarker research in prostate cancer and gives us a major opportunity to leverage this in respect of further funding initiatives.

Furthermore, the Friends of the Cancer Centre has partnered with the Centre to provide a £900,000 funding injection for support of our clinical trials portfolio – medical research trials involving patients – over the next three years. The investment, which will be delivered through an annual grant of £300,000 will allow the CCRCB to increase the clinical capacity of the specialist team that delivers clinical trials, through a number of critical new staff positions.

Finally, the Centre launched a series of important Postgraduate Research Scholarship Programmes in 2013. The Heather Clarke Scholarship Programme was launched in memory of the late wife of our local Open Champion and Ryder Cup golfer, Darren Clarke. Through a generous donation from his Foundation, the Centre has supported two postgraduate students working on aggressive forms of breast cancer. The family and friends of Sean Crumme, the talented and much-admired political satirist and broadcaster, have also provided a significant donation to fund a scholarship in his name, who will work on understanding new techniques to improve the diagnosis and treatment of rectal cancer. A further Scholarship has been funded by the generosity of a long-standing supporter of the Belfast Cancer Research Programme, Dr Tom Moran. We are sincerely grateful to all for the generosity and the spirit of these donations, and trust that the research that stems from these programmes does tribute to those in whose honour they are named.

## Centre Life

CCRCB has played host to a busy calendar of visits from academics and key stakeholders over 2012 and 2013. Our annual Mitchell Lecture was delivered by Professor Edison Tak-Bin Liu, the President and Chief Executive of the Jackson Laboratories. Professor Mike Stratton, Director of the Wellcome Trust Sanger Institute, is the next honouree in this prestigious series. Professor Laura Machesky from the Beatson Institute in Glasgow gave the 2013 Cancer Research UK Lecture, rounding up another successful year long seminar programme. Throughout the year, the Centre was also visited by Baroness Delyth Morgan, the Chief Executive of Breast Cancer Campaign, Paul Villanti, an Executive Director of Movember and Professor Nic Jones, Chief Scientist of Cancer Research UK. These visits play an important role in enabling our key partners to learn more of the research ongoing within the Centre, and to identify how the Centre Focus Groups can contribute to major national and international consortia. The Centre has also played host to a number of important patient information events across our major disease focuses. For example, the Brainwaves NI Neuro-Oncology Information Evening in June 2013 was an important catalyst to inform patients and their families of important new developments in research that are being pioneered by Dr Tom Flannery and his colleagues in Belfast in this specific disease.

Our academic and research staff have contributed significantly to many major cancer conferences and symposia. In addition to the major contribution of our young researchers to the Irish Association for Cancer Research and the Haematology Association of Ireland meeting, our postgraduates and research fellows have presented at a range of important conferences across the UK, Europe and the US. Members of our academic staff have also been prominent in both organizing and speaking at a range of key European and UK wide conferences, highlighting the increasing impact and dissemination of our findings across the cancer research community.

The life of the Centre has been enriched by a number of new academic appointments to consolidate our translational research programmes. Mark Lawler was appointed to the Chair of Cancer Genomics, complementing the aforementioned appointment of Professor Tim Harrison to lead our Medicinal Chemistry Programme. In addition, the Centre made several key junior appointments in late 2012; Dr Kienan Savage was appointed to a Lectureship following his award of a Cancer Focus NI Fellowship and Dr Simon McDade was appointed to a Lectureship in Molecular Oncology. Moreover, the Centre has made significant clinical academic appointments. Dr Suneil Jain and Dr Gerry Hanna have been appointed as Consultant Senior

Lecturers in Radiation Oncology, establishing Belfast as one of few Centres across the UK with such an academic base in this discipline. Moreover, our Medical Oncology Programme has been boosted by the appointments of Professor Richard Kennedy as McClay Professor of Medical Oncology and Dr Vicky Coyle at Consultant Senior Lecturer level. Academic recruitment on the clinical and scientific side remains an important feature of the Centre's priorities for 2014 and we look forward to the prospect of welcoming new members of the team later in the year. Our congratulations also go to Chris Scott in recognizing his promotion to Professor, to Dan Longley on his promotion to Reader and to Frank Emmert-Streib on his elevation to Senior Lecturer during the most recent promotion rounds.

Our delight at welcoming new colleagues and celebrating the success of existing staff was tinged with the deepest sadness at the untimely death of Dr Jennifer Quinn-O'Brien in May 2013. Jenny had recently been appointed to a Lectureship in Molecular Pathology following the completion of her five-year tenure as a Breast Cancer Campaign Fellow. Jenny's research had revolved around the importance of the breast cancer susceptibility gene BRCA1 for many years and in keeping with her focus on patient wellbeing, she was a key player in establishing the BRCA-link Forum for women affected by hereditary breast cancer in Northern Ireland. As testimony to the widespread affection in which she was held, the Centre and Breast Cancer Campaign paid a joint tribute to Jenny in holding a Breast Cancer Symposium and Dedication in November 2013. She was a dear friend and colleague to us all, and will be sorely missed.



*Professor Edison Tak-Bin Liu, 2012 Mitchell Lecturer speaker*

# Research Awards

The Centre takes great pride in recognizing the outstanding achievements of our staff in 2012 and 2013. A synopsis of the major and notable awards to our staff includes:

- Professor Patrick Johnston received the 2013 Bob Pinedo Cancer Care Prize in recognition of his pioneering work in translating discovery science for the benefit of cancer patients. Professor Johnston received the Pinedo Prize at the Society for Translational Oncology's (STO) Fourth Annual meeting in Amsterdam in October 2013.
- Professor Richard Kennedy was named the winner of the Vice-Chancellor's Impact Prize at an awards ceremony on Friday 15 November 2013. Professor Kennedy and his team have developed tests to personalise cancer treatment worldwide.
- Sister Ruth Boyd, CRUK Senior Research Nurse received the Research Engagement – "Flame of Hope Award" in recognition of her dedication to patient care, her continuous advocacy on behalf of patients in Northern Ireland and her long-standing work in the Northern Ireland Clinical Trials Unit.
- Dr Niamh O'Brien was awarded the nationally prestigious Breast Cancer Campaign Fellowship, a five year award to support her research into mechanisms driving aggressive and therapeutically-resistant breast cancers.
- Dr Kienan Savage was awarded the Cancer Focus NI Fellowship, a four year programme to support his research into the mechanisms and consequences of BRCA1-regulated gene splicing in breast cancer.



Sister Ruth Boyd with her Flame of Hope Award

The total amount of grant income obtained by our Centre Investigators in competitive processes hit a record high of £14 million during this reporting period. Grants were obtained from a range of funding bodies including research councils, major charitable organizations, governmental regional development agencies and the Northern Ireland Department of Health (Research and Development Division of the NI Public Health Authority). Major grant awards are highlighted below:

- EU FP7 Programme Mercuric – A Phase I/II trial in the context of Ras-mutant colorectal cancer (Van Schaeybroeck/Johnston/Wilson/Lawler/Salto-Tellez) (€6.2million);
- CRUK Centre Grant (Waugh) (~£2million);
- ECMC, CRUK and R&D Funding (Waugh/Kennedy/Wilson) (£600K);
- CRUK Programme Grant (Johnston/Longley/Van Schaeybroeck) (£1million);
- FASTMAN – the Movember/PCUK Centre of Excellence (Waugh/O'Sullivan/Prise/Kennedy/Jain/Salto-Tellez and the Prostate Cancer Focus Group Investigators) (£5million);
- Wellcome Trust Seed Discovery Funding (Longley/Harrison) (£3.9million);
- Medical Research Council (Harkin/Savage) (£670K);
- Breast Cancer Campaign (O'Brien/Mullan) (£550K);
- Friends of the Cancer Centre Infrastructure for Clinical Trials (Waugh) (£900K);
- PCUK Legumain Project (Williams/Mullan) (£384K);
- Leukaemia & Lymphoma NI Infrastructure grant (Mills) (£496k);
- Invest NI Almac/CCRCB Drug Discovery (Harrison/Waugh) (£5.5million);
- Invest NI Almac/CCRCB Phase I Clinical Trial of a novel anti-angiogenic compound (Wilson) (£403K);
- Invest NI PathXL/CCRCB (Hamilton) (£492K);
- Invest NI Radox/CCRCB (Williamson) (£805K).

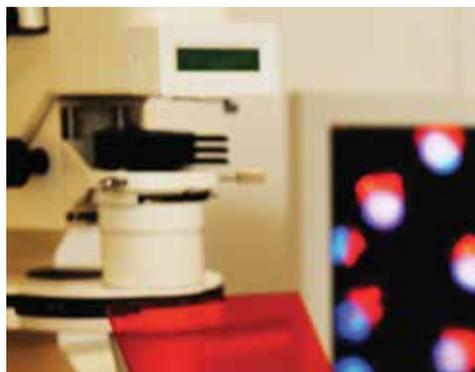
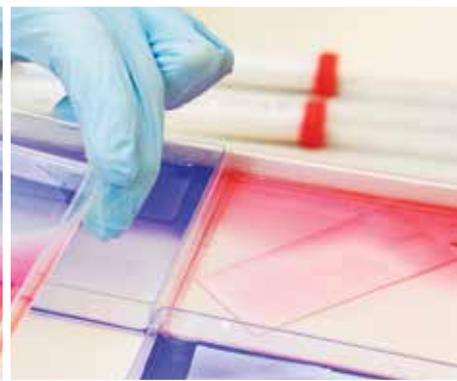
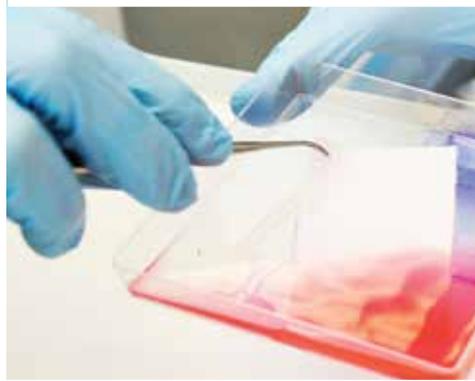
In addition, we recognize the significant accomplishment of several of our fellows and scholars-in-training and postgraduate students:

- Dr Aidan Cole was awarded the ESTRO (European Society for Radiotherapy and Oncology) Accuray Award for his work on 'Radiobiological implications of respiratory motion in the treatment of lung cancer radiotherapy' and received his award at the ESTRO meeting in Geneva on 19-23 April 2013. This is the first time this award has been made to a recipient from the UK and follows on from the success of the Jack Fowler ESTRO award to Dr Conor McGarry in 2011. Aidan was also awarded the St Luke's Medal in October 2013.
- Dr Karl Butterworth was elected as the Chair of the Scholar-in-Training Committee of the Radiation Research Society, a global organization committed to interdisciplinary discovery to advance the application of and understanding of the effects of radiation.
- Ryan Hutchinson, a postgraduate research student was the recipient of a Cancer Translational Research Group Travel Award, a Pathology Informatics Travel Award, was a Finalist for the Sylvia Lawler Oncology Prize at the Royal Society of Medicine and has been invited to join the Moffitt Cancer Centre Translational Pathology and Imaging Research Group as an international member (Florida, USA).
- Dr Joy Kavanagh and Dr Simon Horn were awarded Young Scientist Awards to attend the European Radiation Research Society meeting (ERR2013).
- Dr Adam Pickard was awarded the 2012 Roche Centre of Excellence Prize for his presentation 'Inactivation of Rb in stromal fibroblasts promotes epithelial cell invasion'. Adam was also invited to present his work at the EACR/ IACR Conference on Tumour Microenvironment in September 2012.
- The 2013 Roche Prize was awarded to Dr Philip Dunne for his presentation 'AXL is a key regulator of inherent and chemotherapy-induced invasion and predicts a poor clinical outcome in early stage colon cancer'.



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# FOCUS GROUPS



# Advanced Radiotherapy



**ALAN HOUNSELL**  
Chairperson

## Focus Group Membership:

Dr Darren Brady	Dr Ciara Lyons
Dr Karl Butterworth	Dr Karen McCloskey
Dr Aidan Cole	Dr Conor McGarry
Dr Fred Currell	Dr Stephen McMahon
Dr Tom Flannery	Professor Joe O'Sullivan
Dr Gerry Hanna	Professor Kevin Prise
Dr Iain James	

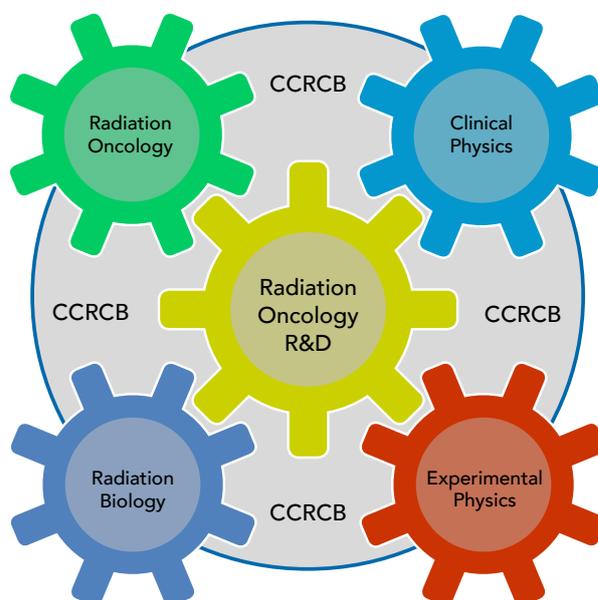
The Advanced Radiotherapy Group has recently formed from the previous Radiation Sciences Focus Group and is developing new translational research programs with the application of advanced radiotherapies as an underlying theme. Common areas which the group are working on include the applications of image-guided therapies, ion beam therapies and radionuclide approaches.

The work includes basic research, preclinical and trial activity in these areas feeding into Centre themes around biomarker development and combinations of advanced radiotherapies with new molecularly targeted agents. The group is a multidisciplinary team having strengths in radiation physics, radiotherapy physics, cell biology, mathematical modelling, radiation biology, neuro-oncology, bladder physiology, and radiation oncology. The membership includes basic scientists, clinical scientists and clinicians. Additional members are invited along to meetings ad hoc depending on the focus of the current work of the group. Some aspects of the work are disease specific, with a particular focus around prostate cancer, but other interests are in breast, lung and brain tumours with some members also contributing to other focus groups such as breast, ovarian and genito-urinary/prostate. The objectives of the Advanced Radiotherapy group are to maximise our input into Radiation Oncology Research and Development by:

- Developing new collaborative research programmes in Advanced Radiotherapies;
- Maximising the translational opportunities of our research;
- Inputting into new radiation-based clinical studies at the Northern Ireland Cancer Centre (NICC);
- Maximising training opportunities in radiation sciences;
- Initiating collaborative projects with other focus groups and external partners;
- Profiling radiation-based work at Queen's, nationally and internationally.

## Our research covers three component areas:

- Radiation Biology;
- Radiotherapy Physics;
- Clinical Radiotherapy Research (including radiographer led research).



# Breast



## PAUL HARKIN Chairperson

The breast cancer focus group has two sub-sections:

- Clinical Research
- Basic & Translational Research

### Clinical Research Membership:

Dr David Boyle	Dr Tong Lioe
Dr Gerry Hanna	Dr Stuart McIntosh
Dr Gareth Irwin	Dr Eileen Parkes
Dr Colin James	

### Basic & Translational Research Membership:

Dr Mohamed El-Tanani	Dr Konstantin Panov
Dr Frank Emmert-Streib	Professor Kevin Prise
Dr Fiona Furlong	Professor Tracy Robson
Dr Gerald Gavory	Professor Manuel Salto-Tellez
Dr Nuala McCabe	Dr Kienan Savage
Professor Dennis McCance	Dr Stephen Walker
Dr Simon McDade	Dr Rich Williams
Dr Paul Mullan	Dr Shu-Dong Zhang
Dr Niamh O'Brien	

#### Clinical research:

Ultimately this focus group aims to translate research findings such as the identification of novel biomarkers or the development of novel therapies and incorporate them into prospective clinical trials. Significant progress has been made within the last year to establish this clinical infrastructure:

- A specialized neo-adjuvant clinic has now been established within the Northern Ireland Cancer Centre under the leadership of Dr Stuart McIntosh;
- Furthermore approval has been granted for a Proof of Concept clinical trial evaluating a novel assay developed by Almac Diagnostics in collaboration with CCRCB to predict benefit from anthracycline based chemotherapy.

#### Basic and translational research:

The on-going focus for breast cancer research within CCRCB is in two main areas:

- DNA damage signalling;
- Tumour microenvironment.

### The four current translational breast cancer programmes that have downstream commercial potential include:

- FKBPL as a prognostic marker in breast cancer – Professor Tracy Robson;
- Ran GTP as a prognostic/predictive assay in breast cancer – Dr Mohamed El-Tanani;
- Legumain as a novel drug target in breast cancer – Dr Rich Williams/Dr Paul Mullan;
- SF3B1 as a novel diagnostic marker in breast cancer – Dr Kienan Savage/Professor Paul Harkin;

To date the Legumain project has been further supported in the form of a Heather Clarke studentship and the SF3B1 project has received Proof of Concept funding from Invest Northern Ireland to further validate as a diagnostic assay.

# Gastro-Intestinal



MANUEL SALTO-TELLEZ  
SANDRA VAN SCHAEYBROECK  
RICHARD WILSON  
Chairpersons

Focus Group Membership:	
Dr Aidan Armstrong	Professor Patrick Johnston
Professor Charles Campbell	Dr Claire Jones
Dr Marie Cantwell	Dr Paul Kelly
Dr Declan Carey	Professor Mark Lawler
Dr Robert Carson	Dr Jack Lee
Dr Mark Catherwood	Dr Dan Longley
Dr Basak Celtikci	Dr Maurice Loughrey
Dr Helen Coleman	Dr Darragh McArt
Dr Graham Cotton	Dr Simon McDade
Dr Vicky Coyle	Dr Damian McManus
Dr Sonali Dasgupta	Dr Stephen McQuaid
Dr Philip Dunne	Dr Liam Murray
Dr Martin Eatock	Dr Bode Oladipo
Dr Mohamed El-Tanani	Dr Colin Purcell
Professor Peter Hamilton	Dr Richard Turkington
Dr Jackie James	Professor David Waugh
Dr Awais Jalil	Dr Rich Williams
Dr Brian Johnston	Dr Shu-Dong Zhang

The Gastro-Intestinal focus group has established a comprehensive collaboration between basic scientists, clinician scientists, academic clinicians from CCRCB and the Belfast Health and Social Care Trust (BHSCT), pathologists, bio-informaticians and medicinal chemists. It addresses a number of important clinical problems, both in the early and advanced disease settings.

The main activity in this focus area is on colorectal cancer. Traditionally a basic/translational group, its major goals and achievements to date are the identification of novel targets, in particular for specific molecular subtypes (eg: mutant Kras and mutant Braf), the identification of biomarkers for response to chemotherapy and novel targeted agents and the implementation of both research approaches into novel adaptive clinical trial designs. This significant activity has extended into the clinical research (clinical trials) arena, by leading one of the first early

phase, European wide and multicentric clinical trials based on science generated by the group, and supported by European funds.

Parallel to the long-standing and established research in the CRC arena, the group has started to work in very focused, specific projects in other areas of gastrointestinal oncology, such as oesophageal cancer, pancreatic cancer and small bowel cancer.

Members of this group are also involved as clinical or scientific partners in several national and international phase I-III trials and are part of the NCRI colorectal/upper GI clinical studies groups and/or EORTC GI group.

# Genito-Urinary/Prostate



DAVID WAUGH  
Chairperson

## Focus Group Membership:

Dr Mark Catherwood	Dr Paul Mullan
Professor Peter Hamilton	Dr Declan O'Rourke
Professor Tim Harrison	Professor Joe O'Sullivan
Dr Suneil Jain	Dr Konstantin Panov
Dr Iain James	Professor Kevin Prise
Professor Richard Kennedy	Professor Manuel Salto-Tellez
Dr Adrien Kissenpfennig	Dr Stephen Walker
Dr Dan Longley	Dr Rich Williams
Dr Karen McCloskey	

Prostate cancer is a highly incident male cancer in Western society. This disease shows a very significant range of clinical presentation in men, stemming from indolent, slow-growing and asymptomatic cancers to lethal cancers which account for over 11,000 deaths in the UK each year. Within CCRCB, we are driving innovation in clinical practice through a focused interdisciplinary programme, bringing forth key scientific discovery alongside the pursuit of clinical trials that facilitate rapid application of this knowledge. The award of the Movember UK Centre of Excellence to CCRCB in partnership with colleagues in Manchester is testimony to the strength and depth of our expertise in this disease. This £5 million award over five years provides a very significant foundation on which we can further build the scale of our prostate cancer research programme.

Improving the early detection of the disease and enabling clinicians to make an improved diagnosis is critical. Consequently, many countries have used large population-based screening programmes to detect the disease. However, the inability to use this screen to reliably differentiate those "indolent" prostatic tumours from those that are "high-risk" and potentially lethal has resulted in many men opting to undergo unnecessary treatment. Our researchers are working to develop a molecular diagnostic test that can be used to provide a definitive diagnosis of high-risk disease in patients, enabling them and their clinician to make an informed choice of their future treatment.

Radiotherapy is a frequently used and very effective treatment for locally-aggressive, high-volume prostate cancers. Nearly 70% of patients are cured by radiotherapy. Our scientific and clinical research teams, led by Professor Kevin Prise and Professor Joe O'Sullivan, respectively are working to enhance the use of this treatment modality in patients, with the intent of reducing the numbers of patients who experience relapse of their

disease after radiotherapy. Our research is seeking to define the biological basis of radiotherapy relapse in patients, with the intent of being able to develop further diagnostic tests to identify patients at higher risk of relapse, while also enabling to characterize biologically informed clinical interventions that can be used to increase the effect of radiotherapy in these patients. Additionally, we are seeking to identify improved ways of scheduling the delivery of radiotherapy in order to enhance patient outcomes.

Castrate-resistant prostate cancer remains currently incurable. Our researchers are working to define improved therapeutic strategies to treat this disease by providing an enhanced understanding of the biological pathways that are driving the progression of this stage of disease. Through Professor O'Sullivan, Belfast is leading the way in understanding how to use small radionuclides as therapeutic strategies to target prostate cancer cells that have spread to the bone. Through further clinical trials and pre-clinical research, we aim to identify relevant ways to enhance the use of these radionuclides in patients, with the intent of enabling the full potential of these exciting therapeutics to be realized.

## In summary, our goals are:

- To promote molecularly-stratified approaches that identify high risk patients;
- To characterize novel therapeutic strategies and accompanying biomarkers for molecular stratified, high risk groups;
- To identify increasingly effective treatments of advanced castrate-resistant prostate cancer, especially in the context of bone metastasis;
- To characterize novel therapeutic strategies and biomarkers of radio-resistant prostate cancers.

# Haematological Malignancies



**KEN MILLS**  
Chairperson

## Focus Group Membership:

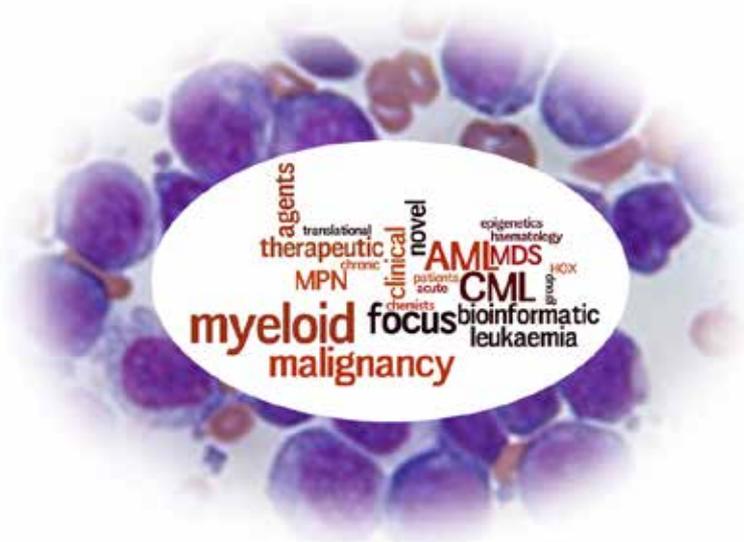
Dr Lesley Anderson	Dr Christine Macartney
Dr Mark Catherwood	Professor Mary Frances McMullin
Dr Mohamed El-Tanani	Dr Melanie Percy
Dr Frank Emmert-Streib	Dr Alex Thompson
Dr Gerald Gavory	Dr Lakshmi Venkatraman
Dr Sandra Irvine	Dr Paul Winter
Professor Terry Lappin	Dr Shu-Dong Zhang

The Haematological Malignancies focus group is focusing on the Myeloid Malignancies spectrum of diseases which includes Myelodysplastic Syndromes (MDS), Myeloproliferative Neoplasms (MPN), Acute Myeloid Leukaemia (AML), and Chronic Myeloid Leukaemia (CML). A significant percentage of patients with MDS, MPN or CML will eventually transform into an AML type disease. AML, MDS and MPN are predominantly a disease of the elderly and unsatisfactory outcomes persist for the majority of these patients. Therefore, novel and less intensive therapies are required for this group of patients.

Around 35 genes have been shown to be mutated across the myeloid malignancies spectrum. These mutations often occur in combination negating or amplifying any individual prognostic benefit. This molecular complexity means that targeted therapies to an individual gene may be less effective and combination therapies or more system target therapies may be required.

The Haematological Malignancies Focus Group is using different research strands to identify and understand how novel therapies could be used in combination with other novel or cytotoxic therapies. These strands include using in vivo models of AML particularly to assess the role of the HOX-TALE axis in disease initiation and maintenance; characterising the molecular responses to epigenetic, proteasome and other novel agents; using integrated analysis of markers of disease progression to re-purpose therapeutic agents against the myeloid malignancies; and identifying the molecular basis for a rationally designed epigenetic priming therapeutic strategy.

The focus group involves a wide range of translational and clinical scientists, bio-informaticians, medicinal chemists, pathologists and academic clinicians from the CCRCB and the Belfast Trust. The laboratory approaches are complemented by national and international trials for CML, MPD and AML supported by the Leukaemia and Lymphoma Research Therapy Acceleration Programme (TAP) portfolio within the Experimental Cancer Medicine Centre.



# Ovarian



**RICHARD KENNEDY**  
Chairperson

Focus Group Membership:	
Dr James Beirne	Professor Patrick Morrison
Dr Fiona Furlong	Dr Paul Mullan
Professor Paul Harkin	Dr Niamh O'Brien
Dr Ian Harley	Dr Eileen Parkes
Professor Tim Harrison	Dr John Price
Dr Nuala McCabe	Professor Tracy Robson
Professor Glenn McCluggage	Professor Manuel Salto-Tellez

The Ovarian focus group facilitates the transition of novel biomarkers or therapies from the clinic into prospective clinical trials run in the Belfast Experimental Cancer Medical Centre (ECMC).

### The major projects are:

- Targeting of FKBPL in ovarian cancer. The ALM201 peptide based drug was originally discovered and developed in Tracy Robson's laboratory. In collaboration with Almac, the peptide will enter a Belfast ECMC supported clinical trial in advanced ovarian cancer in 2014. The focus group has been active in developing biomarker strategies to allow stratification of patients for this study.
- Identification of Biomarkers for Ovarian Cancer Progression. The group has successfully profiled a series of clinical samples that represent the progression from normal tissue to malignant disease. This study has

identified important molecular changes that may be detectable in blood as an early biomarker for ovarian cancer. These findings are being validated in a prospective tumour and blood collection study from high-risk patients which started in October 2013.

- Validation of Ovarian Cell line models. The group has developed a transcriptional-based methodology for the validation of tumour of origin and histological classification of ovarian cancer cell lines. Using this approach we have discovered that some ovarian cell lines commonly used for research are actually of gastro-intestinal origin. Glenn McCluggage has confirmed these findings using conventional IHC approaches used for tumour classification in the clinic.

### Other areas of focus include:

- Development of biomarkers for SRC inhibitors;
- Molecular subtyping of ovarian cancer.

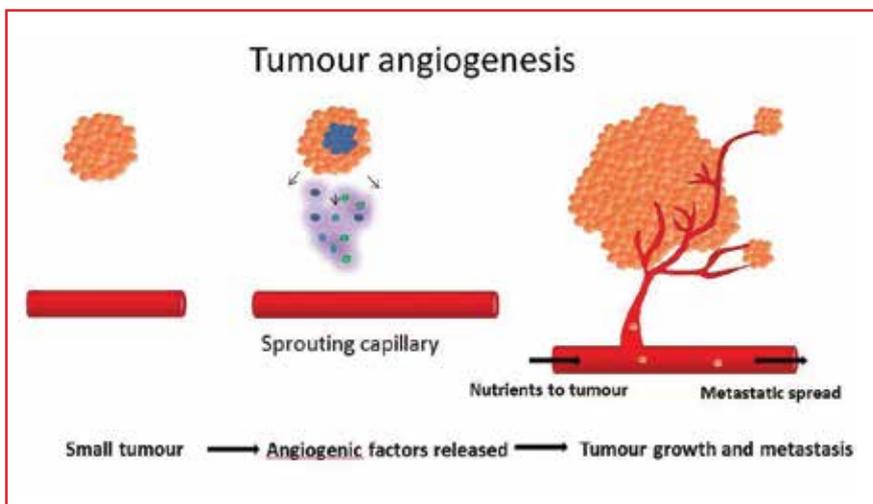


Image courtesy of Professor Tracy Robson, School of Pharmacy, QUB

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# ENABLING TECHNOLOGIES



# Bioinformatics and Imaging



PETER HAMILTON  
Lead Investigator

The Cancer Bioinformatics (CBI) group, which was established in 2009, forms part of the Clinical Research division. The group consists of scientists with expertise across a broad spectrum ranging from Computational Biology, Computer Vision and Machine Learning to Systems and Network Biology. In the era of high-throughput data, quantitative methods are key for elucidating biological processes. For complex diseases like cancer the deciphering of molecular signatures and networks for diagnostic and treatment modalities form major challenges for translational and experimental cancer research. The aim of the group is to develop novel computational and statistical methods and to engage in interdisciplinary collaborative research by working closely together with biologists and clinicians across the CCRCB, providing the interface between data and understanding.

Developing innovative research programmes in **Cancer Bioinformatics** is a priority of the team. Key research areas include:

- Computational Biology and Biostatistics;
- Pathway analysis, causal inference of regulatory networks and integration of genetics and genomics data;
- Tissue Imaging, Analytics and Biomarker Discovery;
- High-throughput analysis of genomic and image data;
- Quantitative methods in disease-genes-drugs connection discovery;
- Biomolecular Structure Prediction;
- Data integration.

The research of the group spans a wide range from basic research and method development to their applications. The group has specific interests in drug resistance and various types of complex diseases like lung cancer, colorectal cancer, cervical cancer and haematological malignancies.

The group has a strong interest in Tissue Imaging and Pathology Informatics and works closely with the Northern Ireland Molecular Pathology Laboratory (NI-MPL) and the Northern Ireland Biobank (NIB) to achieve these goals. It has one of the most extensive digital pathology laboratories in the UK, with scanning technologies, image and TMA management software and image analysis capabilities for quantitative biomarker discovery, validation and translation. The team have been developing new algorithms for biomarker measurements and a novel "integromics" platform for the management of phenotypic and genotypic data from cancer tissues.

In addition, the group takes a leading role in the education and mentoring of students and scientists to provide them with a deeper knowledge and understanding of modern quantitative methods as needed to cope with the data revolution in biology and medicine. Furthermore, the group aims to generate a public awareness of the current exciting developments in quantitative cancer research.

# Drug Discovery



**PROFESSOR TIM HARRISON**  
Lead Investigator

It has become increasingly clear that rather than being a single disease, cancer is a heterogeneous collection of diseases. It therefore follows that in order to diagnose and treat cancer effectively, strategies for patient selection must be combined with the development of molecularly targeted therapeutics so that patients can receive the drug or combination of drugs which is most appropriate for the treatment of their disease, at the appropriate time. This approach necessitates the involvement of multi-disciplinary teams of basic researchers and clinicians, working within an infrastructure which allows for effective knowledge transfer.

In June 2013, a new industrial-academic drug discovery collaboration was established within the Centre for Cancer Research and Cell Biology (CCRCB). This partnership integrates both academic and industrial scientists to facilitate the translation of basic research discoveries into products which can ultimately derive value for patients. Working in close partnership with researchers from across the University and local hospitals, as well as with external researchers, the mission of the Drug Discovery group is to identify molecular targets which are relevant to disease and to develop strategies to modulate their function. Working closely with colleagues within the Centre (which includes the new Northern Ireland Molecular Pathology Laboratory and NI Biobank), a strong emphasis will be placed on the early development of biomarkers, both for patient selection, and for determining the relationship between drug pharmacokinetics and the associated pharmacodynamic response.

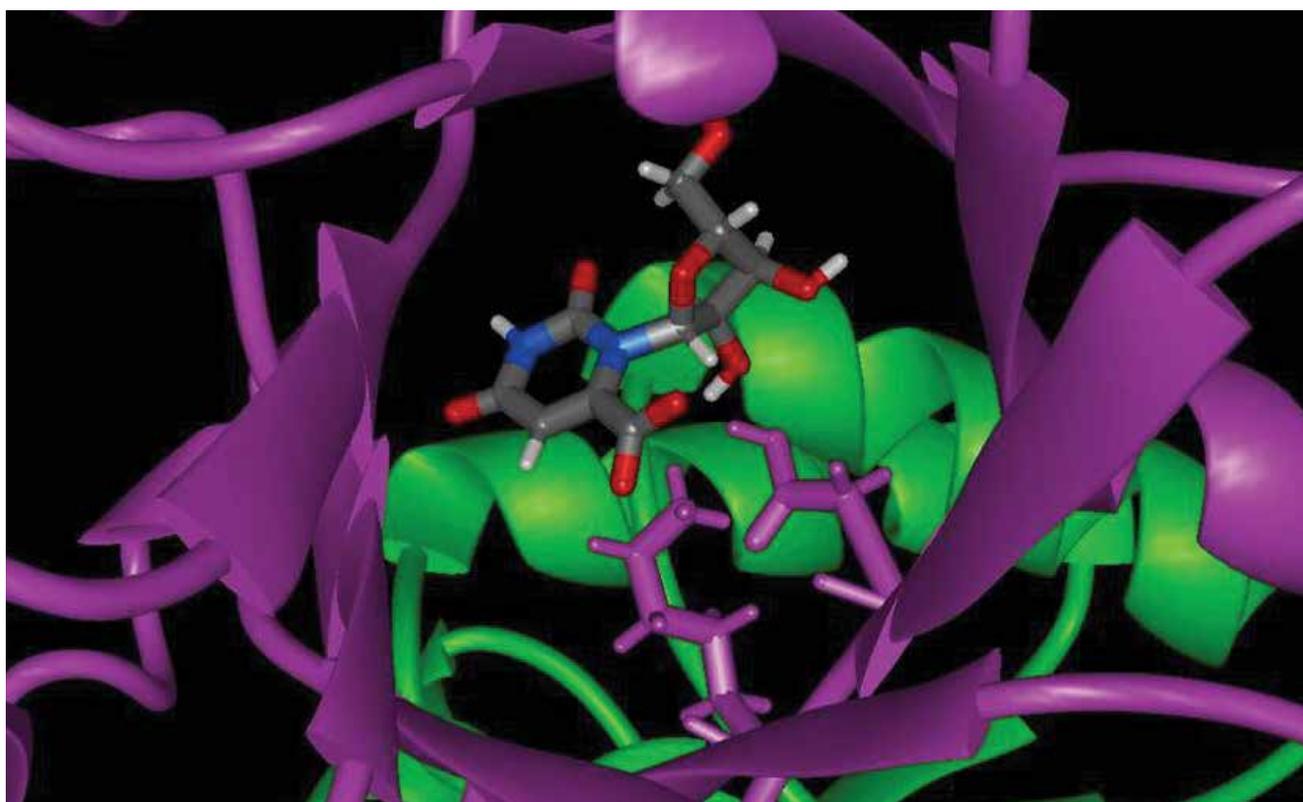
Key to the progression of any drug discovery programme is the identification of a chemical compound (either small molecule or protein based) which can interact with the target. This drug "hit" is then optimised to provide a compound (often termed a preclinical candidate) which has the potency and specificity to interact with the target at a therapeutic concentration which does not cause unacceptable side effects. This candidate molecule is further evaluated in pre-clinical development studies before progressing into clinical trials.

## The capabilities of the Drug Discovery group include:

- Medicinal chemistry expertise in hit identification, hit to lead and lead optimisation;
- Biology expertise in target validation and assay development using multiple formats;
- Fragment screening (using a range of orthogonal biophysical techniques);
- Computer aided drug design;
- Measurement and interpretation of Absorption, Distribution, Metabolism and Excretion (ADME) and physicochemical properties of molecules;
- State of the art compound storage and data management facilities;
- Pre-clinical and clinical project management;
- International network of collaborators and outsourced service providers.

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Research is currently focussed on the discovery of inhibitors of ubiquitin specific proteases and other ligases involved in the ubiquitin-proteasome system, as well as other protease targets shown to be involved in cancer progression. There is also a strong interest in developing new strategies for the disruption of protein-protein interactions, using both small molecules and peptides, and in the development of novel delivery vehicles for the specific targeting of therapeutic agents to tumours. Based on these drug discovery capabilities, it is anticipated that molecules will emerge that may be developable into the next generation of clinical medicines. The projects originate both from the CCRCB and other Schools within QUB. The multidisciplinary environment within the Centre for Cancer Research and Cell Biology, itself situated within easy reach of other research QUB faculties and Clinical Centres, offers an exciting opportunity for chemists, biologists, bioinformaticians, physicists, radiographers and clinicians to combine their expertise to facilitate the drug discovery process.



# Molecular Pathology and Biobanking

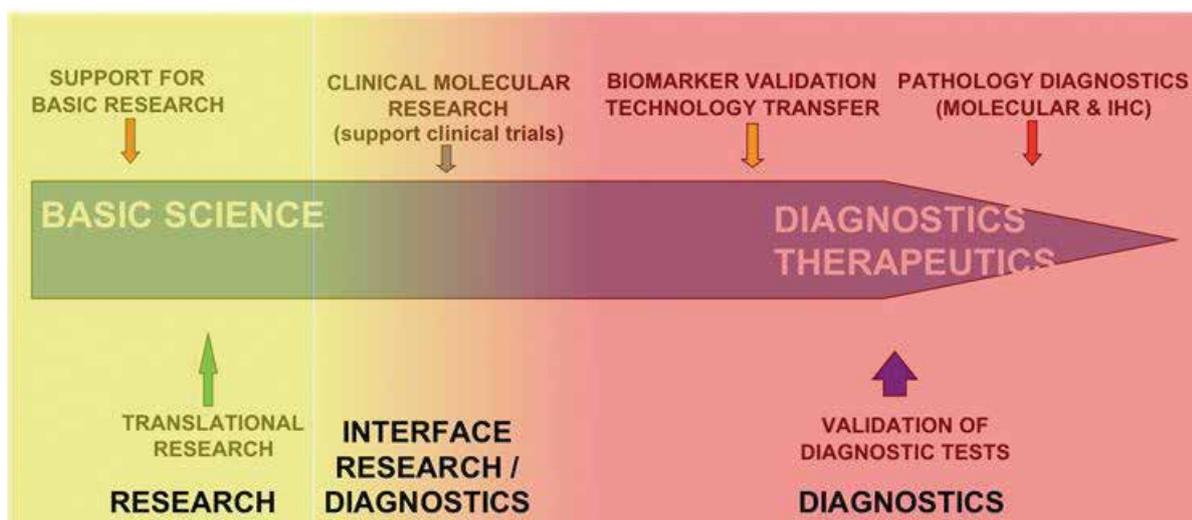


**MANUEL SALTO-TELLEZ**  
**JACKIE JAMES**  
 Lead Investigators

The Molecular Pathology Programme at CCRCB includes the Northern Ireland – Molecular Pathology Laboratory (NI-MPL), the Northern Ireland Biobank (NIB), the Digital Pathology programme and an incipient Comparative Pathology Group. NI-MPL is a self-contained, purpose-designed, nationally accredited hybrid operation capable of performing molecular pathology translational research and molecular diagnostics of solid tumours. The molecular pathology diagnostic unit is a partnership between CCRCB and the Belfast Health and Social Care Trust (BHSCT).

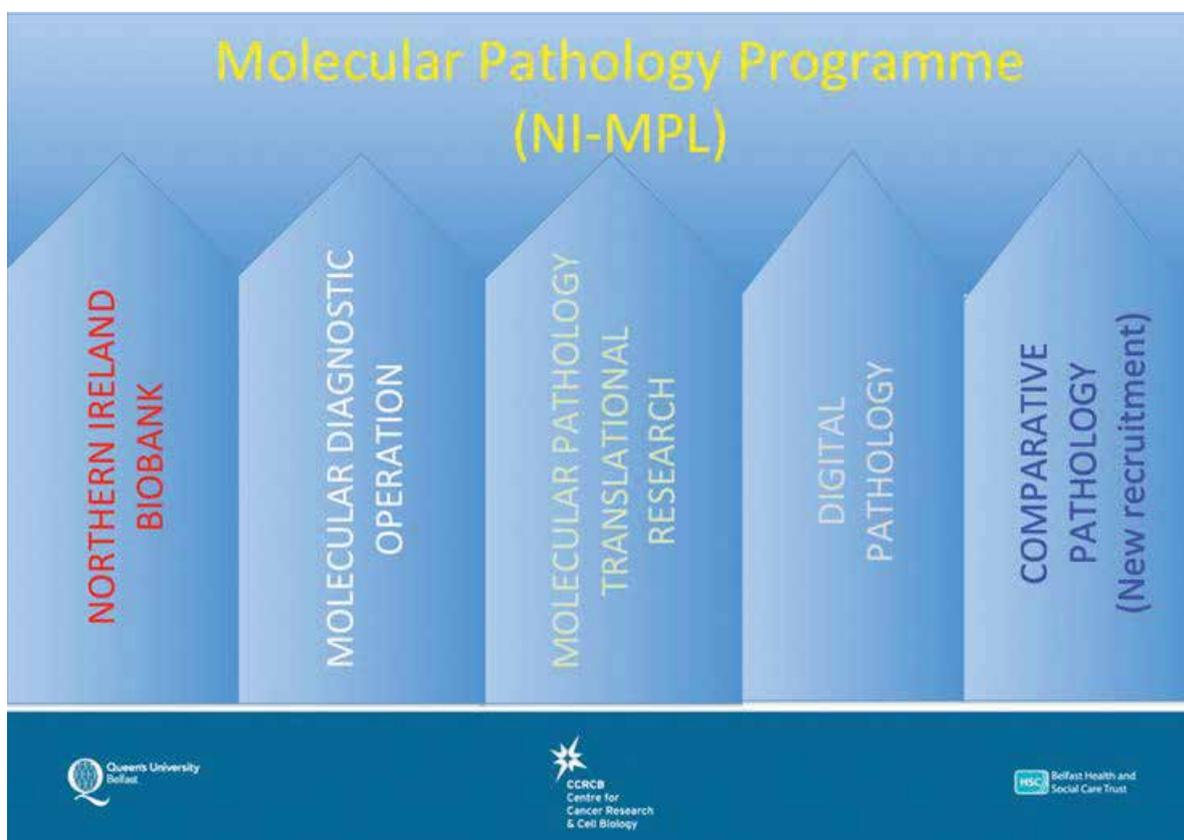
The technologies available in the basement hub are tissue and nucleic acid based, and include: tissue processing and embedding, conventional HE, manual and automated immunohistochemistry, various automated in-situ hybridization techniques, tissue microarrays, gel and capillary electrophoresis, Q-PCR, Next Generation Sequencing, laser capture

microdissection and tissue bioimaging. This has been complemented with capacity to undertake high-throughput gene expression, methylation and gene copy number analyses, currently under validation. The laboratory environment ensures the proper SoPs, procedure manuals and QA/QC schemes to exercise its hybrid role. This laboratory is able to provide research support to basic scientists willing to understand the clinical relevance of their research findings, academic oncologists willing to have biomarker analysis or validation in the context of clinical trials, and all those in need of high-quality, affordable molecular diagnostic testing in oncology. Within the first 15 months, the programme has attracted research funding and diagnostic structural funds in excess of £1million, has validated some of the core molecular diagnostic tests and has taken part in some of the best published work of CCRCB.



Molecular Pathology research in Belfast involves academics at QUB and clinicians within the BHSCT Tissue Pathology laboratories and is underpinned by the new Northern Ireland Biobank. The NIB is funded by the Health and Social Care (HSC) Research and Development (R&D) Division of the Public Health Agency of the Northern Ireland and a local charity, the Friends of the Cancer Centre; it is also supported through the CRUK Centre grant. The NIB enhances translational cancer research through the quality assured collection of tissues and blood samples linked to reliable clinical and pathological data sets. The Belfast Experimental Cancer Medicine Centre (ECMC) previously had project-based but no systematic tumour tissue collection capabilities;

however, the NIB has now put in place a robust infrastructure to facilitate tissue collections associated with phase I-III trials. The NIB complements clinical trial activities by establishing a unique targeted collection of tissues and bodily fluids, including normal and tumour tissues, for translational studies. The NIB is supported by a secure, information management system modified to include the integration of whole slide imaging and tissue microarray management. There is a close working relationship between the NIB and the NI Cancer Registry to ensure all samples processed for the bank are linked with robust de-identified clinical and pathological information collected from state of the art data repositories.



# Northern Ireland Cancer Trials



RICHARD WILSON  
Lead Investigator

Our mission at the Northern Ireland Cancer Trials Centre (NICTC) is to deliver the highest quality and standard of care to cancer patients through leading edge clinical and translational research.

## Goals:

- to ensure high quality patient care by participation in clinical research;
- to co-ordinate and promote cancer clinical trial activity throughout Northern Ireland;
- to drive the development of early phase cancer clinical research;
- to integrate with Queen's University Belfast and University of Ulster basic science and translational research programmes;
- to develop and train clinical research staff.

The Northern Ireland Cancer Trials Centre (NICTC), formerly known as the Northern Ireland Cancer Clinical Trials Unit (NICCTU) was formally established in 1999 following the signing of the National Cancer Institute-Ireland-Northern Ireland Cancer Agreement. Our local Northern Ireland DHSSPS Research and Development Office (now the Research and Development Division of the HSC Public Health Agency) provided funding for the initial infrastructure to be put in place. Today the HSC R&D provides core funding in support of the NICTC's continued expansion with significant additional funding being provided by several Cancer Research UK grants and from local charities such as the Friends of the Cancer Centre.

## The role of NICTC is:

- to co-ordinate and promote cancer clinical trials, and run the full range of first-in-human phase I to phase IV trials, along with genetic epidemiology, questionnaire, quality of life, translational and other high quality studies. Clinical trials can be designed locally (investigator-initiated) or adopted as part of a multi-centre study. Investigator-initiated trials often involve collaboration with other academic groups within local universities or hospitals;
- to act as the co-ordinating centre for the Northern Ireland Cancer Trials Network (NICTN) responsible for the co-ordination of cancer clinical trial and translational research activity throughout Northern Ireland, particularly phase III trials and epidemiology studies;
- to manage an academic early clinical trials unit running a portfolio of Cancer Research UK, commercial and local investigator-initiated experimental cancer medicine studies including phase I, II and translational trials. In April 2007, the NICTC was awarded Experimental Cancer Medicine Centre (ECMC) status, one of 18 such centres appointed within the UK.

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# EDUCATION AND TRAINING



# Post Doctoral Programme



**DAN LONGLEY**  
Associate Director for  
Post-Doctoral Studies

In addition to the training of PhD students, CCRCB is a major centre within the School of Medicine, Dentistry and Biomedical Sciences for further research training and career development. It attracts researchers from the UK, Ireland and across the world due to the breadth and quality of the research, and the emphasis on international and cross-disciplinary collaborations. Researchers at all stages of their career development benefit from the very active programme of seminars and internal research meetings and the availability of courses to learn key scientific and complementary skills. Our aim is to continue to attract enthusiastic scientists and clinicians to work with our established staff and to draw on their experience and also to independently generate new ideas in a stimulating research environment.

Central to the post-doctoral programme within the Centre, is a weekly seminar programme where post-docs present their work to their peers and colleagues and gain skills in introducing speakers and leading questioning.

As part of the career development for our post-doctorate, we also run a mentoring scheme within the Centre which aims to take forward a small group of post-docs and assist them with preparing applications for fellowships to be held at CCRCB or elsewhere. Currently 8 post-docs are in the programme, and several fellowship applications have been submitted to funders including CRUK, the MRC, EU and the Breast Cancer Campaign. This has now started to show significant success with three prestigious fellowships being awarded to post-docs on the mentoring programme:

- Dr Niamh O'Brien has been awarded a 5 year fellowship from the Breast Cancer Campaign on "The identification of a subgroup of breast cancers with combined BRCA1 dysfunction/NFkB hyperactivity and the development of novel therapeutic strategy" valued at over £500K;
- Dr Kienan Savage has been appointed to a 4 year fellowship from Cancer Focus Northern Ireland and subsequently was appointed to a lectureship position in CCRCB.
- Dr Stephen McMahon, a postdoctoral researcher in Professor Kevin Prise's radiation biology group, has been awarded a 3 year Marie Curie International Outgoing Fellowship (to commence in 2014) to develop new clinically-relevant models of radiation responses. During this fellowship, he will spend two years working with Professor Harald Paganetti at Massachusetts General Hospital, working on implementing biologically-driven models into their state-of-the-art proton therapy treatment planning system, with a final year within Queen's University Belfast adapting these models to conventional X-ray therapy techniques.

The Centre's post-doctorate continue to be major players in the School-wide Post-Doctoral Society. Initially setup by members of CCRCB, the committee is currently chaired by Dr Caitriona Holohan. The Society acts as a forum to provide a voice for the postdoctoral community within the School and to promote opportunities for career advancement, personal development and social interaction. The society aims to hold two symposia per year featuring both scientific presentations from the postdoctoral body and career-focussed talks from invited speakers. These were held at Riddel Hall on 13 March and 4 October 2013 respectively.

Throughout the period covered by this report, a number of our postdoctoral fellows obtained awards for their achievements; some of these are highlighted below:

- Dr Karl Butterworth won a National Institute of Health funded Scholarship to attend the 22nd annual course on Experimental Models of Human Cancer at the Jackson Laboratory, Bar Harbour, ME.
- Dr Karl Butterworth won a Cancéropôles Grand Ouest travel award to speak at the 7th annual meeting on the Future of Radiation Oncology in Berder Island, Brittany, France.
- Dr Lisa Crawford won the Haematology Association of Ireland/The Royal College of Pathologists Research Fellowship Award for 2014, which was announced at the Haematology Association of Ireland Annual Meeting on 18 October 2013. The award is for €20,000 and the title is "Defining new ubiquitin proteasome system targets in Multiple Myeloma". The award will further the work on the Ubiquitin Proteasome System, which is carried out in collaboration with Professor Brian Walker, Department of Pharmacy and Dr Mary Drake, Belfast Health and Social Care Trust.

- Dr Philip Dunne was awarded the Roche Prize on 16 December 2013. The winning presentation was entitled "AXL is a key regulator of inherent and chemotherapy-induced invasion and predicts a poor clinical outcome in early stage colon cancer". The Roche Researcher of the Year Award is an event launched by Roche Diagnostics Ireland designed to highlight and support excellence in life science research within the academic centres of Ireland, both in the Republic and Northern Ireland;

- Dr Joy Kavanagh and Dr Simon Horn were awarded Young Scientist Awards to attend the European Radiation Research Society meeting (ERR2013) which was held in Dublin in September 2013;

- Dr Adam Pickard, post-doctoral research fellow in Professor Dennis McCance's research group, was awarded the Roche Prize for 2012. Dr Pickard was presented with a medal and cheque for £400 at the Centre for Cancer Research & Cell Biology on 30 November 2012. The winning presentation was entitled "Inactivation of Rb in stromal fibroblasts promotes epithelial cell invasion". The talk was on a paper of the same title which was published in the EMBO journal, EMBO J (2012) 31, 14: 3092-103.



Julie McAlinden presents the Roche Prize to Dr Adam Pickard (2012 winner, above) and Dr Philip Dunne (2013 winner, right)



# Seminar Programme

An important aspect of our work and success is the Centre's seminar programme which provides an opportunity to talk about our research and share ideas with colleagues. We have a post doctoral seminar programme where each week the post doctoral research fellows present and discuss their work with colleagues in other research groups within the Centre. In addition we have an external seminar programme (advertised on our website [www.qub.ac.uk/ccrcb](http://www.qub.ac.uk/ccrcb)) in which we host guest speakers to encourage collaborations and interactions with other research institutions.

Our distinguished **Mitchell Lecture**, which was initiated in 2007 and is held annually to honour the previous Chancellor of Queen's University Belfast, Senator George Mitchell, for his enormous contributions to the University and the wider community, took place on 18 October 2012. The lecture was given by Dr Edison Liu, Director, Jackson Laboratory in Bar Harbour, Maine. Dr Liu's talk was entitled "Systems Genomics in Cancer Medicine".

This year's prestigious **CRUK Lecture**, held annually as part of the Belfast Cancer Research UK Centre initiative was delivered on 16 May 2013 by Professor Laura Machesky, Beatson Institute for Cancer Research, University of Glasgow. Professor Machesky's talk was entitled "The role of the actin bundling protein fascin in pancreatic cancer invasion and metastasis".

The following external seminars were held during the period of this annual report:

**Dr Richard Grose, Barts Institute,**  
Queen Mary University of London  
"Novel roles for FGFR1 signalling in cancer";

**Dr Owen Williams, University College London**  
"Oncogene addiction in models of acute leukaemia";

**Dr Mark Arends, University of Cambridge**  
"Modelling the role of K-ras in intestinal carcinogenesis in the mouse";

**Dr Tim Sommerville, Paterson Institute for Cancer Research, University of Manchester**  
"Epigenetic targets in myeloid leukaemia";

**Dr Viji Draviam, University of Cambridge**  
"Mechanisms that define the plane of cell division in a cell shape dependent manner";

**Professor Tony Green, University of Cambridge**  
"JAK/STAT signalling and malignancy – clonal complexity and stem cell subversion";

**Professor Bob Brown, Imperial College London**  
"Epigenomic biomarkers and epigenetic therapies in ovarian cancer";

**Professor Chris De Lance Holmes, Oxford University**  
"Detecting copy-number-aberrations in cancer genomes using Bayesian Hidden Markov models with linear time decoding algorithms";

**Dr Mark Dawson, University of Cambridge**  
"Cancer epigenetics: From mechanism to therapy";

**Professor Cairiona O'Driscoll, University College Cork**  
"Gene delivery – translating concepts into medicines";

**Dr Eva Szegezdi, National University of Ireland, Galway**  
"The fork(s) in the road: The TRAILS for cancer therapy";

**Dr Rosemary O'Connor, University College Cork**  
"IGFs, Mitochondria and cancer metabolism";

**Dr Jacintha O'Sullivan, Trinity College Dublin**  
"Functional role of novel small molecule drugs that target metabolism and angiogenesis in gastrointestinal cancers";

**Professor Chris Bunce, University of Birmingham**  
"Targeting Aldoketoreductases in human cancers: Trials, tribulations and drug redeployment";

**Dr Grant Stewart, University of Birmingham**  
"Ubiquitin-dependent regulation of the DNA damage response induced by replication stress";

**Professor Neil Perkins, Newcastle University**  
"NF-KappaB context and crosstalk: Does it really matter";

**Dr Ian Mills, Centre for Molecular Medicine, Norway**  
"The implications of transcriptional changes in prostate cancer";

**Dr Jeanette Wood, Astrazeneca**  
"How can academia contribute to drug discovery and development";

**Dr Ananth Ravi, Lead Brachytherapy Physicist, University of Toronto**  
"Personalized radiation therapy using advanced image guidance: Stereotactic radiotherapy and high dose rate brachytherapy in prostate cancer";

**Professor Anne Willis, University of Leicester**  
"Translational control of gene expression – the cancer connection";

**Professor Lawrence J Marnett, Vanderbilt University**  
"The aspirin-cannabinoid connection – discovering new biological pathways and therapeutic opportunities";

**Professor Penny A Jeggo, University of Sussex**

"DNA double strand break repair; the pathways, their interplay and contribution to human disease";

**Dr John Thompson, Aldevron Freiburg GmbH**

"Genetic immunization allows generation of antibodies that recognize and may modulate function of complex cell surface receptors";

**Professor Thomas Rulicke, University of Veterinary Medicine, Vienna**

"GMOs and alternative methods in basic research";

**Dr Charlotte Bevan, Imperial College London**

"Inhibiting androgen signalling in prostate cancer";

**Professor Martin Ebert, University of Western Australia**

"Experience with RT trials databases – the RADAR prostate radiotherapy trial and derivation of planning dose constraints";

**Dr John Dixon, JD International Consulting Ltd**

"Invention of Brilinta, a potential blockbuster for treating thrombotic conditions";

**Professor Xin Lu, University of Oxford**

"Suppressing Squamous Cell Carcinomas (SCC) by a novel ASPP2/NFkB/p63 pathway";

**Professor Roger Griffin, Newcastle University**

"Anticancer drug discovery – symbiosis through industry-academia collaboration";

**Professor Raoul Coombes, Imperial College London**

"New molecular targets for breast cancer";

**Professor Valerie Brunton, University of Edinburgh**

"Targeting adhesion linked signalling in tumour progression";

**Professor Malcolm Mason, Cardiff University**

"UK clinical research in prostate cancer: yesterday, today and tomorrow";

**Professor Ian Collins, ICR-Institute of Cancer Research**

"Targeted anticancer drug discovery: Chemical tools and candidates";

**Professor Henning Walczak, UCL Cancer Institute**

"New traits of TRAIL in cancer";

**Dr Manuela Buonnano, Columbia University**

"Targeted and non-targeted effects of radiation: cell cultures and small animal models."



# Postgraduate Programme



**KAREN McCLOSKEY**  
Associate Director for  
Postgraduate Studies

An important aim of the CCRCB is to train research leaders of the future. The purpose of our clinician/graduate training programme is to give students and clinical fellows starting in research, an opportunity to work in state-of-the-art laboratories. The training of our postgraduate research students is achieved by offering both three and four year PhD studentships. Currently there are 62 postgraduate students within the Centre.

The postgraduate programme integrates training in cancer research with the transferable skills necessary for the communication of science and career development as an independent scientist. All students receive training in safe working practices, good laboratory practice, project report writing and communication/presentation skills. The Annual CCRCB Research Symposia for first, second and final year postgraduate students, in addition to forming part of the Annual Progress Assessment process, provides an appropriate scientific forum for conference presentation training. Students are given the opportunity to present poster/oral communication on their work at national and international conferences to enhance their network of scientific contacts. Where appropriate, students undertake short visits to collaborators' laboratories in the UK, Europe or the USA to work on unique sample sets or to access new methodologies.

Four-year PhD studentships are supported by the McClay Trust and CRUK. These prestigious studentships enable students to take short rotations in a number of CCRCB laboratories during their first year and then to develop a project proposal within the laboratory of their choice. There are currently four McClay Trust and eight CRUK supported students within CCRCB.

CCRCB provides PhD opportunities for self-funding international students and 3 international students commenced their PhD in September 2013. Candidates are invited to discuss their research project preferences and supervisory team at the time of application to ensure that their research interests are best addressed.

## A number of our postgraduate students have received awards during the period of this report:

- Aidan Cole was awarded the ESTRO (European Society for Radiotherapy and Oncology) Accuray Award for his work on "Radiobiological implications of respiratory motion in the treatment of lung cancer radiotherapy". Aidan received his award and presented his work at the ESTRO meeting held in Geneva from 19-23 April 2013. This is the first time this award has been made to a recipient from the UK and follows on from the success of the Jack Fowler ESTRO award to Conor McGarry in 2011. Aidan also won the St Luke's Medal for the best clinical radiotherapy research project in Ireland. The medal was awarded on 28 September 2013 for his study investigating radiobiological modelling and dose escalation in lung cancer.
- Laura Kettle won a prize for her oral poster presentation at the IACR meeting in Dublin on 28 February – 1 March 2013. Joanna Majkut also won a prize for her poster presentation.
- Kathryn Clarke won a Gold Sponsorship package from PrimerDesign worth over £3,000 of kits and training for Real Time PCR. Her submission in the international competition was chosen because of the 'elegant, ground breaking questions' she hoped to answer by qPCR.
- Jodie Hay was awarded a grant from the EU COST Action Committee of 750 euros to attend the bioinformatics workshop organised by the COST Action BM0801 in Modena, Italy with 18 other young scientists from 12 different EU countries

- Ryan Hutchinson won top award for his presentation on Image Analysis of EGFR Expression in Colorectal Cancer in the Oncology and Personalised Medicine track in the scientific session at Pathology Informatics in Chicago. Ryan was also a Sylvia Lawler Oncology Prize finalist at the Royal Society of Medicine, and has been invited to join the Moffitt Cancer Centre Translational Pathology and Imaging Research Group as an international member (Florida, USA). Ryan won a Pathology Visions Speaker Award and was workshop co-presenter with Dr Charles Frevert (University of Washington) and Adam Smith (Merck Serono) at the Pathology Visions 2013 meeting.
- Gemma Logan won the prize for best oral presentation at the Haematology Association of Ireland Annual Meeting which took place on 18 October 2013.



*Dr Fabio Liberante, Dr Sukanya Suresh and Dr Richard Armstrong*



*Dr Karen McCloskey with CCRCB Postgraduate Symposium winners Aidan Cole, Naomi Dickson and Conor Bradley*

A summary of the postgraduate degrees awarded during this period is shown below:

Name	Degree Awarded	Date	Thesis Title
Armstrong, Richard	PhD	December 2012	The effect of demethylation on miRNA expression in acute myeloid leukaemia (Supervisors: K Mills/A Thompson)
Askin, Conal	MPhil	July 2013	Investigating the effects of 118 signalling on epithelial mesenchymal transition in prostate cancer (Supervisors: D Waugh/R Wilson)
Cichon, Ann-Christin	PhD	December 2012	Stromal AKT2 controls epithelial invasion (Supervisors: D McCance/D Patel)
Cochrane, David	MPhil	December 2013	Impact of Estrogen Receptor Alfa Signalling in the Molecular Profiling of FFPE-Derived BRCA1-Deficient Breast Tumours (Supervisors: P Harkin/J Quinn)
Gray, Susannah	PhD	July 2013	Functional innervation and neurogenic dependence of interstitial cells in the urinary bladder (Supervisors: K McCloskey/G McGeown)
Hinds, Lynsey	MD	December 2013	The p53 family, septin scaffolds and epithelial ovarian cancer (Supervisors: H Russell/J Price)
Jones, Claire	MPhil	July 2013	A study of the role of positron emission tomography scanning in the management of colorectal hepatic metastatic deposits and analysis of predictors of disease survival (Supervisors: R Wilson/T Diamond/T Lynch)
Lamers-Schmidt, Elisabeth	PhD	December 2012	Identification and characterisation of novel proliferation-associated BRCA1 transcriptional target genes (Supervisors: P Harkin/J Quinn)
Liberante, Fabio	PhD	December 2012	Investigating the molecular basis for the progression of myelodysplastic syndromes to acute myeloid leukaemia (Supervisors: K Mills/S Zhang)
Majkut, Joanna	PhD	July 2013	Modelling and targeting FLIP's interactions at the DISC (Supervisors: D Longley/J Murray)
McKechnie, Melanie	PhD	July 2013	Relevance of pro-angiogenic signalling as a mode of relapse to anti-androgen therapy in prostate cancer (Supervisors: D Waugh/D Longley)
Roche, Muireann	MD	December 2012	The role of Septin 6 in the progression of malignant melanoma (Supervisors: H Russell/P Hall)
Suresh, Sukanya	PhD	December 2012	CCN3 in Chronic Myeloid Leukaemia Regulation and Signalling (Supervisors: S Irvine/K Mills)
Trainor, Colman	PhD	July 2013	Cellular responses following exposure to modulated radiation fields (Supervisors: K Prise/A Hounsell)
Tripathi, Shailesh	PhD	July 2013	Statistical models for cancer gene expression data and visualization of biological networks (Supervisors: F Emmert-Streib/A Albrecht/K Mills)
Zaharieva, Elena	PhD	December 2012	Inflammatory responses in irradiated endothelial cells (Supervisors: K Prise/G Schettino)

# Clinical Academic Training Programme

The Clinical Academic Training Programme (CATP) at Queen's University Belfast was established in conjunction with the Northern Ireland Medical and Dental Agency (NIMDTA) and the Belfast Health and Social Care Trust in 2008 to provide a unique opportunity for highly motivated individuals who want to excel in both clinical and academic training. The three programmes available are: Academic Foundation (AF2) – a four month placement which enables the trainee to gain insights into clinical academic medicine at an early stage through regular interaction with academic clinical supervisors and scientific staff. The Academic Clinical Fellow (ACF) is targeted at doctors in the early years of specialty training. This is a two-year funded programme, attracts a National Training Number (academic), and allows the ACF to develop academic skills simultaneously with specialty clinical skills. This academic training environment is aimed at helping the ACF prepare a competitive application for a training fellowship to undertake a higher degree. The Academic Clinical Lecturer (ACL) post offers exciting opportunities for aspiring trainees who are considering a career in clinical academic medicine. These posts are designed for doctors who have already obtained a higher degree. Trainees will finish their clinical training while continuing academic development at post-doctoral level.

The CATP Committee oversees the academic progression of the trainee in ACL, ACF and AF2 programmes. The CATP Committee is comprised of members from the School of Medicine, Dentistry and Biomedical Sciences at Queen's University Belfast, NIMDTA and the Belfast Health and Social Care Trust. The Committee approves and appoints supervisors and allocates trainees to the appropriate Research or Education Centre within the School of Medicine, Dentistry and Biomedical Sciences. Progress is reviewed at the end of each AF2 placement and at six monthly intervals for the ACF and ACL trainees. In CCRCB we have successfully had trainees on all levels of the Clinical Academic Training Programme and the current trainees within the Centre are listed in the table below.

For further information on the Clinical Academic Training Programme contact the Programme Administrator, Ms Valerie Reid (v.reid@qub.ac.uk), School of Medicine, Dentistry and Biomedical Sciences.



Programme	Name	Period
ACL	Turkington, Richard (Supervisors: P Johnston/S Van Schaeybroeck)	1 August 2011 – 31 July 2014
ACF	Campbell, Patrick (Supervisors: K McCloskey/J Price)	1 August 2012 – 31 July 2014
AF2	Forde, Claire (Supervisor: M Salto-Tellez)	7 August 2013 – 6 December 2013
AF2	Yu Sun, Julia (Supervisor: J O'Sullivan)	4 December 2013 – 1 April 2014

# Undergraduate Programme



**KEN MILLS**  
Associate Director for  
Undergraduate Studies

The role of Associate Director for Undergraduate Studies was formed in 2012 to coordinate and link the CCRCB contribution to the various teaching activities in the School Education Centres. CCRCB researchers coordinate and lecture on a range of biomedical, medical and dental modules at all levels of undergraduate course. In addition, around 40 Biomedical Level 3 undergraduate students and Intercalated students undertake their research projects across the various focus groups within the CCRCB.

During 2012-2013, the Biomedical Education Centre in collaboration with the research centres introduced "Research Discovery Days" for 1st year students. This has involved groups of students visiting the CCRCB and being introduced to the focus groups' cancer research activities. This will be a rolling programme with the visits and mentoring continuing as the students progress through Level 2 and 3. A new showcase of "research into the clinic" was introduced for 1st year medical students in the first semester from 2013.

The CCRCB Summer Research Programme is now well established across the CCRCB and provides an excellent opportunity for promising young students to undertake a short laboratory based research project for eight weeks over the summer period. The students benefit from learning laboratory techniques, data analysis and interpretation and are required to write a research report and present their work at a CCRCB summer student symposium. In 2012 and 2013, around 25 students were on the Programme representing a mix of QUB and external students on biomedical, science, medicine or dentistry courses, from across Northern Ireland, the UK, the Republic of Ireland and the USA. The studentships were funded by the School, CCRCB, Pathology Society, Biochemistry Society, Leukaemia Lymphoma Research, Leukaemia & Lymphoma NI, Friends of the Cancer Centre, the Haemophilia Centre and the EU EpoCan project.

Details of the Undergraduate Education Programmes offered within the School of Medicine, Dentistry and Biomedical Sciences can be found at [www.qub.ac.uk/schools/mdbs/students](http://www.qub.ac.uk/schools/mdbs/students).



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# PUBLIC ENGAGEMENT ACTIVITIES



# Public Engagement Activities

Here at CCRCB we are proud of our pioneering research and want people across Northern Ireland to share this pride – and understand the real impact it could have on cancer prevention, detection and care in the future. In this section we highlight the successes from the year.

CCRCB is part of the Belfast Cancer Research UK Centre – one of 18 Cancer Research UK (CRUK) designated Centres of Excellence across the UK. This virtual Centre encompasses a network of scientists, doctors and nurses based at the Northern Ireland Clinical Trials Centre and the five Cancer Units located in hospitals across the region, as well as the CCRCB. The Centre brings doctors, scientists and nurses closer together so that developments in cancer research can be taken swiftly from the bench to the bedside.

Public engagement is central to the Belfast CRUK Centre strategy – bringing to life the ground-breaking research taking place at CCRCB to build support for this work within the local community. Our researchers are key to this engagement work, regularly giving talks to people about their work, hosting interactive tours of the laboratories, and often volunteering their time for fundraising events. Launched in 2009, when the CCRCB was awarded Cancer Research UK Centre status, our public engagement programme continues to demonstrate the impact of our research to people across Northern Ireland.

Other charities provide funding to CCRCB and also contribute to our public engagement activities and outreach programmes. For example, CCRCB regularly welcomes supporters and volunteers of local charities such as the Leukaemia & Lymphoma NI, Friends of the Cancer Centre, Cancer Focus NI, Brainwaves NI and other national charities.

## Award for one of our leading public engagement champions

For many years CRUK Senior Research Nurse, Ruth Boyd, has been a passionate and active champion of public engagement, speaking to thousands of people across Northern Ireland about our work. In recognition of her outstanding efforts to engage the public with cancer research in Northern Ireland, Ruth was awarded the CRUK Research Engagement Flame of Hope Award in May 2013. This Award is given to someone who has shown exceptional commitment to raising awareness of CRUK's pioneering research and who has been an inspiring spokesperson for CRUK.

## Bringing local research to life

Messages about the research taking place at the Belfast CRUK Centre reached over 9,000 people across the region during the year. People who have supported CRUK and others interested in local cancer research are invited to the CCRCB to hear about our work from the researchers themselves. Our researchers also guide groups through interactive tours of the laboratories – bringing local research to life and explaining the impact their work could have on cancer detection and treatment in the future. This year 127 people took part in these lab tours, and an additional 220 people participated in other events in the Centre.

Our researchers also take time out of their work to attend community events where they talk to people about our work. Our researchers volunteered at **over 50 events** this year, including the CRUK Race for Life in Belfast and the Relay for Life in Banbridge – **reaching over 6,000 people** at these events alone. Two of our Clinical Research Nurses, Ashlene Alexander and Kirsty McKay, spoke at the Race For Life, generating huge support from the audience. Altogether there were **195 instances of researcher engagement** this year.

Scientists at CCRCB and CRUK funded Research Nurses from across the region joined Channel 4 and Cancer Research UK for Stand Up To Cancer in October 2012. They handed over their locks to make their hair stand on end for a promotional photoshoot and called on people to get involved in the campaign. With their help over £8m was donated across the UK to fund translational cancer research.

## Inspiring the next generation of cancer researchers

CCRCB is committed to inspiring the next generation of cancer researchers and hosts an annual programme of events for schools. This year we launched two new events for students to inspire them to pursue a career in cancer research by showing students the realities of the cancer research environment and the opportunities science education can create.

Thanks to a grant from Research Council UK, 90 students in years 9 and 10 participated in our 'Inspiring Lives-Creating Futures' event at the CCRCB. We also launched our first Northern Ireland-wide competition for AS-level Biology students, in partnership with CRUK and Almac. The competition concluded with students spending a day in the CCRCB labs where they had the opportunity to learn about the different careers available to them through a 'speed dating' session with researchers from different fields of cancer research.

In June we once again hosted our annual Information Day for teachers to bring them into contact with the most recent cancer research developments and techniques relevant to the A Level syllabus. The third event of its kind, it received excellent feedback from the teachers who attended. Teachers heard talks from some of our leading researchers on gene technology and DNA testing. They also had the opportunity to work alongside our researchers in the labs. In three years of hosting this event we have supported over 115 teachers from across NI to help them teach and encourage their students to pursue a career in cancer research at Queen's.

## Celebrating International Clinical Trials Day

For the first time this year we joined forces with the CRUK funded Clinical Research Nurses from across Northern Ireland to run simultaneous events at Cancer Units across Northern Ireland to celebrate International Clinical Trials Day. International Clinical Trials Day was created in memory of James Lind who pioneered the fair testing of treatments for healthcare. Each year it is held on or near his birthday.

Events were held in the Cancer Centre in Belfast, as well as Antrim Area Hospital, Craigavon, Ulster and Altnagelvin hospitals. The nurses engaged with staff, patients and their families, carers and members of the NI Cancer Research Consumer Forum also added their voice to the day, featuring stories about their involvement in trials on posters and attending the stand at the Cancer Centre to talk to patients.

Our activities helped to raise awareness of the role of CRUK and the NI Cancer Trials Network in enabling groundbreaking clinical trials and highlighted how trials have led to advances in preventing, detecting and treating cancer that have saved many thousands of lives.

## Cancer awareness and prevention

Prevention and early diagnosis are important strategies toward beating cancer sooner. During the year, the CRUK Senior Nurse, based at the NI Cancer Trials Centre, attended 13 health events in a range of communities and workplaces, helping to raise awareness of healthy lifestyle factors that help reduce the risk of cancer, and call attention to the signs and symptoms of cancer and the value of seeking medical advice. In June this year the CRUK Senior Nurse and CRUK/HSC R&D co-funded Network Nurses joined forces with the CRUK Cancer Awareness Roadshow, supporting the community outreach of vital cancer information and health assessments and promoting the take up of screening programmes.

## Building high profile support

This year we received several visits from high profile supporters of the CCRCB, including amongst other guests the Health Minister, Edwin Poots MLA, who marked the official opening of the NI Molecular Pathology Laboratory and Biobank here at the CCRCB. The Lord Mayor of Belfast, Alderman Gavin Robinson, also came to show his support in November 2012 for our team of researchers who took part in Movember to raise funds for prostate cancer research. In August 2013, 30 players, management and staff from Ulster Rugby visited CCRCB as part of their partnership with CRUK, who are Ulster Rugby's Charity of the Year for the 2013/14 season.

## About the Belfast Cancer Research UK Centre

The Belfast CRUK Centre is a partnership between Cancer Research UK, Queen's University Belfast, the Health and Social Care Research and Development Division of the Public Health Agency of Northern Ireland and the Belfast Health and Social Care Trust.

The Centre's public engagement strategy is delivered by Margaret Carr, Cancer Research UK's Research Engagement Manager. Based in the CCRCB, Margaret works closely with our researchers to identify opportunities to take information about our research out into the community.

To find out more about our public engagement programme email [margaret.carr@cancer.org.uk](mailto:margaret.carr@cancer.org.uk) or call 028 9097 2715.



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# STAFF LISTING



## New Appointments



MARGARET CARR  
CRUK Research Engagement Manager

Margaret joined us as the Belfast Cancer Research UK Centre's new Research Engagement Manager at the beginning of August 2013.

As the Belfast Research Engagement Manager, Margaret's role is to engage a wide range of people in Belfast and across Northern Ireland with the research taking place in their community. Audiences include people affected by cancer and their families, CRUK supporters, politicians and journalists, as well as the general public.

Margaret engages these different audiences in a variety of ways, arranging talks about CRUK funded clinical and lab-based research and bringing the research to life through interactive tours of the labs in the CCRCB. Research engagement also means finding opportunities for researchers to go out and speak about their work at community events in order to reach more people and build greater support for the pioneering research taking place here at the Centre.

Teachers and students are also a vital audience for the Centre, which has a clear commitment to hosting events and activities that inspire the next generation of cancer researchers. Margaret will be working with colleagues in the CCRCB to expand the annual teachers' and schools' days, and to develop the new schools' competition, which launched for the first time this year.

Margaret also works closely with the press teams at CRUK and the other Centre partners to ensure that exciting new research developments make the news and raise the profile of the Centre.

Margaret will also be instrumental in keeping the central CRUK Policy team up to date on issues in Northern Ireland affecting cancer research, diagnosis and treatment, such as early diagnosis, research funding and regulation and radiotherapy provision. She will work with local politicians, statutory health bodies and others to promote CRUK's policies on these issues.

Before joining us, Margaret was most recently Engagement Officer for Age NI, working with older people's groups across Northern Ireland to widen and strengthen their input into consultations on health and social care. Prior to that, Margaret was Fair Trade Manager for Oxfam Ireland for 12 years.

To contact Margaret or find out more about her role email: [margaret.carr@cancer.org.uk](mailto:margaret.carr@cancer.org.uk) or call: 028 9097 2715.



## MARK LAWLER

### Chair in Translational Cancer Genomics

Mark Lawler was appointed to the Chair in Translational Genomics at Queen's University Belfast and joined the Centre in April 2013. His career has been characterised by providing academic leadership in cancer research, establishing and implementing research programs which aim to improve our knowledge of the cancer process and translate this information to clinical practice. Genetics has been his passion since his undergraduate degree in Genetics in Trinity College Dublin (TCD). His interest in translational/experimental medicine was first sparked during his PhD, a collaborative project between TCD and St James's Hospital Dublin. He then moved to the Sir Patrick Dun Research Laboratories at St James's Hospital and undertook research in understanding the biology of haematological malignancies and how this knowledge can benefit patients. His research resulted in a number of national/ international awards and led to the development of a molecular test now in widespread use in haematology/bone marrow transplant laboratories throughout the world. Recognising the importance of applying discovery science in clinical medicine, he established the Cancer Molecular Diagnostics laboratory at St James's Hospital, the first of its kind in the country.

His research expanded to include solid tumours, with a particular focus on the genetics of prostate cancer. He was co-founder of the Prostate Cancer Research Consortium, an interdisciplinary trans-institutional initiative to foster advances in prostate cancer research. "I am extremely excited to be joining a cadre of high quality researchers here at Queen's University – it represents a huge opportunity for me to contribute to the development of research initiatives that will impact on the lives of cancer patients and their families.

The research ethos at QUB resonates with my own philosophy, we should be competing against cancer, not against each other". Prof Lawler believes that research leadership should also reflect teaching leadership, and has been at the forefront of academic teaching, defining and implementing policy in his role as Director of Postgraduate Teaching and Learning at TCD, whilst developing and delivering a series of innovative education programs, particularly in 4th level education, both nationally and at European level. He also has a keen interest in both research and cancer policy and was a key member of the Ireland-Northern Ireland-National Cancer Institute Consortium, serving on its Scientific Advisory Committee and Chair of the Scholar Exchange Committee. He sits on a number of European Commission/European Research Council Committees and is currently involved in a pan European initiative on cancer care in Europe.

Mark is married to Ruth and they have two children Sarah and Emily. He has a keen interest in the arts and is involved in a number of literary/cultural heritage projects.



## TIM HARRISON

### McClay Professor of Medicinal Chemistry

Tim Harrison joined CCRCB in June 2013 having been appointed to the position of McClay Professor of Medicinal Chemistry. He obtained a first class BSc degree in chemistry from Nottingham University, and then stayed at Nottingham to complete a PhD in synthetic organic chemistry with Professor G Pattenden, studying the application of new radical chemistry in organic synthesis. Tim then moved to the University of California at Irvine to undertake postdoctoral studies with Professor L Overman aimed toward natural product synthesis using oxonium and iminium-ion rearrangements.

In 1991 Tim joined Merck Sharp and Dohme in Harlow, UK where he worked for 15 years, eventually rising to the position of Director, Medicinal Chemistry Department. During this time, Tim played a leading role in a number of Merck's drug discovery research programmes, several of which led to clinical candidates. Tim was recipient of the 2004 Thomas Alva Edison Patent Award as part of the team which identified the marketed Substance P antagonist Emend®. In 2006, he joined Almac Sciences as Vice President, Research and Development, and during this time played a key role in setting up Almac Discovery, where he currently holds the post of Vice President Discovery Chemistry. In 2011 Tim, together with Professor Richard Kennedy, was involved in the development of a joint collaborative programme with Queen's University, Belfast, focused on the identification of new oncology targets together with drug leads. Using this programme as a template, he then played a key role in establishing a new expanded 3 year, industrial-academic drug discovery collaboration in 2013 between Almac and the Centre for Cancer Research and Cell Biology at QUB. As part of this new collaboration, the McClay Chair of Medicinal Chemistry was created at CCRCB. Tim is the inaugural holder of this Chair and now splits his time between this academic role and his Almac position. He sits on several external boards and advisory groups, and is author or inventor on over 120 papers and patents.

Speaking about his new role, Professor Harrison commented: "the past decade has seen a transformation in the pharmaceutical industry, and the downsizing and externalization of R&D within large pharmaceutical companies has provided an opportunity for small biotech's and Universities to develop innovative drug discovery programmes and technologies. Whilst this can be achieved individually, there also exists the opportunity to develop new industrial-academic partnerships which build upon the respective strengths of the two organisations in basic research and product development. I am excited to be involved in implementing such a new model within Northern Ireland, particularly as I believe it will enhance the probability of successfully bringing new medicines to patients".



**VICKY COYLE**  
Clinical Senior Lecturer in  
Medical Oncology

Vicky Coyle joined CCRCB as a Senior Lecturer in April 2013. She graduated from Queen's University medical school in 1998 and entered medical oncology training in 2002. Following a PhD in the field of genomic markers in colorectal cancer she was an Academic Clinical Lecturer (ACL) in Medical Oncology in CCRCB in 2009/2010. Her research interests are in clinical and translational research in colorectal cancer and in clinical trials, in particular, early phase trials in colorectal cancer and melanoma.



**SUNEIL JAIN**  
Clinical Senior Lecturer in  
Radiation Oncology

Suneil Jain was appointed as Clinical Senior Lecturer at Queen's University Belfast in December 2012. Originally a Queen's University medical graduate in 1999 Dr Jain went on to train in Clinical Oncology at the Northern Ireland Cancer Centre. A period of full-time research enabled attainment of a PhD in 2010, in radiobiology and nanotechnology in prostate cancer, again from Queen's University Belfast. It was during this time that Dr Jain developed an interest in prostate cancer clinical research. To gain further experience in clinical trials he undertook a clinical fellowship at the Sunnybrook Odette Cancer Centre, University of Toronto in 2011. During this time he

gained extensive experience in stereotactic radiotherapy and image guidance for lung and prostate cancer. He also gained expertise in low and high dose-rate brachytherapy and transperineal biopsies, techniques he is implementing in the Northern Ireland Cancer Centre.

This background has led to Dr Jain's current interests in clinical-translational prostate cancer research, stereotactic hypofractionated radiotherapy, tissue procurement for clinically relevant cancer modelling and biomarkers of normal tissue radiation damage.



**SIMON McDADE**  
Lecturer in Signal Transduction  
and Gene Regulation

Simon McDade was appointed as a lecturer in CCRCB in December 2012. Prior to taking up this post Dr McDade carried out postdoctoral research in the laboratory of Professor Dennis McCance in the CCRCB investigating the role of p63 and its interplay with the tumour suppressor p53. It was during this time and time spent as a visiting scientist at the Institute for Cancer Research in London that he developed his interest in next generation sequencing and its application in defining the

transcriptional networks regulated by the p53 family. P53 is mutated in more than fifty percent of all cancers and this correlates with poor outcome and resistance to therapy. The ultimate goal of the group's research is to use integrative genomic strategies to identify changes that occur as a result of p53 mutations which could be exploited to specifically target mutant p53 expressing tumours.



**KIENAN SAVAGE**  
Cancer Focus Northern Ireland  
Lecturer in Molecular Oncology

Kienan Savage was appointed to the position of Cancer Focus Northern Ireland Lecturer in Molecular Oncology in November 2012. Kienan originally completed his Bachelor of Biomedical Science at Griffith University, in Queensland Australia. He followed this with a joint MBBS/PhD programme at the University of Queensland and the Queensland Institute of Medical Research, where he carried out his PhD studies in the lab of Professor Kum Kum Khanna.

Kienan's PhD focused on the involvement of DNA damage response and repair proteins in the development and progression of breast cancer during which he demonstrated the involvement of the BRCA1 protein in

the G1/S checkpoint, characterised the role of KAP-1 phosphorylation in chromatin remodeling and DNA repair and helped with the discovery of the novel DNA repair protein hSSB1. Following his PhD in 2007 Kienan joined Professor Paul Harkin's group as a post-doc where his work focused on identifying and characterizing novel proteins that co-operate with BRCA1 in the cellular DNA damage response.

Kienan's current work focuses on understanding the novel role of the mRNA splicing machinery in the cellular DNA damage response and how mutations in these proteins affect cancer development progression and response to treatment.

# Current Staff

(as at 31 December 2013)

## ACADEMIC STAFF

### Professors:

Professor Charles Campbell	Professor Dennis McCance
Professor Karl Hale	Professor Mary Frances McMullin
Professor Peter Hamilton	Professor Ken Mills
Professor Paul Harkin	Professor Joe O'Sullivan
Professor Tim Harrison (McClay Professor in Medicinal Chemistry)	Professor Kevin Prise
Professor Patrick Johnston	Professor Manuel Salto-Tellez
Professor Richard Kennedy (McClay Professor in Medical Oncology)	Professor Chris Scott
Professor Mark Lawler	Professor David Waugh

### Readers:

Dr Fred Currell	Dr Marie Migaud
Dr Dan Longley	Dr Richard Wilson
Dr Karen McCloskey	

### Senior Lecturers:

Dr Vicky Coyle	Dr Jackie James
Dr Mohamed El-Tanani	Dr Paul Mullan
Dr Frank Emmert-Streib	Dr Sandra Van Schaeybroeck (CRUK Clinician Scientist Fellowship)
Dr Tom Flannery	Dr Kate Williamson
Dr Suneil Jain (Friends of the Cancer Centre)	

### Lecturers:

Dr Simon McDade	Dr Alex Thompson
Dr Konstantin Panov	Dr Richard Williams
Dr Daksha Patel	Dr Shu-Dong Zhang
Dr Kienan Savage (Cancer Focus NI)	

## HONORARY STAFF

Dr Ian Banks	Dr Maurice Loughrey
Ms Ruth Boyd	Dr Tom Lynch
Dr Mark Catherwood	Dr Perry Maxwell
Dr Tim Davison	Professor Glenn McCluggage
Dr Glenn Dickson	Dr Conor McGarry
Dr Brian Duggan	Dr Stuart McIntosh
Dr Martin Eatock	Dr Damian McManus
Professor Dean Fennell	Dr Stephen McQuaid
Dr Gerry Hanna	Dr Melanie Morris
Dr Ian Harley	Professor Patrick Morrison
Professor Alan Hounsell	Dr James Murray
Dr Sandra Irvine	Dr Declan O'Rourke
Dr Colin James	Dr Melanie Percy
Dr Iain James	Dr Giuseppe Schettino
Professor Terry Lappin	

## SCIENTIFIC FELLOWS

Dr Niamh O'Brien (Breast Cancer Campaign)

## CLINICAL RESEARCH FELLOWS

James Beirne (HSC R&D Division)  
David Boyle (CRUK)  
Aidan Cole (Joint Royal College of Radiologists/CRUK Fellowship)  
Catherine Davidson (CRUK)  
Sonali Dasgupta (CRUK)

Gareth Irwin (HSC R&D Division)  
Ciara Lyons (QUB)  
Michael Moran (HSC R&D Division)  
Eileen Parkes (CRUK)

## RESEARCH STAFF

Shahnaz Al Rashid (Brainwaves/QUB)  
Peter Bankhead (Invest NI)  
Karl Butterworth (UK Department of Health, Radiation Protection Programme)  
Basak Celtikci (CRUK)  
Pankaj Chaudhary (MRC)  
Hilary Colyer (QUB)  
Lisa Crawford (BCH Charitable Funds)  
Nyree Crawford (EU)  
El Habib Dakir (Invest NI)  
Sabine Dalleau (Invest NI)  
Zenobia D'Costa (Breast Cancer Campaign)  
Ravi Deevi (CRUK)  
Ricardo de Matos Simoes (Invest NI)  
Philip Dunne (CRUK)  
Mihaela Ghita (MRC)  
Catherine Higgins (Wellcome Trust)  
Caitriona Holohan (CRUK)  
Simon Horn (UK Home Office, Health Protection Agency)  
Kerry Anne Hughes (Invest NI)

Joy Kavanagh (EU)  
Fabio Liberante (Leukaemia & Lymphoma NI)  
Joanna Majkut (Wellcome Trust)  
Adnan Malik (Wellcome Trust)  
Kyle Matchett (EU)  
Pamela Maxwell (CRUK)  
Darragh McArt (QUB)  
Clare McCourt (QUB)  
Cheryl McFarlane (Invest NI/McClay Foundation)  
Melanie McKechnie (CRUK)  
Stephen McMahon (CRUK)  
Julia Miskelly (MRC)  
Nuala Mulgrew (Leukaemia & Lymphoma Research)  
Adam Pickard (MRC)  
Keara Redmond (CRUK)  
Kelly Redmond (Breast Cancer Campaign)  
Joel Riley (Wellcome Trust)  
Daniela Schmid (MRC)  
Kirtiman Srivastava (MRC)  
Izabela Stasik (British Lung Foundation)  
Yinhai Wang (EU)

## ALMAC SECONDED STAFF

Oliver Barker  
Alan Brown  
Frank Burkamp  
Gerald Gavory  
Peter Hewitt  
Dominic Janssen  
Linda Jordan  
Keeva McClelland  
Mary McFarland

Hugues Miel  
Krzysztofa Odrzywol  
Colin O'Dowd  
Natalie Page  
Shane Rountree  
Steven Shepherd  
Graham Trevitt  
Andrea Valentine  
Andrew Wilkinson

## TECHNICAL STAFF

Ken Arthur  
Conal Askin (CRUK/HSC R&D Division)  
Victoria Bingham (CRUK)  
Anne Carson (HSC R&D Division)  
Gail Carson (Invest NI)  
Alan Coffey  
Josephine Dutton  
Cathy Fenning (CRUK/EU)  
Marc-Aurel Fuchs (Friends of the Cancer Centre)  
Paula Haddock (Breast Cancer Campaign)  
Anne Jordan (Leukaemia & Lymphoma NI)

Claire Lagan (CRUK)  
Oksana Lyubomska (MRC)  
Angelina Madden (Cancer Focus NI)  
John McCotter  
David McGibbon  
Claire McGready (CRUK)  
Gordon McGregor  
Kirsty McLaughlin (CRUK)  
Tatiana Panova (Invest NI/McClay Foundation)  
Gaurang Patel (CRUK)  
Maria Rea

## ADMINISTRATIVE

Margaret Carr (CRUK Research Engagement Manager)  
Priscilla Clark (NI Biobank Administrator)  
Sharon Dunwoody (CRUK Centre Administrator)

Beryl Graham (Centre Manager)  
Julie Hunter (Clinical Trials Administrator, HaBio)

## CLERICAL

Jane Arbuthnot  
Claire Atchison (Leukaemia & Lymphoma NI)  
Ruth Beattie  
Jenni Byers (CRUK)  
Caroline Crothers (Leukaemia & Lymphoma NI)  
Julie McClean (Almac/Invest NI)

Frances McCormick  
Anne McRoberts  
Linda Megrath  
Noreen Rafferty  
Katie Stewart



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## Obituary



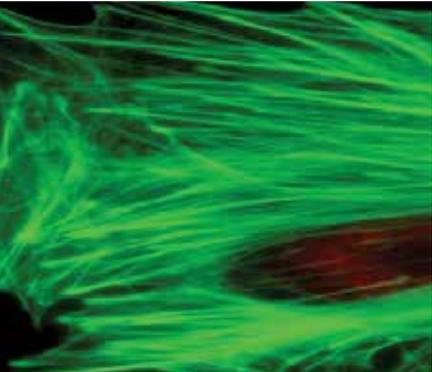
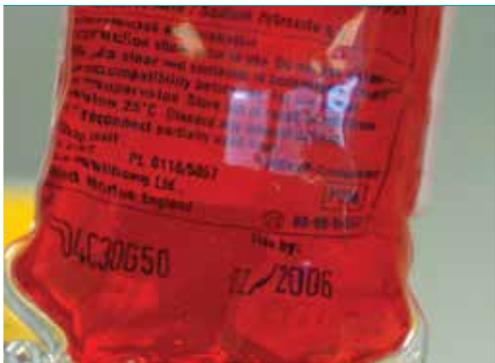
DR JENNIFER QUINN-O'BRIEN  
(1974-2013)

The sudden and tragic death of Jenny Quinn-O'Brien shocked and saddened all who knew her. Jenny was a member of the School of Medicine, Dentistry and Biomedical Sciences from October 1997 when she joined the former Department of Oncology as a PhD student. Jenny was an outstanding student (evidenced by the number of awards she received and the numerous times she featured in previous CCRCB bulletins) and quickly progressed to a postdoctoral research fellow position in 2001. In 2007 Jenny was awarded a personal Breast Cancer Campaign Research Fellowship and was appointed to a lectureship position in CCRCB in December 2012. Jenny was tireless in her support of the Breast Cancer Campaign organising many 'Wear it Pink' coffee mornings in the Centre to raise funds for the charity. She was a great role model for the postgraduate research students and postdocs within the School.

Jenny was focused on a career in medical research and concentrated particularly on breast and ovarian cancer research. She was instrumental in the establishment of BRCA Link NI, a support group for families affected by the BRCA gene mutation. Not only was Jenny an expert scientist she was also a gifted lecturer, receiving excellent reviews from her students.

Jenny will be remembered as a devoted wife, a loving mum, a great colleague who set the highest personal standards, and was great fun to be with. Jenny will be greatly missed and never forgotten by her colleagues and friends in CCRCB.

# MAJOR SOURCES OF FUNDING



# Funding Bodies

The work of our research groups would not be possible without the substantial grant funding from our sponsors and from generous donations. Our major sources of funding include:

## Research Councils

Biotechnology and Biological Sciences Research Council (BBSRC)  
Engineering and Physical Sciences Research Council (EPSRC)  
Medical Research Council (MRC)

## Charities

Action Cancer  
Association for International Cancer Research (AICR)  
Brainwaves Northern Ireland  
Breast Cancer Campaign  
British Heart Foundation  
British Lung Foundation  
Cancer Focus Northern Ireland  
Cancer Research UK (CRUK)  
Friends of the Cancer Centre  
Leukaemia and Lymphoma Northern Ireland (formerly NILRF)  
Leukaemia and Lymphoma Research  
Nuffield Foundation  
Prostate Cancer UK  
Wellcome Trust

## Companies

Almac Diagnostics  
Almac Discovery  
Amgen  
Astra Zeneca  
Boehringer Ingelheim Ltd  
Bristol-Myers Squibb  
Celgene  
i-Path XL  
Leica  
Merck Serono  
Pfizer Ltd  
PharmaMar  
Pierre Fabre  
Randox  
Roche

## Government

British Council  
Health and Social Care (HSC) Research and Development (R&D) Division of the Public  
Health Agency of Northern Ireland  
Belfast Health and Social Care Trust (BHSCT)  
EU Framework 7  
EU Marie Curie Scheme  
National Institutes of Health (NIH)  
UK Home Office

## Societies

Biochemical Society  
Pathological Society  
Royal Society

## Agencies

Invest Northern Ireland



# Research Grants Awarded

(from 1 August 2012 - 31 December 2013)

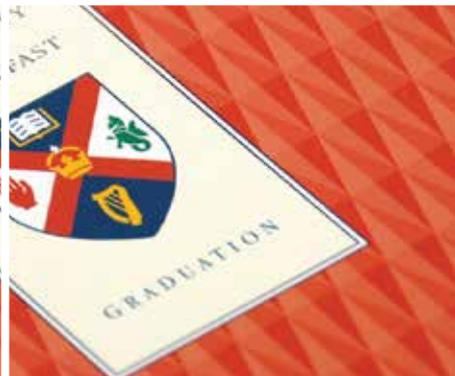
Investigator(s)	Sponsor	Title of Project	Amount	Period
Borghesi, Marco* Prise, Kevin Zeph, Matthew* Kar, Satyabrata*	EPSRC Programme Grant	Advanced laser-ion acceleration strategies towards next generation healthcare	£2,203,843	01/05/2013 - 30/04/2019
*School of Mathematics and Physics				
El-Tanani, Mohamed	Invest NI	Dissect the ran axis in diagnosis, prognosis and therapy of epithelial cancers	£9,492	01/11/2012 - 30/04/2013
El-Tanani, Mohamed	Invest NI	Technology development plan for Ran Assay: Early prediction of metastasis risk in cancer patients, treatment and follow up care	£27,255	01/11/2012 - 30/04/2013
El-Tanani, Mohamed	Invest NI - PoC	Development of antibodies to detect RAN (breast and lung cancer)	£106,000	01/05/2013 - 30/04/2014
Emmert-Streib, Frank	Invest NI - PoC	Visualisation of Complex Networks	£102,507	01/01/2014 - 31/12/2014
Haigh, Dave Longley, Dan Haider, Shozeb Johnston, Patrick	Wellcome Trust	SDDI – FLIP-FADD	£3,991,143	01/12/2012 - 30/11/2015
Hamilton, Peter	British Lung Foundation	MesoBank	£70,000	01/09/2012 - 31/08/2015
Hamilton, Peter	Invest NI - PathXL	Cancer predictive biomarker discovery and development programme	£492,853	01/06/2013 - 31/05/2016
Harkin, Paul Savage, Kienan	MRC	Functional characterisation of a novel BRCA1-mRNA splicing complex that is mutated in multiple cancers	£669,626	01/09/2013 - 31/08/2017
Harkin, Paul Savage, Kienan	Invest NI - PoC	Novel Cancer Genes	£105,999	01/10/2013 - 30/09/2014
Irvine, Sandra	Leukaemia & Lymphoma NI	Consumable funds	£10,000	01/09/2012 - 31/08/2013
Irvine, Sandra	Leukaemia & Lymphoma NI	Travel fund	£2,000	01/09/2012 - 31/08/2013
Irvine, Sandra	BCH Charitable Funds	Development of sensitive active-site dependent ELISAs for profiling proteasome subunit activities	£100,752	01/08/2013 - 31/07/15
Johnston, Patrick Longley, Dan Van Schaeybroeck, Sandra	Cancer Research UK	Identification and targeting of clinically relevant molecular and genetic subtypes in colorectal cancer	£995,104	01/08/2012 - 31/07/2017

Investigator(s)	Sponsor	Title of Project	Amount	Period
Kennedy, Richard Mullan, Paul	MRC	Development of a biomarker for the SRC pathway in ovarian cancer	£84,038	01/03/13 - 31/07/15
Kennedy, Richard	Invest NI - PoC	Development of a predictive assay to guide prostate cancer therapy decisions	£105,993	01/07/13 - 30/06/14
Kennedy, Richard Mullan, Paul Jain, Suneil	Cancer Research UK	Functional characterisation of a novel subgroup of prostate cancer with distinct metastatic biology (Clinical Research Fellowship)	£256,817	01/10/13 - 30/09/16
Longley, Dan Scott, Chris Van Schaeuybroeck, Sandra	MRC	Development of EGFR-targeted camptothecin-loaded nanoparticles for targeting Kras wild-type colorectal cancer	£87,152	01/03/13 - 31/07/15
Mills, Ken	Celgene	An in vitro and molecular study of possible combination therapies involving Azacytidine and Romidepsin for myelodysplastic syndrome (MDS) – PhD Studentship	£120,047	01/10/12 - 30/09/15
Mills, Ken	Leukaemia & Lymphoma NI	Funding for Post Doctoral Research Fellow – Fabio Liberante	£13,500	01/01/13 - 30/04/13
Mills, Ken	Leukaemia & Lymphoma NI	Summer Studentships 2013	£6,000	01/07/13 - 31/08/13
Mills, Ken	Leukaemia & Lymphoma NI	Golden Anniversary Research Award	£496,000	01/10/14- 30/09/17
Mullan, Paul Quinn, Jennifer	Charitable Funds – Samaritan Fund	Characterising the cell or origin of high grade serous ovarian cancer	£20,075	01/10/12 - 31/09/13
Mullan, Paul Kennedy, Richard	Breast Cancer Campaign	The identification of senescence bypass markers	£19,990	01/01/13 - 31/12/13
Mullan, Paul Williams, Rich	Darren Clarke Foundation	Characterisation of a novel TBX2-CST6-Legumain oncogenic signalling pathway and development of specific LGMN inhibitors for the treatment of poor prognosis breast cancers	£80,000	01/10/13 - 30/09/16
O'Sullivan, Joe	Friends of the Cancer Centre	Clinical Research Fellowship in Clinical Oncology	£180,000	01/05/14- 30/04/17
Prise, Kevin (PI Sandrine La-combe, CNRS, Paris, France)	European Union FP7 Marie Curie Training Network	Advanced Radiotherapy, Generated by Exploiting Nanoprocesses and Technologies – ARGENT	€736,000 (of €7,500,000 grant)	01/09/2012 - 31/08/2013
Quinn, Jennifer Salto-Tellez, Manuel Mullan, Paul	HSC R&D Fellowship	Characterising the cell of origin of high grade ovarian cancer	£192,265	01/08/13 - 31/07/16
Salto-Tellez, Manuel Coyle, Vicky Wilson, Richard	Sean Crummey Memorial Fund	Establishing personalised medicine in the treatment of rectal cancer: predictors of response to preoperative chemoradiotherapy and radiotherapy, and description of therapy-related genomic changes (PhD studentship)	£60,000	01/10/13 - 30/09/16
Savage, Kienan Harkin, Paul	Darren Clarke Foundation	PhD Studentship	£80,000	01/10/13 - 30/09/16

Investigator(s)	Sponsor	Title of Project	Amount	Period
Turkington, Richard	BHSCT Charitable Funds	Identification of Molecular Biomarkers to Neo-adjuvant Chemotherapy	£70,626	01/10/12 - 30/09/14
Van Schaeybroeck, Sandra Johnston, Patrick	QUB Foundation	Tom Moran Studentship	£64,397	01/10/13 - 30/09/16
Van Schaeybroeck, Sandra Johnston, Patrick Salto-Tellez, Manuel Wilson, Richard Kennedy, Richard Longley, Dan Lawler, Mark	EU	MErCuRIC	£265,322	01/10/13-30/09/18
Waugh, David Van Schaeybroeck, Sandra	Invest NI	A phase Ib/II study of combined MEK/cMET inhibition in KRASMT KRASWT CRC patients	£7,875	01/01/13 - 30/06/14
Waugh, David	Medical Research Foundation	Training and Skills Development Award	£1,707	01/04/13 - 31/03/14
Waugh, David Williams, Rich Wilson, Richard Harkin, Paul Johnston, Patrick Kennedy, Richard Longley, Dan Mullan, Paul O'Sullivan, Joe Prise, Kevin Salto-Tellez, Manuel	Invest NI / Almac	Establishment of an integrated Almac/QUB Drug Discovery Unit at CCRCB	£5,491,910	01/05/13 - 30/04/16
Waugh, David	Friends of the Cancer Centre	Infrastructure for NI Cancer Trials Centre	£900,000	01/09/13 - 31/08/16
Williams, Rich	Invest NI - PoC	Development of Inhaler based Cathespin S Inhibitor for treating COPD	£105,934	01/09/13 - 31/08/14
Williams, Rich Mullan, Paul	PCUK	Development of a Legumain based Therapeutic for the Treatment of Prostate Cancer	£384,294	01/03/14 - 28/02/17
Williamson, Kate Emmert-Streib, Frank Stevenson, Michael Hamilton, Peter O'Sullivan, Joe	Invest NI	Development of protein based algorithms for the detection of bladder cancer in haematuria populations	£805,188	24/04/12 - 31/12/15
Wilson, Richard Kennedy, Richard Robson, Tracy Waugh, David Salto-Tellez, Manuel	Invest NI	Phase I/II clinical trial for ALM201 for the treatment of solid tumours	£403,432	01/04/13 - 31/03/16
Wilson, Richard	Cancer Research UK	CTAAC grant A15828 for BALLAD trial (A Global Study To Evaluate The Potential Benefit Of Adjuvant Chemotherapy For Small Bowel Adenocarcinoma)	£613,167* *to CR-UK CTU Glasgow	01/11/13 - 31/10/18

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# PUBLICATIONS



The following publications were published within the period of this report:

ANDERSEN, C.L., McMULLIN, M.F., EJERBLAD, E., ZWEEGMAN, S., HARRISON, C., FERNANDES, S., BAREFORD, D., KNAPPER, S., SAMUELSSON, J., LÖFVENBERG, E., LINDER, O., ANDREASSON, B., AHLSTRAND, E., JENSEN, M.K., BJERRUM, O.W., VESTERGAARD, H., LARSEN, H., KLAUSEN, T.W., MOURITS-ANDERSEN, T. and HASSELBALCH, H.C. (2013) A phase II study of vorinostat (MK-0683) in patients with polycythaemia vera and essential thrombocythaemia, *Br J Haematol*, 162(4), p498-508.

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BAROSI, G., MESA, R., FINAZZI, G., HARRISON, C., KILADJIAN, J.J., LENGFELDER, E., McMULLIN, M.F., PASSAMONTI, F., VANNUCCHI, A.M., BESSÉ, C., GISSLINGER, H., SAMUELSSON, J., VERSTOVSEK, S., HOFFMAN, R., PARDANANI, A., CERVANTES, F., TEFFERI, A. and BARBUI, T. (2013) Revised response criteria for polycythemia vera and essential thrombocythemia: an ELN and IWG-MRT consensus project, *Blood*, 121(23), p4778-81.

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