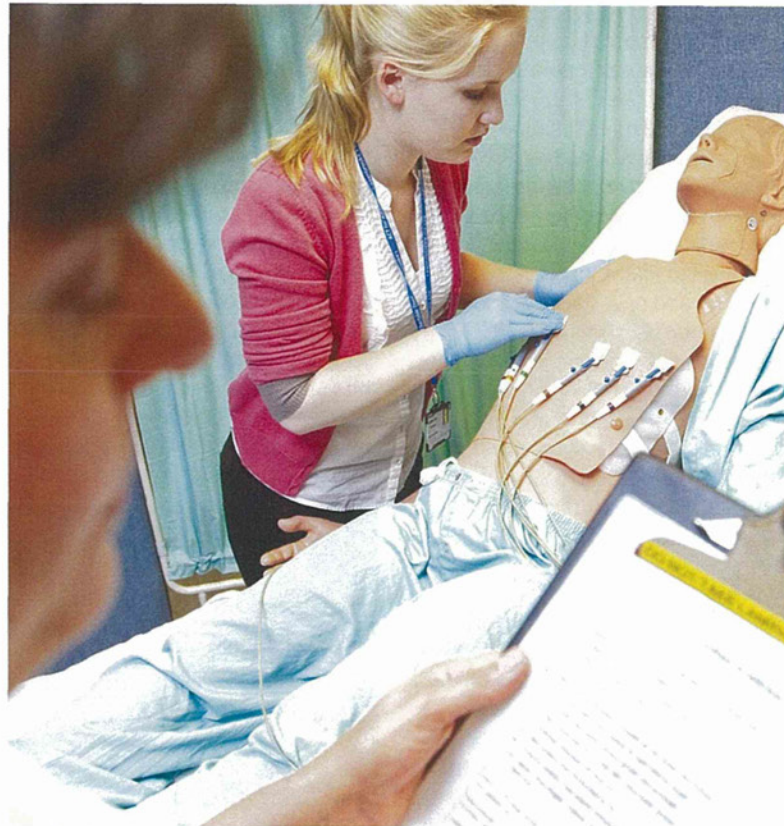


the whole health service. As an Academic Health Science Centre we must look outwards to compare ourselves to the best equivalent centres across the world – in Europe, North America and increasingly in Asia – and here the achievements of Cambridge in biomedical and clinical research stand comparison with the very best centres internationally. However, at the same time as we measure ourselves against this global competition, it is crucial that we in the Clinical School also look to our regional healthcare system and ensure that our teaching and research lead to service innovation and benefit the healthcare economy we serve with our regional NHS partners. It is thus a key aspect of our mission as an Academic Health Science Centre to build educational, research and service partnerships with our surrounding NHS partner organisations which deliver healthcare in the region, and also provide undergraduate and postgraduate teaching and training for our medical students and faculty. My colleagues and I in Cambridge University Health Partners see our contribution to this wider 'Academic Health Science System' as a critical goal for the immediate future and, again as I write, it is encouraging to see there is a national recognition of the contribution that the Academic Health Science Centres can make to innovation across the health service.

The Cambridge Biomedical Campus is at an exciting stage of its development, reflecting the realisation of the plans the campus partners (Cambridge University Hospitals, the Clinical School, the MRC and Cancer Research UK) have pursued over the past decade. The new road and transport access for the expanded campus are in place and the splendid new building for the MRC Laboratory of Molecular Biology ('LMB2') is nearing completion. Plans for the relocation of Papworth Hospital to the expanded campus



A student being examined in clinical skills

are at an advanced stage, with building expected to start in a year's time – realising a vision which goes back more than twenty years. The Government is rightly keen to position the UK so that it can build on its major contributions to the life sciences in an internationally competitive climate, by facilitating interactions with industry and translating research into advances in healthcare. The Cambridge Biomedical Campus with its close location to the Wellcome Trust Sanger Institute, the Babraham Institute and the surrounding science parks is part of the wider 'Cambridge cluster' but also forms one end of a corridor stretching from new developments in biomedical research in north London (with the Francis Crick Institute at St. Pancras), through the GlaxoSmithKline campus at Stevenage, to Cambridge – all of which gives the broader critical

mass so essential for international competitiveness.

The vitality of our research endeavour is captured in this report. Of particular note is the success of our National Institute for Health Research (NIHR) Biomedical Research Centre which has just been successfully renewed (one of five nationally) in a competition judged by an international panel, and provides the infrastructural funding for translational clinical research – again our success is a reflection of the strength of the partnership between the University and Cambridge University Hospitals, through whom the NIHR funding flows. The NIHR CLAHRC (Collaboration for Leadership in Applied Health Research and Care), held through the University and Cambridgeshire and Peterborough

Introduction

NHS Foundation Trust partnership, is also proving a success in developing innovative new care pathways in mental health. The Clinical School's annual research grant income from the principal funders of UK biomedical research (the Medical Research Council, Wellcome Trust and medical research charities) continues to follow an upward trajectory and now stands at some £86m annually. This reflects the excellence and creativity of my colleagues in the Clinical School, across its Departments and in our three principal Institutes: the Cambridge Institute for Medical Research, the Institute of Metabolic Science and the Institute of Public Health which, with the Cancer Research UK Cambridge Research Institute, provide so much of our cutting edge research. Here it is worth noting that we intend to build on our excellence in biomedical research with a strategic focus on research in population and public health, both at national and international level, and on the contribution public health can make to our regional healthcare system.

The strength of Cambridge biomedical research is further exemplified in the period under review by the awards of the Lasker Prize for Basic Biomedical Research in 2008 to David Baulcombe (for small regulatory RNAs); and in 2009 to John Gurdon (for nuclear re-programming); and of the 2010 Nobel Prize for Physiology or Medicine to Robert Edwards (for in vitro fertilisation) – all from our sister School of Biological Sciences – and by the international quality of the research on the Cambridge Biomedical Campus, with the award of the 2009 Nobel Prize for Chemistry to Venki Ramakrishnan from the MRC LMB (for the structure of the ribosome), and with the other prizes listed later in this report. These strengths in basic biological research underpin, and provide a fertile environment for, the highest quality clinical

research. In addition, clinical research draws increasingly on the strengths that can be harnessed across the wider University, as reflected in our collaborative research with the physical sciences, engineering and social sciences. This interdisciplinary approach across the University has been formalised in a number of strategic 'cross School' research initiatives approved by the University. These include the Cambridge Cancer Centre, Cambridge Neuroscience, the Cambridge Infectious Disease Initiative, the Cambridge Stem Cell Initiative and the Cambridge Immunology Network.



Deakin Centre

Finally, education and training remain at the heart of our mission. It is gratifying to see the success of our pioneering MBPhD programme (conceived by my predecessor Sir Keith Peters and led by my colleague Tim Cox) as reflected in the survey and analysis of the Programme described here on its 21st birthday, and in the growing number of its graduates who are now independent investigators.

We continue to attract the very best medical students to both our standard clinical course and our graduate entry course. The extended three year clinical course, and the associated new curriculum (led by my colleague Diana Wood), are aimed in particular at preparing our graduates for their transition to working as doctors in the health

service – and recent evidence suggests our graduates do indeed now feel much better prepared for this critical step. We look forward to the opening this year of the Deakin Centre (named after Tony Deakin, former Addenbrooke's NHS Trust Chairman) which includes new clinical skills training facilities for our students. It is becoming clear that the Clinical School needs to increase its intake of medical students so that it can offer more of the students who come to Cambridge to study Medicine the opportunity to complete their clinical training in Cambridge. This is an ambition we hope to realise in

the next few years, against a national background of continuing pressure for changes in medical education. Graduate student education is also a vital aspect of our educational activity – as evidenced by the growing number of PhD students and programmes, and new taught Masters courses.

Thus the story of medicine, and the journey of the School of Clinical Medicine in Cambridge, continue on an exciting and upward trajectory. This is only achieved by the contributions of the many people, students and staff, who study, teach and pursue research, in the School: I thank them all for what they do to make the School such a rewarding and stimulating place in which to work.

Two years in profile

Cambridge University Health Partners



In April 2009, following a competitive process judged by an international panel, the Department of Health formally designated five Academic Health Science Centres (AHSC) of which Cambridge University Health Partners (CUHP) was one.



Dr Arun Gupta



Dr Robert Winter



Mr Stephen Davis, Chief Operating Officer

Bringing together the University of Cambridge, Cambridge University Hospitals NHS Foundation Trust, Cambridgeshire and Peterborough NHS Foundation Trust and Papworth Hospital NHS Foundation Trust, CUHP exists to facilitate partnership working across a number of boundaries – between community and hospital-based medicine, between general and specialist services, and between the University and the NHS. CUHP enables the partners to work together in a structured fashion in order to pursue the tripartite mission of research, education and clinical service.

Since its formation, CUHP has enabled the partners to open formal discussions about shared infrastructure in a number of areas – including research support, where a clinical trials unit has already been launched under the leadership of Dr Ian Wilkinson; and fundraising, where the partners are discussing the possibility of a joint function to support philanthropy across all four partners. These are examples

of areas where the partners believe they can achieve added value through shared working, and it is an important part of CUHP's mission to enable the partners not only to identify such areas, but also to facilitate implementation – often involving far-reaching culture change.

CUHP has been particularly active in the education realm through the Regional Innovation and Education Cluster. A number of workstreams have been formed to identify areas of clinical practice where new patient pathways require support in the form of innovative educational provision. These include diabetes, chronic obstructive pulmonary disease (COPD), urology and palliative care. CUHP has also led for the partners on the policy agenda relating to the future of postgraduate education within the NHS.

Most recently, two new senior appointments have been made to CUHP. Dr Robert Winter, previously Medical Director at NHS East of

England, joins as Director of the Academic Health Sciences System. Dr Winter will work with the four CUHP partners and their regional associates to develop new clinical programmes and innovative healthcare pathways; to inform the commissioning of health services in the region and work with the emerging GP consortia to explore new opportunities for integrated services; to ensure that public health expertise is used to inform the work of CUHP; and to work with the University to identify programmes with potential for application to healthcare.

Dr Arun Gupta, Director of Postgraduate Education at Cambridge University Hospitals, joins as Director of Postgraduate Education: he comments "CUHP offers the opportunity to combine the strengths in healthcare education of each of the partners. It is vital that we maintain and develop the healthcare education sector to make sure we continue to produce excellent clinicians in the future."

Two years in profile

National Institute for Health Research (NIHR) funding

In December 2006, Cambridge University Hospitals NHS Foundation Trust in partnership with the University of Cambridge, was designated one of the Government's new National Institutes for Health Research (NIHR) Comprehensive Biomedical Research Centres and as a consequence received substantial new research and development funding from the NIHR. In August 2011, the NIHR announced the second round of Biomedical Research Centres (BRCs) and Units (BRUs). Cambridge did exceptionally well in this competition, with its BRC (with Dr John Bradley as Operational Director and Professor Steve O'Rahilly as Scientific Director) renewed for a further five years with a 48% increase in funding, and a new BRU in Dementia (directed by Professor Peter St George-Hyslop) awarded. Our success in this competition builds not only on our impressive track record of research achievement over the first five years of the BRC but also on our record of delivery through the Collaboration for Leadership in Applied Health Research and Care (CLAHRC) held by Cambridgeshire and Peterborough NHS Foundation Trust and the NIHR Research Networks. These investments underpin the research of the School of Clinical Medicine as a whole, and virtually every development reported in this Review has received support from the NIHR in some form or other.

Biomedical Research Centre

The Cambridge BRC is a collaboration between the University of Cambridge and Cambridge University Hospitals NHS Foundation Trust. As well as contributing to the direct costs of clinical research programmes in ten key thematic areas, including Cancer, Cardiovascular Disease and

Metabolism and Endocrinology, the BRC has provided investment in core infrastructure to support clinical research across the campus. This has included not only the development of physical facilities such as a molecular phenotyping hub, a bio-repository and associated sample storage area, and (together with the Medical Research Council) the Eastern Sequencing Hub (EASIH), but also the funding of a major programme of research training for clinicians, under the leadership of Professor David A Lomas.

The BRC has also formed important links with Industry. A PET-CT scanner acquired in partnership with Merck, underpins research across a number of themes, and serves a wide range of research organisations. In excess of 200 patients have been entered into studies using the PET scanner many of which are sponsored by Cambridge University Hospitals NHS Foundation Trust.

At the point of renewal, the BRC has been expanded to include not only Cambridge University Hospitals, but also to include research partners within Cambridgeshire and Peterborough NHS Foundation Trust. Over the next five years, the BRC aims to use its expertise in genomics, population science, imaging, pathology, immunology, cell, molecular and developmental biology, and regenerative medicine to continue developing novel diagnostics and treatments for common and rare diseases.

Key objectives of the BRC from 2011 onwards, as shown in the table, include cancer, cardiovascular disease, dementia and neurodegeneration, brain injury, mental health, obesity and diabetes, infectious diseases, disorders of the immune system,



John Bradley, Director of R&D Cambridge University Hospitals NHS Foundation Trust and the Cambridge Comprehensive BRC

and those associated with women's health. To enable and accelerate these health benefits, the BRC will continue to work with other BRCs and BRUs, research councils, research charities and industry to embed infrastructure for translational research within the NHS to pull through our world-class experimental medicine into NHS clinical use.

The BRC aims to achieve effective integration and translation through sharing of research findings and methodologies, fostered by shared infrastructure including clinical informatics, ongoing review of scientific discoveries in the context of clinical needs and priorities, and the application of Health Service Research methodologies to experimental medicine. The BRC will develop capacity across professions, building on the success of the existing Capacity Development and our Training Theme. The NIHR Cambridge BRC will provide, within the Cambridge Biomedical Campus, opportunities for translational research that are offered by very few biomedical centres in the world.

Collaboration for Leadership in Applied Health Research and Care (CLAHRC)

The CLAHRC is a collaboration between the University of Cambridge and Cambridgeshire and Peterborough NHS Foundation Trust. It forms a partnership between the University of Cambridge and a consortium of NHS and Social Service organisations, which as well as Cambridgeshire and Peterborough NHS Foundation Trust includes, NHS Cambridgeshire, NHS Peterborough, Cambridgeshire County Council and the local Strategic Health Authority.

The University component includes the Department of Psychiatry, the Institute of Public Health, the Judge Business School and the Engineering Design Centre. The CLAHRC focuses on the application of research to everyday practice in mental health care, and will align its activity with

the BRC. The investment of the NIHR Cambridge BRC in the Herchel Smith Building for Brain and Mind Sciences and the establishment of themes in Mental Health, Dementia and Neurodegeneration, and Evaluation and Implementation, within the BRC, will ensure effective transition between the early stages of translation supported by the BRC, and the later stages of implementation that form the focus of the CLAHRC.

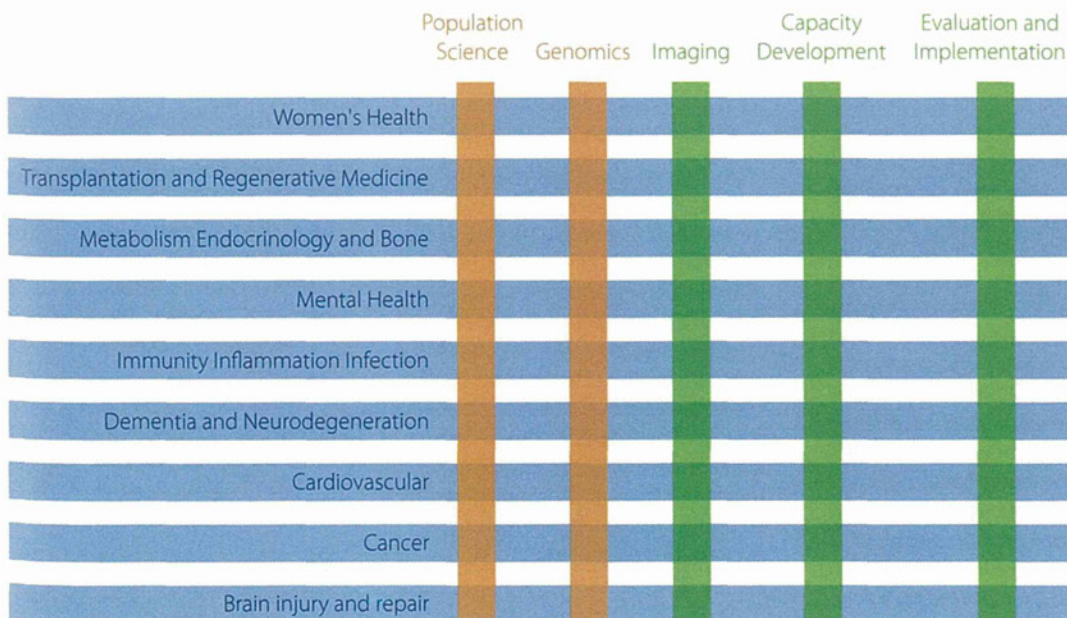
NIHR Research Networks

A further source of NIHR support to clinical research is represented by the NIHR Research Networks, including the West Anglia Comprehensive Local Research Network, the West Anglia Cancer Research Network, and the Eastern England Diabetes Research Network.

By working closely with the BRC, the NIHR Research Networks, fostered

by the involvement of key Cambridge researchers, ensure an effective environment on campus for the transition of translational research activity into later stage clinical trials.

Effective translation is also supported via additional NIHR funding streams such as Research for Patient Benefit and Programme Grants where funding has been received by Cambridge University Hospitals researchers in areas such as Cancer; End of Life Care; Imaging; Medicines Management; Diabetes (reducing the burden of Type 2 diabetes by translating epidemiology and behavioural science into preventative action); Mental Health (causes & effective treatments for psychotic disorders) and Transplantation (access to transplantation and transplant outcome measures), which involves the transplant units across the UK, UK Transplant and the UK Renal Registry.



The NIHR Cambridge BRC is built around nine topic specific themes, with cross cutting themes in Population Science and Genomics, and cross-cutting resources for Imaging, Capacity Development, and Evaluation and Implementation.

Two years in profile

Cambridge Clinical Trials Unit

2011 has seen the establishment of the Cambridge Clinical Trials Unit under the directorship of Dr Ian Wilkinson. Funded through the Cambridge Biomedical Research Centre, Cambridge University Hospitals NHS Foundation Trust and Cambridge and Peterborough NHS Foundation Trust, this is one of the first collaborations under Cambridge University Health Partners.

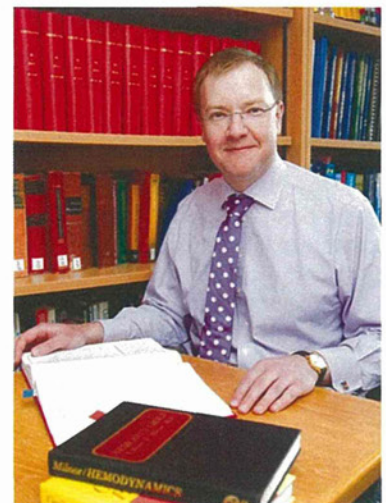
Working alongside Dr Ian Wilkinson, dealing with the day to day operations and set-up of the unit, is the Assistant Director, Dr Sabine Kläger. The Unit has grown considerably in the first year from three to 15 members of staff, working in three teams: Clinical Trial Management and Co-ordination; Quality Assurance and Safety; and Data Management and Statistics. The Unit also has close links with the Cambridge Cancer Trials Centre, and various University Departments including the Centre for Health Services Research, the Department of Public Health and Primary Care, and the MRC Biostatistics Unit.

The aim of the Unit is to work with investigators to develop and conduct the highest quality clinical research. This may range from simple advice through assistance with protocol development and trial design, to full-blown trial co-ordination, databasing and statistical analysis. The Unit has developed a suite of guidance notes, templates, forms and standard operating procedure (SOPs) available to investigators for all key aspects of trial activities, which will ensure that researchers are working within the regulations that surround Clinical Trials of Investigational Medicinal Products (CTIMPs). In addition, the Unit can now provide a data management system called MACRO to build clinical trial data bases.

Trial data bases in MACRO meet all the Medicines Healthcare products Regulatory Agency (MHRA) validation and Good Clinical Practice (GCP) audit trail requirements. It enables electronic data capture (EDC), replacing paper case report forms (CRFs) with on-line electronic CRFs (eCRFs), which have inbuilt data cleaning checks and data audit trail. A library of eCRF templates for common data capture pages like vital patient statistics, blood results, or serious adverse event/serious adverse reaction (SAE/SAR) forms facilitates the set-up of such data bases.

Providing these resources, the Unit will enable researchers to take on more clinical trial work, knowing that the appropriate back-up for regulatory and GCP compliant systems and resources are in place.

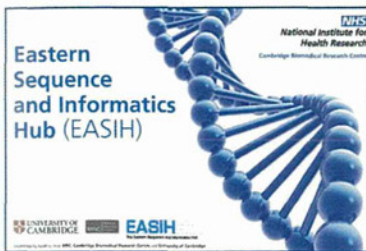
The Unit has delegated oversight for all Cambridge University Hospitals or University sponsored CTIMPs. The majority of the currently active 33 CTIMPs are early phase I/II trials and multi-centre trials. The portfolio also includes phase III/VI trials and a number of small mechanistic studies, as well as some large observational studies. The Unit does not focus on specific disease areas, but supports investigators from all specialities and is currently involved in the set-up of around 24 new projects.



Dr Ian Wilkinson

Eastern Sequence and Informatics Hub (EASIH)

In the last few years next generation DNA sequencing has been developed, the first major advance since Sanger sequencing was invented over two decades ago.



The new sequencing methods allow DNA sequencing at a higher throughput and lower cost. These advances are literally revolutionising genomics in basic and medical research, from whole genome sequencing (including

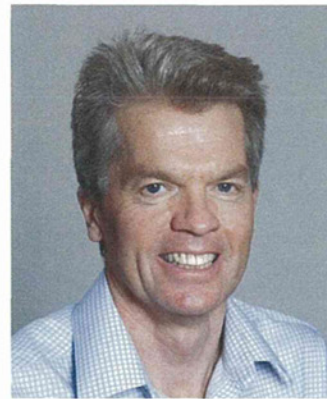
hospital pathogen sequencing and identification), to the identification of the parts of the genome that control gene expression.

In 2009 the University of Cambridge won a national funding competition from the MRC to establish one of four next generation sequencing hubs. EASIH (www.easih.ac.uk) is now fully set up and operational in the heart of the Clinical School, with additional support from the NIHR Cambridge Biomedical Research Centre and the University of Cambridge.

Our major projects are medical sequencing, exome sequencing, RNA-sequencing, ChIP-seq, HLA typing and hospital pathogen sequencing.

EASIH will become clinically accredited and, in collaboration with East Anglian Medical Genetics

Service, will play a major part in the introduction of medical genomics into the NHS for patient benefit. The facility is headed by Dr Anthony Rogers, and the Director is Professor John Todd.



John Todd
Professor of Medical Genetics

Juvenile Diabetes Research Foundation/ Wellcome Trust Diabetes and Inflammation Laboratory (DIL)

The DIL is supported by a five year Strategic Award from the Wellcome Trust, plus funding from the Juvenile Diabetes Research Foundation, National Institute for Health Research Biomedical Research Centre, the EU FP7 and the National Institute of Diabetes and Digestive and Kidney Diseases, to identify mechanisms and disease precursors in autoimmune diabetes (T1D) and related diseases.

In this third period of funding, we are exploiting our genetic findings to characterise immunophenotypes in human blood samples that are under the control of the T1D risk loci and genes. By using microarray gene expression, next generation

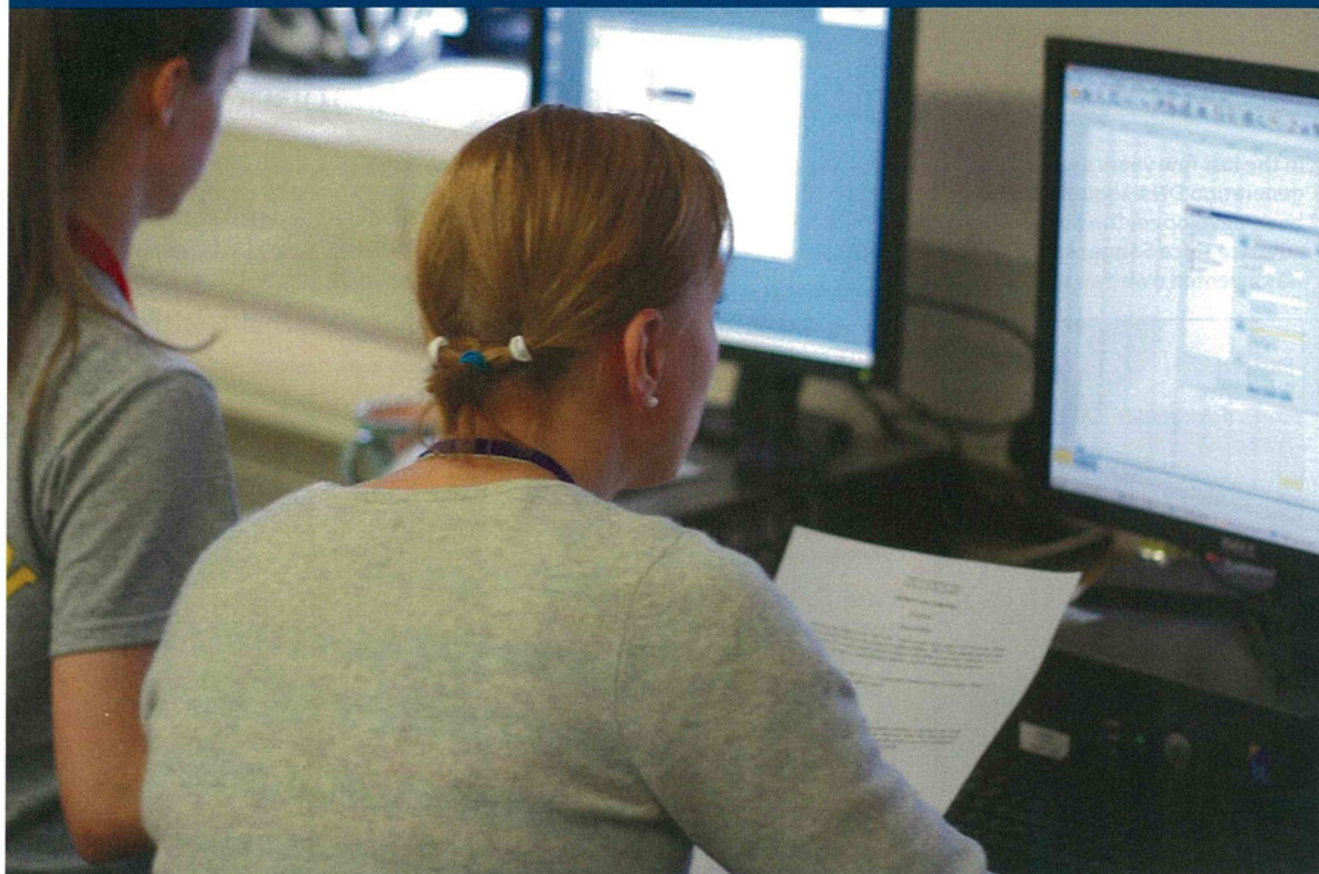
sequencing, immunoassays and polychromatic flow cytometry we have identified cellular and molecular phenotypes that could lead to informative biomarkers, and that could be used in future treatment and prevention trials in T1D. Most recently, the DIL is establishing a clinical team to begin studies and trials in patients and unaffected siblings towards stratified, mechanism-based prevention strategies.

The DIL has three principal investigators, John Todd (Director), Linda Wicker (co-Director) and David Clayton, who supervise immunology, genetic, clinical, bioinformatics and statistical studies in the Cambridge Institute for Medical Research and with their collaborators.



Linda Wicker
Professor of Immunogenetics

Two years in profile



Graduate School of Life Sciences

The Graduate School of Life Sciences has been established to create a single vibrant postgraduate research community for approximately 1,500 graduate students and 1,500 postdoctoral early-career researchers spread across 21 University departments in the Faculties of Clinical Medicine, Veterinary Medicine and Biology, five University institutes and 12 local University Partner Institutes, such as the MRC Laboratory of Molecular Biology and the Wellcome Trust Sanger Institute.

A key element in the success of the Graduate School has been the co-ordination of the admission, monitoring and examination of students, creating a firm platform on which their research activities and skills training can take place.

This has been achieved through central academic and administrative collaborations and dissemination of best practice, but also through response to feedback from students.

This collaborative arrangement has also provided a suitable framework for the rapid and co-ordinated development of showcase doctoral research programmes, such as, our four-year doctoral training programmes funded by the Wellcome Trust, MRC and British Heart Foundation; a Translational Medicine and Therapeutics MPhil and PhD programme; three highly successful international scholarship programmes with the National Institutes of Health, Howard Hughes Medical Institute (Janelia Farm) and A* Singapore; and a new Clinical Academic Training programme for clinicians, set up in response to NIHR requirements.

In each case, the Graduate School provides the wider context in which such programmes can readily be integrated with training and research in basic biomedical sciences across the University. For example, some of the students admitted to a four-year doctoral training programme in Medicine may proceed to a PhD in Biological Sciences and vice-versa.

The Graduate School is now recognised in the University as a focus for graduate student training, providing induction and a wide range of research and transferable skills training. In recent Postgraduate Research Experience Surveys, the Graduate School consistently scored highly compared to other Cambridge Schools and UK universities in the level of satisfaction expressed by students with support offered for their research and skills training.

Cambridge University Clinical Research Society (CUCRS)

As highlighted in an article by Professor Edwin Chilvers further on in the review, there are concerns about academic medicine in the UK. The Cambridge University Clinical Research Society founded in December 2009 by Garth Funston and Adam Young whilst studying as undergraduate clinical medical students, has been a welcome addition to the work the University is doing to contribute to the national drive to 'rejuvenate' academic medicine.



Adam Young



Garth Funston

The CUCRS had a very successful first year, holding a number of events including, among other things, talks by leading scientists and a large national student conference where 65 medical students, from 11 UK universities presented their submissions.

Keen to build on this success Garth and Adam have secured additional funding from the Wellcome Trust to expand their initiative and establish a National Student Association of Medical Research. Sir Mark Walport, Director of the Wellcome Trust, is Honorary President of the Association which was launched in November 2011 (see <http://ftp5.dns-systems.net/~nsamr/> for more details). The Association envisages individual university societies working together to promote the cause of academic medicine on the national stage.

'Garth and Adam have demonstrated the very real appetite that exists amongst medical undergraduates to engage with research. Their leadership, in driving forward the establishment of a student led research society, not just in Cambridge but also in other schools, demonstrates the appeal of their vision. They have thrown out a powerful challenge to those in leadership roles in our medical schools to ensure that the training that they offer meets the needs and expectations of the fee paying student generation. The future health of academic medicine demands a creative response.'

John Williams PhD FRCPE
Head of Clinical Activities
Head of Neuroscience & Mental Health
Wellcome Trust

The Raymond and Beverly Sackler Medical Research Centre

The Clinical School remains grateful to the Raymond and Beverly Sackler Foundation for their generous and consistent support for medical education and research through the Sackler Scholars and the Sir Keith Peters Scholarships programme, and for enabling academics and students from across Cambridge to hear distinguished scholars and scientists on subjects within the field of medical sciences through the Sackler Distinguished Lectures programme.

Raymond and Beverly Sackler Studentships

A growing number of highly qualified postgraduates are applying for the Raymond and Beverly Sackler Studentships. In October 2009 the School was able to offer a total of 28 awards. In October 2010 we offered 29 and for the academic year beginning October 2011 we have just awarded 24 awards. We have also been able to provide funding for Clinical School MBPhD students during their three year research phase.



The Regius Professor of Physic and Professor Sir David Baulcombe FRS



Professor Sir Venki Ramakrishnan FRS and the Regius Professor of Physic

Sackler Distinguished Lectures

The Sackler Distinguished Lectures Fund provides lectures by distinguished scholars and scientists on subjects within the field of the medical sciences. During the period under review there have been two lectures:

20 June 2011, 'How antibiotics illuminate ribosome function and vice versa', Professor Venki Ramakrishnan FRS.

14 June 2010, 'Small RNA and epigenetics: lessons from plants for studies of heritability and disease', Professor Sir David Baulcombe FRS.

Two years in profile



A student in a simulated patient/doctor environment



Dr Diana Wood, Clinical Dean

we are now able to offer a more integrated career pathway to our students with academic ability and ambition. 2011 also marked the 10th anniversary of the Cambridge Graduate Course in Medicine (CGCM) which admitted its first students in 2001 and which now shares its final year with MBPhD students completing their clinical studies. CGCM students tend to be over-represented at the top of the academic rankings and we have been particularly pleased that recent analysis shows the performance of our students whose first degree is in a non-biomedical science is equal to that of the science graduates. These students add diversity to the student body and their breadth of experience bodes well for them and the profession as they move on into their future careers.

Nationally, medical schools are keen to preserve the diversity of undergraduate medical education programmes, whilst providing evidence of equal achievement of the graduate outcomes established by the General Medical Council. We do not seek to educate our students to minimum standards. Rather, working together with the School of Biological Sciences and our NHS partners, we aim to enthuse our students to take all the educational opportunities available and move on to excel in their subsequent medical careers. There is always work to be done, but current evidence suggests that our education programmes are thriving!

Medical Education

Medical education in the Clinical School aims to produce graduates who combine high academic achievement with excellence in the clinical, communication, practical and interpersonal skills required for good medical practice.

The School attracts applications from outstanding students and is greatly over-subscribed by Cambridge pre-clinical medics wishing to continue their clinical studies here. This complete change from the historic situation reflects the introduction of the new clinical curriculum in 2005 and the huge amount of work put in by both academic and NHS staff in Cambridge and throughout the Eastern region. This has been led by a dedicated group of staff who have become enthused by the challenges and rewards of student teaching and learning, many of whom have undertaken higher academic qualifications in medical education to further their educational expertise. Staff development for education is expanding within the School and we work closely with NHS colleagues in postgraduate education to ensure that skilled and dedicated clinical teachers are available in all the Trusts and general practices where Cambridge students are taught. In this way we offer clinical education

of a very high standard across a wide range of socio-economic settings and clinical environments which is much appreciated by the students and which provides them with a sound basis for making the transition from medical student to doctor.

Looking to the future, in the light of recent success, the changes in Higher Education funding and the structural changes in the wider NHS educational environment, the School aims to continue to increase the number of places available for students to study clinical medicine in Cambridge, with the overall aim of providing a complete medical education programme for all our Cambridge students.

The period under review has seen two important anniversaries. Events to mark the 21st anniversary of the MBPhD programme are described over the next page. Taken together with the structured approach to clinical academic training developed through the CATO Office (see p22),



Professor Roger Barker
with MBPhD students

MBPhD Programme at 21

2010 saw the Clinical School celebrate 21 years of the first UK MBPhD Programme with an all-day symposium in November. Professor Cox, Director of the Programme since its inception, reviewed the Programme's development and progress to a large and diverse audience of numerous programme alumni and other distinguished speakers, including the Vice-Chancellor, Sir Mark Walport (Director of the Wellcome Trust), and Professor Sir Keith Peters.

Sir Keith had conceived this educational initiative on his appointment as Regius Professor of Physic in 1987 with the Programme actually starting in 1989.

The six-year Programme includes a three-year full-time research period integrated within the standard clinical course and has an overall duration from matriculation of nine years. Since 1989, 162 graduates have been enrolled of which a quarter have transferred as graduates from other universities in both the UK

and overseas. Of the 107 members who had graduated by 2010, almost one third were women.

Not only has the performance of the Programme been striking in its achievements in the clinical examinations, but alumni have also gone on to excel in the research field. In an anonymous electronic survey carried out in 2010, 90% of alumni contacted responded. Of those nearly 80% were still engaged in research, 90% have continued research after graduating, and 85% were planning further academic work – including a majority with research fellowships in mind.

Perhaps the most telling statistics of the survey were the career placements of the alumni. Of the respondents, 30 were full-time academic staff. Just after the symposium, Dr Jeremy Hall was appointed Professor of Psychiatry in the University of Edinburgh – the second Full Professor in the cohort. Dr Moeen Panni had earlier



Professor Tim Cox



Dr Stefan Marciniak

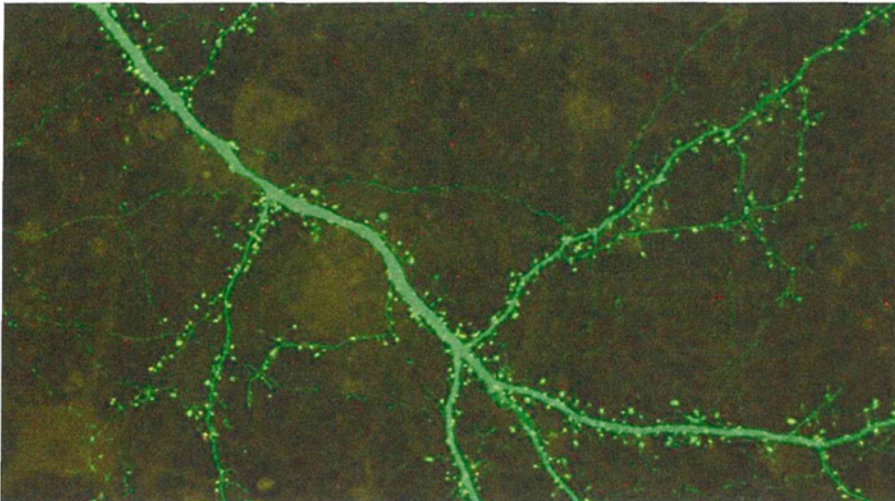


Dr Andres Floto

been appointed as Full Professor and Chairman, Department of Anaesthesiology, Duke University Medical Centre, NC, USA. Of the 35 alumni still in clinical training, 11 were Specialty Registrars, six Academic Clinical Fellows, three Academic FY2s. Many former Programme members were full-time Clinical Consultants. There were many other notable achievements: Dr Barakat, a Reader in Metabolic Medicine and Medical Director of the Department of Medicine at Imperial College was awarded the OBE for establishing the Imperial College London Diabetes Centre in Abu Dhabi. Other achievements included a Wellcome Trust Senior Research Fellowship to Dr Floto and an MRC Senior Clinical Fellowship to Dr Marciniak (both pictured above) both of whom are based in Cambridge.

Two years in profile

The Behavioural and Clinical Neuroscience Institute (BCNI)



Working hypothesis: impulsivity arises from a reduced density of spines on GABA-ergic neurons in the Nac core

The Behavioural and Clinical Neuroscience Institute (BCNI) is a centre for translational neuroscience, jointly funded by the Medical Research Council and the Wellcome Trust.

Funding was recently renewed (2010) for a second five-year period. The BCNI Director, Professor Trevor Robbins, is Head of the Department of Experimental Psychology and based at the Downing site in central Cambridge; the Clinical Director, Professor Ed Bullmore, is in the Department of Psychiatry and based on the Cambridge Biomedical Campus. The BCNI is thus organised to bring together Cambridge's geographically distributed strengths in basic and clinical neuroscience to optimise translational impact on a wide range of neurological and psychiatric disorders. The BCNI is partly accommodated in refurbished space in the Herchel Smith Building for Brain & Mind Sciences and has a strong collaborative partnership with the neuroimaging facilities managed by the Wolfson Brain Imaging Centre.

One of the four principal programmes of the BCNI includes several projects



Professor Ed Bullmore



Professor Trevor Robbins

thematically related to aspects of compulsive and impulsive behaviour. This behavioural trait has been explored in animal models and linked to the function of frontal cortical and striatal circuits in the brain. Compulsivity and associated abnormalities of fronto-striatal network function have also been linked to a range of disorders such as drug addiction, Obsessive-Compulsive Disorder (OCD) and attention deficit/hyperactivity disorder. This work provides a rational mechanistic basis to 'repurpose' existing drugs for

new therapeutic indications in the treatment of addiction and OCD – two disorders which currently lack specific pharmacotherapies. The cross-cutting dimension of reward-driven compulsivity is also relevant to understanding some of the behavioural factors that drive over-eating and obesity. This provides a focus for inter-disciplinary interactions between neuroscience and metabolic science in the University and has also been central to the successful partnership between BCNI investigators and GlaxoSmithKline to develop the therapeutic potential of a new opioid receptor antagonist for binge eating and substance dependence disorders.

Other programmes are concerned with identifying the psychological mechanisms underlying such disorders as schizophrenia and depression, relating these to changes in brain circuitry, and testing possible therapeutic effects of drugs on cognitive functioning. The BCNI also has a keen interest in cognitive disorders in neurodegenerative diseases such as Parkinson's and Alzheimer's diseases, in collaboration with the Department of Clinical Neurosciences. Specific achievements include the design of a neuropsychological test of visuospatial learning and memory that can be used to predict a diagnosis of Alzheimer's disease 32 months earlier in patients with mild cognitive impairment and is now available on iPad for use in GP surgeries.

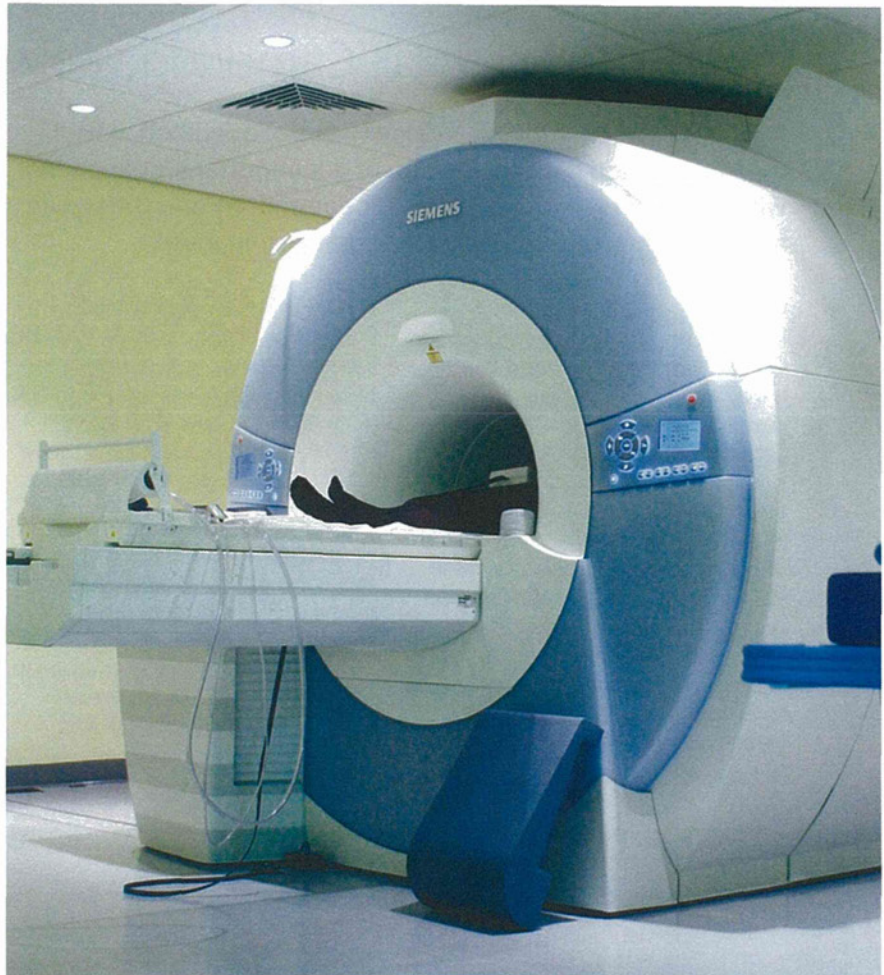
These and other aspects of the BCNI's translational agenda will be greatly strengthened by infrastructural support through the Mental Health theme of the NIHR Cambridge Biomedical Research Centre.

MRC Cognition and Brain Sciences Unit (CBU)

The MRC Cognition and Brain Sciences Unit is a leading centre for cognitive science and neuroscience and its translation into benefits for health and well-being. Established in 1944 as the Applied Psychology Unit, it has an illustrious history as one of the largest and most long-lasting contributors to the development of psychological theory and practice.

In April 2011 Professor Susan Gathercole was awarded a MRC Research Chair at the University, and took up the role of Honorary Director of the Unit. Sue is a cognitive psychologist whose research focuses on the processes of memory, attention, language, and learning. Much of her work involves children with developmental disorders in these areas of cognition, investigating both the fundamental mechanisms underpinning these disorders and the development of cognitive and educational interventions.

Sue says "It's a privilege to take on the stewardship of the CBU at this exciting time at which cognitive neuroscience has come of age, and is now delivering real benefits for health". The mission of the CBU is to improve human health by understanding and enhancing cognition and behavior in health, disease, and disorder. It will maintain its long-standing commitment to cognitive science and cognitive



neuroscience of the highest quality, particularly in the fields of memory, attention, language, and emotion in which important advances are being made in understanding both the cognitive processes and their brain mechanisms.

The Unit is also strongly committed to translating its discoveries in these fields into preventative, therapeutic and educational interventions. Recent advances include the development of new techniques to treat emotional disorders such as anxiety, depression and Post Traumatic Stress Disorder (PTSD), to address cognitive problems resulting from brain damage, and to enhance prosthetic devices in hearing-impaired populations.



Professor Susan Gathercole

With several new teams joining the CBU, there will be an increased emphasis on understanding typical and disordered development spanning childhood through to older age, enhanced by partnerships with clinical and non-clinical teams within and beyond the University.

Two years in profile

Cancer Research UK Cambridge Research Institute (CRI)

2010 and 2011, our fourth and fifth years of operation, have marked a period of consolidation of our important interactions with the wider Cambridge scientific community and the public, and the launch of some new collaborative initiatives.

Of particular note was the official launch of the Cambridge Cancer Centre on 3 February 2010. The centre is a collaboration between Cancer Research UK, the University of Cambridge, Cambridge University Hospitals NHS Foundation Trust and the Medical Research Council, and has a vision to build strong links across disciplines from the laboratory to the clinic. The CCC builds on the previous centre that has been active since 2006, and its new formal identity will further strengthen our mechanisms for joint planning between the partners. The CCC annual symposia continue to be extremely popular,

the 2011 plenary speaker was Robert Weinberg from the Whitehead Institute. We also hosted a popular Experimental Cancer Medicine Centre open day for the public, and CRI staff ran interactive displays at the Cambridge Science Festival with their CUH colleagues.

We were very pleased with the outcome of the CRI's first five-year review on 14 April: the review panel were extremely positive and praised our approach to translational research. For example, pancreatic cancer research and clinical trials continue to be a core focus for the CRI, and our work in this area was



strengthened by the launch of the Cambridge Pancreatic Cancer Centre in March 2011, which aims to bring treatments into first-in-man clinical trials as quickly as possible. In addition, CRI group leader David Tuveson was awarded an honorary professorship, with the title of 'Professor of Pancreatic Cancer Medicine'. The translation from the laboratory to the clinic is a core thread to the CRI's work, which has been supported by the launch of a biomarkers initiative to support this work.



Professor Sir Bruce Ponder; Li Ka Shing Professor of Oncology and Director of Cancer Research UK Cambridge Research Institute

The number of research groups at the CRI now stands at 22. We have been joined by Shankar Balasubramanian, who holds the Herchel Smith Professorship of Medicinal Chemistry (in a joint appointment with the Department of Chemistry) and Douglas Fearon. Junior group leaders Jason Carroll and Duncan Odom were awarded tenure and promoted to senior group leaders. Other group leaders who have been honoured include: Simon Tavaré (Fellow of the Royal Society), Carlos Caldas (Fellow of the European Academy of Cancer Sciences), Shankar Balasubramanian (Fellow of the Academy of Medical Sciences) and John Griffiths (Gold Medal of the International Society for Magnetic Resonance in Medicine).

Scientists in the Caldas lab at the Cambridge Research Institute discuss data.

Image provided by Charles DN Thomson, Cancer Research



Cambridge Institute for Medical Research (CIMR)

The Cambridge Institute for Medical Research (CIMR) is a cross-departmental, multidisciplinary research centre within the Clinical School and is housed in the Wellcome Trust/MRC Building.

Its outstanding feature is the interweaving of clinical medicine with molecular and cell biology and it provides a unique interface between basic and clinical science that is supported by a Strategic Award from the Wellcome Trust. The CIMR has as its major goal the determination and understanding of the molecular and cellular mechanisms of disease. Presently, the major research themes are misfolded proteins and disease, intracellular membrane traffic, autoimmune disease and haematopoietic stem cell biology.

The CIMR provides a state of the art research environment for over 250 researchers and accounts for almost a third of the research grant expenditure in the Clinical School. Over 40% of its Principal Investigators are medically qualified and clinically active, a percentage that has remained constant since the CIMR opened ten years ago. Eight of the CIMR Principal Investigators are Wellcome Trust Principal Research Fellows, a quarter of the national total and the most at a single location in the UK. All of the clinical and non-clinical scientists in the CIMR belong to home departments and currently there are six with some staff who are primarily housed in the CIMR. These are the Departments of Medicine, Medical Genetics, Clinical Biochemistry, Clinical Neurosciences, Haematology and Pathology.



Crystal structure of a serpin dimer revealed a large scale domain swap

Yamasaki M, Li W, Johnson DJ, Huntington, JA. (2008). Crystal structure of a stable dimer reveals the molecular basis of serpin polymerization. *Nature* 455, 1255–8

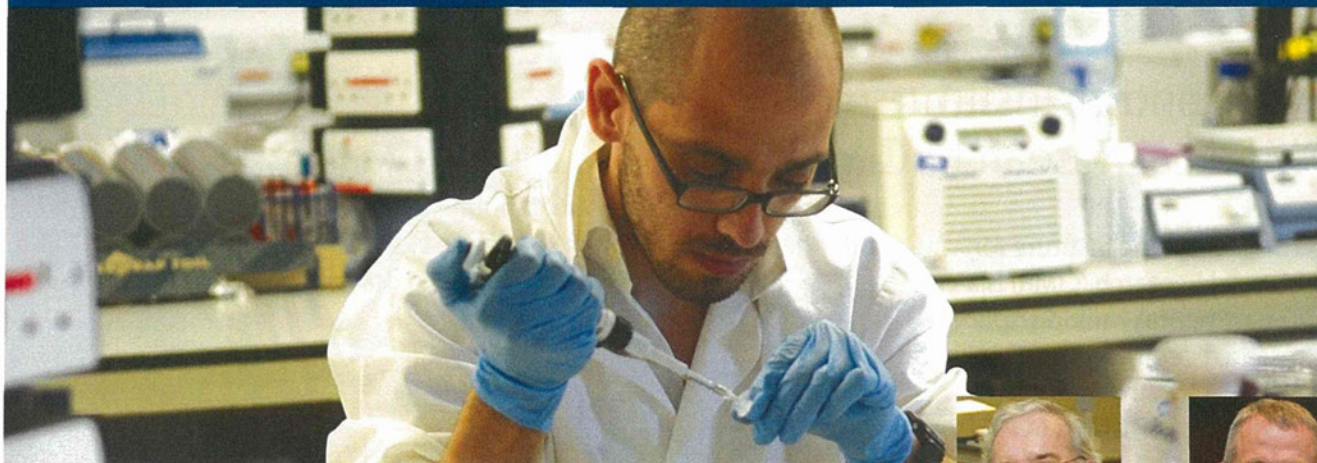


Professor Paul Luzio,
Director of CIMR

Principal Investigators in CIMR make an important contribution to the translational agenda of the Clinical School. Examples of activities that have progressed along the translational path towards patient benefit include (i) the introduction by Professor Tony Green (Department of Haematology) of the diagnostic use of mutations in JAK2 and other genes for frontline investigation of myeloproliferative disorders (also now a central part of national and

international guidelines), (ii) the identification and use of novel transcription signatures by Professor Ken Smith's group (Department of Medicine) to predict prognosis in autoimmune disease, (iii) the clinical safety trial of an autophagy-inducing drug for Huntington's disease following Professor David Rubinsztein's pioneering studies of the activation of autophagy to clear mutant huntington in cell and animal models of Huntington's disease and (iv) high through-put screens carried out by Professor David Lomas' group (Department of Medicine) to identify small molecules to block serpin aggregation and so treat the group of diseases known as serpinopathies.

Two years in profile



Institute of Metabolic Science (IMS)

The Institute of Metabolic Science (IMS) is a purpose-built institute on the Cambridge Biomedical Campus. It addresses the growing health threat posed by obesity, diabetes and related metabolic and endocrine diseases.

Obesity and related health problems are some of the most pressing public health issues of our time. Nearly a quarter of all adults and one in five children in England are classed as obese, and these numbers continue to increase (www.ic.nhs.uk). The IMS is a joint venture of the University of Cambridge, the Medical Research Council and Cambridge University Hospitals NHS Foundation Trust. Led by Co-Directors Professors Stephen O'Rahilly and Nick Wareham, it is unique in the UK, providing an interface between experimental and clinical research to further fundamental understanding of obesity, diabetes and related metabolic diseases, and linking these advances directly to patient care and disease prevention.

The IMS provides facilities for laboratory and clinical research at the University of Cambridge Metabolic Research Laboratories (MRL), allied closely with epidemiological and public health research at the MRC Epidemiology Unit, and clinical areas (the Wolfson Diabetes and Endocrine Clinic and the Weston Centre for Childhood and Adolescent Diabetes and Endocrinology) that provide state-of-the-art treatment facilities.

The MRL currently hosts 20 Principal Investigators. It leads the MRC Centre for Obesity and Related Metabolic Diseases, which also involves scientists in the School of Biological Sciences, local MRC Units, the Wellcome Trust Sanger Institute and the University of Oxford, and hosts the Wellcome Trust 4-year PhD Programme in Metabolic and Cardiovascular Disease.

The most exciting scientific discoveries at the MRL during the last two years include: identification of the first rare copy number variants associated with severe early-onset obesity; novel insights into epigenetic changes that link poor diet during pregnancy with an increased risk of the offspring developing Type 2 diabetes in later life; that the effects of thyroid hormones on brown fat are mediated via the hypothalamus, a region of the brain that also controls food intake; and paradigm shifting observations of circadian regulation in red blood cells that overturn the long held belief that circadian rhythms require changes in gene expression. In 2009, Professor David Ron, an international authority on endoplasmic reticulum stress and metabolic disease, moved from

New York to take up a Wellcome Trust Principal Research Fellowship at the MRL.

The main research areas of the MRC Epidemiology Unit are the genetic, environmental and developmental aetiology of diabetes and obesity, nutritional and physical activity epidemiology and the translation of that understanding into prevention strategies at both individual and population levels.

In the last two years the MRC Epidemiology Unit has been instrumental in major international collaborative studies identifying genetic variants associated with common obesity in adults and children, timing of puberty, type 2 diabetes and multiple other metabolic traits. Other significant discoveries include that physical activity attenuates the genetic predisposition to obesity. We have also established evidence on the benefits and harms of screening and hence early detection of Type 2 diabetes that are directly informing the design of UK preventative strategies.



Professor Steve O'Rahilly FRS



Professor Nick Wareham



Professor
Carol Brayne

Institute of Public Health (IPH)

The Institute of Public Health (Director Professor Brayne) was formed nearly twenty years ago as a strategic partnership between the NHS, MRC and the University. It is one of the three Institutes within the School of Clinical Medicine.

The Department of Public Health and Primary Care is a core member of the Institute. It also includes three MRC units, the MRC Biostatistics Unit, the MRC Epidemiology Unit (also in the Institute of Metabolic Science) and the Human Nutrition Unit. The NHS members are the Eastern Region Public Health Observatory including Quality Intelligence East, the Regional Epidemiology Unit of the Health Protection Agency and the Eastern Region Cancer Intelligence Centre whose core function is to provide population health intelligence for commissioning and surveillance. The Foundation for Genomics and Population Health (PHG Foundation) is the first charitable status member.

The Institute's purpose is to foster research, training and service to improve population health. The research programmes within IPH focus on major chronic disorders from biology to policy, integrating different approaches for maximum benefit. These thrive on the IPH partnership and are illustrated by the programme on cardiovascular epidemiology on p40 (Professor Danesh). There are four major initiatives, Professor Marteau's is profiled on p30, all focus on cross IPH linked translational research.

CEDAR (Centre for Diet and Activity Research, Director Professor Wareham) is one of five Centres of Excellence in Public Health Research. Its purpose is to develop the evidence required for changing dietary and physical activity behaviours in populations including research capacity building.



Successes include 19 grant funded appointments made in 2010–2011 including studentships, fellowships, and lectureships. Research includes tracking active travel in relation to the Cambridge Guided Bus-way and evaluating the Activ8 programme, an afterschool physical exercise club in primary schools.

The new Cambridge Centre for Health Services Research (CCHSR) was established in 2010 (Director Professor Roland). It is a collaboration between the university and RAND Europe, an independent not-for-profit policy research centre based in Cambridge. CCHSR will develop new methods of measuring quality of care, evaluate initiatives to improve the quality of health care and inform health policy in the UK and abroad.

The IPH hosts the Public Health and the End of Life themes of the NIHR Cambridge Collaborative Leadership

in Applied Health and Care (CLAHRC, Director Professor Jones). This CLAHRC aims to improve translation of research relevant to mental health into practice at points of transition across the lifespan. These have increased capacity in health services research, health economics, policy analysis and implementation. Key areas of work include systematic reviewing for policy development in dementia, evaluation of service reconfiguration and innovation, particularly in old age and at the end of life.

IPH members provide a range of teaching, from training health intelligence staff from Primary Care Trusts to doctoral programmes. The IPH has three Masters programmes: the longstanding MPhil in Epidemiology, the MPhil in Public Health and a new Masters in Primary Care (MPhil in Clinical Sciences (Primary Care Research)).

Appointments & elections

Professorial appointments during period under review



Roger
Barker

Professor of
Clinical
Neuroscience



Sadaf
Farooqi

Professor of
Metabolism and
Medicine



Susan
Gathercole

MRC Research
Professor of
Cognitive
Psychology



Berthold
Göttgens

Professor of
Molecular
Haematology



Willem
Ouwehand

Professor of
Experimental
Haematology



James
Huntington

Professor of
Molecular
Haemostasis



Arthur
Kaser

Professor of
Gastroenterology



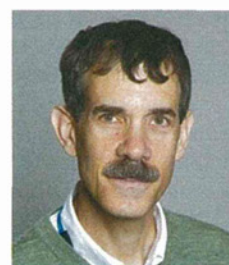
Ziad
Mallet

BHF Professor of
Cardiovascular
Science



Keith
Martin

Professor of
Ophthalmology



David
Ron

Professor of Cellular
Pathophysiology and
Clinical Biochemistry



Ken
Smith

Professor of
Medicine



Christopher
Watson

Professor of
Transplantation



Geoff
Woods

Professor of
Human Genetics

Readers

Dr Francesco Colucci
Reader in Immunology

Dr Fiona Gribble
Reader in Endocrine Physiology

Dr Susan Ozanne
Reader in Developmental Endocrinology

Dr James Rowe
Reader in Cognitive Neurology

Dr Ian Wilkinson
Reader in Clinical Pharmacology and Therapeutics

University Lecturers

University Senior Lecturers

Dr Cedric Ghevaert, Haematology

Mr Paul Gibbs, Surgery

Dr Pablos Monsivais,
Public Health and Primary Care (PHPC)

University Lecturers

Dr Stephen Barclay,
Public Health and Primary Care (PHPC)

Dr Kathy Beardsall, Paediatrics

Dr Menna Clatworthy, Medicine

Dr Emanuele Di Angelantonio,
Public Health and Primary Care (PHPC)

Dr Thomas Krieg, Medicine

Dr Belinda Lennox, Psychiatry

Dr Stefano Pluchino, Clinical Neuroscience

Dr Ken Poole, Medicine

Dr Marc Tischkowitz, Medical Genetics



Katy Teo, Academic Clinical Fellow in Surgery

A model for advancing academic medicine



Professor Edwin Chilvers

Clinical academic staff play a crucial role in advancing the treatment and care patients receive in the NHS. Professor Edwin Chilvers, Director of the Clinical Academic Training Office explains how Cambridge is helping lead the way in rejuvenating academic medicine nationally.