



**Professor Reza Razavi &  
Dr Shalini Jadeja**

Centre Director &  
Centre Manager

Dear All,

As we come to the end of this challenging year we'd like to thank all of the remarkable efforts our community has made.

From the speed with which Covid-related research projects and studies started to the change in working practices and the support and resilience shown whilst combating the pandemic. The breadth of research at the Centre has allowed us to be agile and our location within a major hospital remains our key strength.

The Centre has continued to make great progress in all our research themes and clinical challenges. We have seen success in our major infrastructure projects. Our Radiofrequency lab is in operation and our new HPC and AI platform, MONAI are online. Development of new radiotracers progresses well and we remain on course to have first in man studies.

Looking forward to next year we eagerly anticipate work on our low-field and ultra-low field initiatives getting underway, installation of our head-only MRI system and operation of our Surgical and Interventional Engineering facilities and Imaging Bioresource starting.

We hope you have a restful break over the Christmas period.

Best wishes,  
Reza & Shalini

## COVID RESEARCH



**OxVent**, the rapidly deployable and scalable low-cost mechanical ventilator specially designed for COVID-19 was initially funded £20,000 by the CME. Since then it has [won](#) best innovations of the year by the [Institute of Engineering and Technology](#). A collaboration between Oxford University, King's College London and The School of Biomedical Engineering & Imaging Sciences, the ventilator is now manufactured by Smith+Nephew.

The **SplitVent** project develops a 3D-printable splitter allowing two patients to be ventilated simultaneously, whilst customising and allowing independent adjustment of ventilatory parameters delivered to each patient.

A simulation study was published in [Royal Society Open Science](#).



With collaborators across the CME and Imperial College London, ethical approval has been obtained for data collection

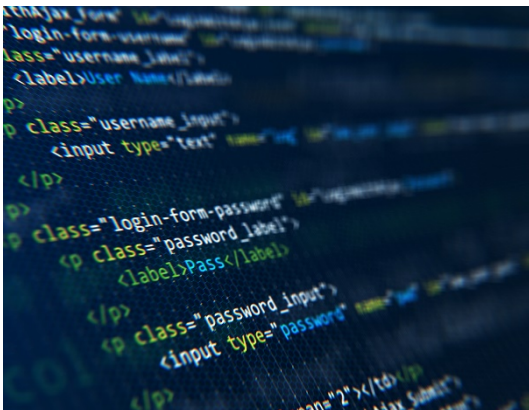
from real-world patients and collection is underway to build a database of all the cardiac features of 1500 COVID patients and will be ready to analyse soon.

The project [website is live](#).

## SOFTWARE DEVELOPMENT & MONAI



Earlier this year the [London Medical Imaging & AI Centre for Value Based Healthcare](#) and the School of Biomedical Engineering & Imaging Sciences at King's College London, in partnership with industry leader NVIDIA, launched the **MONAI** framework. The development of this open-source toolkit for deep learning in healthcare imaging was supported by CME Software Architect Eric Kerfoot and Research Associate Richard Brown. [Learn more](#).



200 participants from 40 countries took part in the MONAI bootcamp. Lectures and hands-on workshops were held covering the technical aspects of MONAI and how it helps in training new biomedical deep learning tools.



Lectures and workshops are part of an ongoing drive to help develop a culture of better, more sustainable code development which can be made open source and is inline with regulatory frameworks being developed within the Quality Management System (QMS) so software can be commercialised and used in trials.

## CHEMISTRY

Francis Man, Amaia Carrascal Minino and Rafa Torres Martin de Rosales developed a simple kit for making  $^{89}\text{Zr}$ -oxine, a cell labelling PET tracer, developed by Phil Blower's group in 2013.

The aim was to make cell labelling easy to perform in any hospital conducting cell-based therapy trials. The kit was patented in summer 2020 and is intended for use in tracking cell migration by PET imaging in clinical trials of cell-based therapies at UCL, Bergen and Nijmegen in the next year or so.

### **PET biotin**

Salvatore Bongarzone developed the first [radiolabelling strategy](#) for transforming the well-known vitamin B7 & Biotin, into an in-vivo PET imaging probe via a radiochemical reaction developed by



Professor Antony Gee's group in 2015.



A new method for in vivo biotin trafficking has now been developed in rodents. The radiosynthesis and preclinical studies were published in 2020 in [\*the Journal of Medicinal Chemistry\*](#). The team is now working with Professor Sally Barrington, Dr Maggie Cooper, Dr Joel Dunn and Dr Malene Fischer to translate PET radiolabelled Biotin to first in human studies at Guy's & St Thomas' NHS Foundation Trust.

## PUBLIC ENGAGEMENT

Since Centre opening, the PE team has delivered 40 training sessions, with 263 staff & students involved in over 116 public events, partnering with diverse groups and institutions to reach over 50,000 people. They have advised researchers on 90 grant applications, being successfully awarded over £500K for public and patient engagement activities.

They established an External Advisory Board, a staff & student PE Committee and have several student PE Ambassadors who endeavour to further embed public engagement into the research culture and practice. Read the [PE Strategy and Evaluation Framework](#).



Project focus: [Big Heart Data at Science Gallery London](#).

For two years, alongside artists and designers, the PE team has collaborated with heart patients and their families through ECHO. Scientists have valued their input into CME's research on developing new technologies to treat heart conditions, and ECHO members have benefited from the chance to experience first hand the work of the researchers.

## IMAGING BIORESOURCE

The [Imaging Bioresource](#) obtained ethical approval in March and provides a resource of clinical data, clinical images and biological samples to be used in medical research.



Applications with research questions in the remit of the Centre will soon be welcomed and considered for approval.

Contact: [Aoife Ruane](#), Imaging Bioresource Manager.

## COMMERCIALISATION



We are working with the Head of Strategic Partnerships, IP team and Commercialisation Institute at King's to commercialise research and guide researchers and academics along the translation pipeline. [Learn more.](#)

## SURGICAL & INTERVENTIONAL ENGINEERING CENTRE FOR DOCTORAL TRAINING



The Centre for Doctoral Training in Surgical & Interventional Engineering welcomed its first cohort of students. With the generous support of the King's College London Centre for Doctoral Studies, our industrial partners, and efforts of our supervisors, we have been able to recruit more than 10 students to our School in October 2020. Their research projects span the entire spectrum of Surgery & Intervention.

In addition, building work for the Surgical & Interventional Engineering facilities is continuing at a good pace, overcoming challenges occurring due to COVID-

19. We hope that population of the facilities will be possible by early 2021, with it being at full swing by summer 2021.

## SILENT MAGNETIC RESONANCE IMAGING (MRI)

The physics team in the Department of Neuroimaging at Denmark Hill, together with collaborators at GE Healthcare, have pioneered development of novel MRI techniques with reduced acoustic noise. In the first half of 2020, we saw several projects in silent MRI come to a conclusion, marking an important step forward in our research in silent MRI. The Centre has supported some young researchers driving this project. [Learn more](#)



**Emil Ljungberg** successfully defended his PhD thesis which focused on how to generate useful image contrast with silent MRI. Part of his thesis was published in *Magnetic Resonance in Medicine*.



Postdoctoral CME fellow **Dr Tobias Wood** published his first silent MRI paper, focusing on magnetisation transfer (MT) and more specifically on myelin-weighted imaging using the recently proposed inhomogeneous MT (ihMT) contrast.

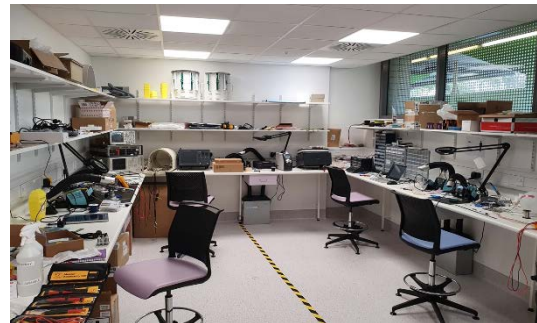


***Nikou Damestani,***

an NIHR Maudsley BRC PhD student, works on the development of silent fMRI using a sequence known as Looping Star. She presented initial results of using Looping Star with an auditory oddball paradigm, highlighting the benefits of minimising the confound of acoustic noise.

## RADIOFREQUENCY LAB

The radiofrequency (RF) lab located at the LOCUS area opened again in the summer. We continue with MRI hardware prototyping activities of building parallel-transmit system for clinical MRI scanners, 7T MRI neonatal brain and cardiac imaging coil, 7T MRI body coil for prostate, abdomen and hip imaging and 3T parallel-transmit head coil. For further info and interest in using the RF lab, please contact [Ozlem Ipek](#).



## HIGH PERFORMANCE COMPUTING



Our new HPC came online earlier this year thanks to the efforts of Andrew Cantell & Adelaide de Vecchi. Contact [Andrew Cantell](#) for access or further information.

## QUALITY MANAGEMENT SYSTEM

In development is a QMS to facilitate clinical uptake and commercialisation of hardware and software medical devices by creating a controlled structure where medical devices can be developed in line with relevant regulations.

Existing King's infrastructure will be used to deliver a QMS in Microsoft Teams and Sharepoint. Get in touch about the [QMS](#).

## MULTI CONTRAST CARDIAC IMAGING



CME researchers [developed a novel non-invasive](#), radiation-free and contrast-free Magnetic Resonance Imaging (MRI) framework for comprehensive assessment of coronary and myocardial disease in a single multi-contrast and multi-

parametric high-resolution 3D whole-heart scan.

## POSTDOC FELLOWSHIP ENABLER RECIPIENTS

**Cian Scannell, Daniel West, Emil Ljungberg, Hannah Greenwood** and **George Keeling** were the 5 awardees of the CME [New Postdoc Fellowship Enabler Awards](#). The awards are given to outstanding PhD students who are about to complete their studentship with funding for up to a year's salary plus consumables to enable obtaining data and experience to use towards a fellowship application in the future.



Celebrating the  
Centre for Medical Engineering