

IPA-IoP Cockcroft-Walton Lecture



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Jubilee
Hall

Working in the Gray-Zones of Oncology Challenges and Opportunities in Radiation Therapy Research

Radiotherapy (RT), which is indicated in >50% of cancer patients, faces two major challenges. First, for cancers of unmet clinical need, better targeted treatments are required to improve tumour control and reduce toxicity. Second, a dramatic (>50%) increase in cancer incidence predicted for the next decade threatens to limit timely patient access to high-quality radiotherapy. Research in physics, engineering and computer-science addresses both challenges by increasing the accuracy and efficiency of high-precision RT.

The lecture will provide an overview and discuss the detailed methodology of the most advanced treatment technologies like on-line adaptive and MRI-guided radiotherapy enabling unprecedented clinical studies in hypo-fractionated RT, whose radiobiological foundations need to be reconsidered. Clinical context will be provided by clinical examples and trials from studies performed at the Royal Marsden Hospital.

Novel opportunities in RT to significantly improve radiotherapy outcomes, like spatial fractionation, FLASH and the development of biomarker driven dose distributions require engagement into the complexity of pre-clinical research and cancer biology. Hypoxia will be used as an example to demonstrate the challenges of biologically adaptive radiotherapy. As an example for research on novel opportunities in radiotherapy physics research, the lecture will inform on the development of pre-clinical micro-beam irradiation technologies together with results of in-vitro and in-vivo studies currently performed at our Centre for Cancer Imaging.

Finally, the approach of personalized RT and the role of artificial intelligence for medical physics research will be briefly discussed.

SPEAKER



Prof. Uwe Oelfke

Head, Joint Department of Physics, The Institute of Cancer Research, London

Professor Uwe Oelfke is head of the Joint Department of Physics at the Institute of Cancer Research (ICR) and Royal Marsden NHS Foundation Trust (RMH) in Sutton, United Kingdom. He is deputy head of the Division of Radiotherapy and Imaging (ICR) and group leader of the Radiotherapy Physics Modelling team (ICR). He began his career in Theoretical Nuclear Physics, later transferring to Medical Physics, and has more than 20 years' experience in leading innovative radiotherapy physics research in IMRT dose delivery, inverse treatment planning, Image guided radiotherapy and MRI guided radiotherapy. He firmly believes that Medical Physics research on cancer imaging and therapy is an essential component to improve the clinical outcomes of radiation oncology. ICR and RMH, as a world leading comprehensive cancer centre, now initiates the next generation of radiotherapy treatments by combining the most recent developments in cancer biology, cancer therapeutics and medical physics in a truly interdisciplinary approach.

Professor Oelfke's Radiotherapy Physics Modelling Team is researching ways of using modern hardware to improve the delivery of targeted radiotherapy and is part of a team of physicists and clinicians taking a leading role in enhancing the performance of the MR Linac technology for its routine use in patients.