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Focus on Faculty #95
John Kildea

John Kildea is a tenure-track assistant professor of Medical Physics and served as interim co-director of the McGill Medical Physics Unit.

John grew up on a small family farm in Co Monaghan in Ireland where his parents and some siblings still live and where he is fortunate to visit once or twice a year. Following BSc studies in Physics with Astrophysics at Queen's University in Belfast, with a year spent at Alaska Pacific University in Anchorage, Alaska, John undertook PhD studies at University College Dublin. Upon graduating with a PhD in high-energy astrophysics in 2003, John moved to Montreal for a postdoc in astrophysics at McGill University before moving to Arizona for a second astrophysics postdoc at the telescopes of the Harvard-Smithsonian Centre for astrophysics near Tucson.

In 2008, in search of a more impactful career, John returned to Montreal and entered the Medical Physics MSc program at McGill. This was followed by a clinical medical physics position and on-the-job residency training at the MUHC beginning at the end of 2009 and culminating in membership of the Canadian College of Physicists in Medicine in 2012. In 2017, John transitioned from clinical to academic medical physics and became a tenure-track assistant professor in the Gerald Bronfman Department of Oncology.

John's research lab at the RI-MUHC, which counts almost 30 personnel (students, software developers, patient partners, and researchers), is studying how ionizing radiation causes and cures cancer and is building user-centered software to power a learning healthcare system. From the "cause of cancer" perspective, the Kildea lab is using neutrons produced during high-energy radiotherapy and single-cell whole-genome DNA sequencing to examine the mutations that radiation induces in healthy cells. On the "cure of cancer" side, they are using artificial intelligence techniques, such as natural-language processing, radiomics, deep learning, and digital-twinning to harness the power of real-world data to improve radiotherapy outcomes.

When it comes to user-centered software, John's research group has developed a number of software applications that are in clinical use at the MUHC and beyond. The most notable of these is the award-winning Opal patient portal that arose out of a unique collaboration with radiation oncologist Dr. Tarek Hijal and patient/professor of Computer Science Prof. Laurie Hendren. In 2020, John formed the Quebec SmartCare Consortium (QSCC) to build on the secure and patient-centered data-sharing technology of Opal. The QSCC is a large consortium consisting of two hospitals (MUHC and CHU Ste-Justine), two universities (McGill and Université de Montréal), and six private companies. With $10M in funding from the FACS program of the Quebec Ministry of Enterprise and Innovation, the MUHC and Cedars Cancer Foundations, as well as the private partners, the consortium is aiming to demonstrate how Opal can be used to securely exchange data between patients, clinicians and researchers, while helping to foster industrial partnerships and innovation.

When not working on Opal or devising new Medical Physics projects, John can be found relaxing in nice cafes and walking with his partner Alfredo in Montreal or running in all weather with his running club Les Galopins.

The following well-cited publications cover various aspects of John's career to date:

Kildea, J., Atkins, R.W., Badran, H.M., Blaylock, G., Bond, I.H., Bradbury, S.M., Buckley, J.H., Carter-Lewis, D.A., Celik, O., Chow, Y.C.K. and Cui, W., 2007. The Whipple Observatory 10 m gamma-ray telescope, 1997–2006. *Astroparticle Physics*, *28*(2), pp.182-195.

Maglieri, R., Licea, A., Evans, M., Seuntjens, J. and **Kildea, J.,** 2015. Measuring neutron spectra in radiotherapy using the nested neutron spectrometer. *Medical physics*, *42*(11), pp.6162-6169.

Kildea, J., Battista, J., Cabral, B., Hendren, L., Herrera, D., Hijal, T. and Joseph, A., 2019. Design and development of a person-centered patient portal using participatory stakeholder co-design. *Journal of medical Internet research*, *21*(2), p.e11371.

Naseri, H., Skamene, S., Tolba, M., Faye, M.D., Ramia, P., Khriguian, J., Patrick, H., Andrade Hernandez, A.X., David, M. and **Kildea, J**., 2022. Radiomics-based machine learning models to distinguish between metastatic and healthy bone using lesion-center-based geometric regions of interest. *Scientific Reports*, *12*(1), pp.1-13.