Boulder Research and Development Unit
Pfizer Oncology,
Boulder, Colorado

April 15, 2022

Prof. Daniel Read
School of Mathematics
University of Leeds

Dear Prof. Daniel Read and Members of the Search Committee:

I am writing to apply for your Lecturer position in Applied Mathematics as advertised as posting: EPSMA1059. I am currently a senior scientist in the Pfizer Oncology Research Unit where I perform research to utilize mathematical modelling to improve treatments of solid cancers. I received my PhD from McGill University where I was supervised by Antony R. Humphries and Morgan Craig. Prior to joining Pfizer, I was a junior fellow at the Institut Mittag-Leffler and completed postdoctoral work with Alan Perelson in viral dynamics at the Theoretical Biology and Biophysics Group of the Los Alamos National Laboratory.

My research uses mathematical models to address problems in physiology and medicine. Broadly speaking, I develop physiologically-based mathematical models to understand disease progression, drug resistance, and optimize treatment scheduling. My doctoral work included using mathematical models to infer a clinically actionable and rational combination therapy schedules in late-stage melanoma. As a postdoctoral researcher, I developed mathematical models to understand the dynamic pathways to resistance against a novel broadly neutralizing HIV-1 antibody, elucidated the immune mechanisms leading to establishment of the HIV-1 latent reservoir, and studied the role of phenotypic plasticity in cancer treatment resistance. These papers were published in widely read medical journals such as *Nature Medicine* and the *Journal of ImmunoTherapy for Cancer*. My work on phenotypic plasticity was featured as the cover image of This Week in Mathematical Oncology. I also developed numerical methods for infinite delay differential equations and analytical tools for the study of cyclic functional differential equations that were published in the *SIAM J. Applied Mathematics*. My current research explores combination treatment strategies for patients with advanced colorectal cancer.

My long-term goal is to understand the evolutionary pressures that lead to treatment resistance, particularly in HIV-1 and solid cancers, which is an increasing important question in the current medical landscape. Systems-levels experiments probing the complex interactions leading to treatment resistance are currently intractable, so mathematical modelling offers an unparalleled opportunity to probe and understand the physiological mechanisms underlying drug resistance. Drawing upon this understanding, my work will permit the repurposing of existing therapeutics through rational treatment scheduling and ultimately improve clinical outcomes. To fully leverage the understanding gained via mathematical modelling, I will develop new techniques in infinite dimensional dynamical systems, the analysis of functional differential equations, and numerical analysis.

My research is highly interdisciplinary and well-situated to attract external funding and interdisciplinary collaboration. I have a history of federal funding in Canada; I received NSERC (Canadian Science Funding Scheme) for my doctoral studies and was awarded a NSERC postdoctoral fellowship. I also have industrial experience as a researcher at Pfizer Inc. This industrial experience offers a unique perspective into the use of mathematical modelling in drug development and the skills necessary to perform mathematical research in industry. I will leverage this experience to help my trainees receive funding and industrial opportunities.

My research combines perspectives from a number of different fields in applied mathematics. Consequently, there are ample opportunities for student mentorship throughout my research agenda and I have supervised three undergraduate research projects. These projects have led to one published and one submitted manuscript (minor revisions requested) with undergraduate co-authors and two senior year theses at McGill University.

My teaching ability was recognized by two teaching awards at McGill University as a teaching assistant for integral calculus. I also prepared and delivered a number of lectures during 3rd year honors courses in differential equations and dynamical systems. While my postdoctoral experience was focused on research, I believe teaching is an integral part of my career as a mathematician and therefore organized a graduate level online workshop on Structured Equations in Mathematical Biology through the CAMBAM mini-workshop series that was attended by approximately 60 researchers.

The Applied Mathematics Department at the University of Leeds includes researchers with diverse perspectives and interests and consequently many opportunities for collaboration and co-supervision of graduate students. In particular, my interests in viral dynamics and mathematical immunology complements research performed by the groups of Carmen Molina-Paris and Grant Lythe. Further, the established group in mathematical biology offers numerous opportunities for collaboration and co-supervision of students. The department's focus on undergraduate research and education, including the final year project and MMath programs offer the opportunity to mentor undergraduate students and recruit summer researchers.

I have enclosed my CV, teaching statement, and statement on DEI. I look forward to hearing from you.

Sincerely,

Tyler Cassidy, Ph.D
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Pfizer, Inc.
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