



VIEWING NETS: PERSPECTIVES FROM
PEOPLE AND MACHINES
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Patrick Michael Lelliott studies the role of neutrophil extracellular traps (NETs) in pathology and disease at Osaka University, Japan. Born in Australia, he first studied Nanotechnology at the University of New South Wales before making a shift into the field of Biology and completing his Ph.D. in Advanced Medicine at Macquarie University in 2014. His research has covered a diverse range of topics from biophysics, parasitology, malaria, and genetics to his current field of immunology and cell biology. He has been awarded three fellowships, including from the Japan Society for the Promotion of Science to support his research in Japan, which is centred on the role of neutrophils and NETs in disease. He is interested in improving the reliability, reproducibility, and throughput of cell analysis methods, a broad concern for all scientific research, but of particular importance in the relatively immature field of NET research. – Address: Biophotonics Group, Immunology Frontier Research Center (IFReC), Osaka University, 3-1 Yamadaoka, Suita, 565-0871 Osaka, Japan. E-mail: lelliottp@gmail.com.

Towards the end of 2018, like many young researchers in these times, I found myself at the end of my fellowship and completely in the dark as to where my future lay and when or if I would find my next position. I heard about the Wissenschaftskolleg College for Life Sciences fellowship from a colleague in the field of Evolutionary Biology (somehow I find that Evolutionary Biologists always seem to have a much better handle on the availability and range of opportunities for young scientists). This for me was a perfectly designed fellowship, simply for the freedom involved. So many short fellowships try to tie you down to one laboratory in the guise of learning a particular technique or quite

unrealistically aim to complete entire projects. Longer fellowships ask you to commit to a laboratory with very little understanding of what you are entering into. To me, there is a serious lack of opportunities for young scientists to explore the scientific community and directly spread their research and ideas to the right people of their choosing. Conferences are somewhat aimed toward this, but rarely give good exposure to young scientists and are limited by the selection of people attending and the short time frame. While the opportunity to take a break from wet lab research and work on new angles for my research was certainly enticing, for me the most exciting drawcard for the Wiko fellowship was the opportunity to get a foothold in Europe and visit the many relevant research labs there. This is something I took full advantage of during my stay, and I was able to make strong connections with an array of research labs that have provided invaluable advice for my current project and opportunities for future collaborations that are currently being developed.

Having finally received word that my next position was approved at Osaka University just weeks before my previous fellowship ended, I was forced into a rapid negotiation to take up my fellowship at Wiko. Despite many warnings of Japanese inflexibility, I was relieved to be able to embark on a shortened, three-month stay. My wife was perhaps even more pleased than me, having already planned for a long holiday in Europe. Due to these circumstances, I started my fellowship late and unfortunately missed the introductory events. Despite this, I was immediately made welcome and was thoroughly impressed with the extent and competence of help from the staff, particularly Vera – even down to recommendations for bicycle delivery companies. I was thrown into the deep end at the first Thursday dinner shortly after arriving, however, with great help from Ulrike, and after going through the inevitable introduction of my research area a seemingly endless amount of times, I was amazed at the variety and stature of the Fellows at the institute. This group of people was truly impressive, not just for their achievements, but also for their down-to-earth attitude and interest in subjects outside their sphere. To me, this attitude, combined with the framework of lunches and meetings provided by Wiko, is what really allowed the interdisciplinary mixing of ideas and perspectives that is ultimately the purpose of the fellowship. I was pleasantly surprised with how well I could relate to and engage in the disparate fields of study of the different Fellows. My many fruitful conversations with other Fellows reinforced the notion of effective communication in science and gave me a new appreciation of how people view NETs and how much they do (or do not) know about this field. This was truly a unique experience and one that will shape my thinking for a long time to come.

I approached my work with some trepidation; it was my plan to dive into computer deep learning, a topic at the time I knew very little about, with the eventual goal of coding a program to perform analysis on the millions of images of neutrophils and NETs I had been collecting in my research – the machine’s view of NETs. With no oversight and left to my own devices in my apartment, I thought perhaps I would struggle to be productive and I did not expect to complete the project in the short time frame. On the contrary, my time at Wiko was some of the most fruitful of my career. I put this down to the perhaps underestimated influence of the Wiko environment; simply listening and engaging with the array of inspiring and accomplished Fellows drives one to achieve more in one’s own field. So, I scanned through the vast arrays of freely available tutorials, explanations, and books related to machine and deep learning theory, and after sifting through the inevitable jargon I was able to grasp what is essentially a simple concept: make a prediction, measure its accuracy, make a slight modification in the right direction, and repeat. Following this, the perhaps harder part of the project was putting this to practical use. Having done only superficial programming during my degree a decade earlier, I was surprised how quickly I could learn a new coding language and develop a pipeline to analyze my data. Soon I was spending days stuck to my computer coding and only begrudgingly left it to attend Wiko lunches and events – although I never regretted these interruptions. In the end, I had gone from a superficial interest in exploiting the power of deep learning to a working AI program that was able to recognize and categorize my cell images almost instantaneously and with remarkable accuracy. Now, a few months later, I am using this same pipeline with only slight improvements and preparing a manuscript for publication.

This recount would not be complete without some mention of COVID-19. Although I left Wiko shortly before Germany started implementing measures to stop its spread, I was privy to the many e-mails and rearrangements at Wiko as a consequence. I was both saddened by the heavy impact this had on the remainder of the Wiko year and impressed by the foresight and flexibility of the staff to keep the institute running and viable through such a difficult time. As a researcher in the field of infectious diseases, I am ashamed to say I had very little insight into what this epidemic would become, having buried my head too deeply into the science of immunology and neglecting the practical aspects, something I’ve become more aware of for the future.

Wiko provides a unique environment not just in terms of the vast array of disciplines represented, but also in the freedom and encouragement to pursue new ideas and directions for research. There is a slight, but persistent contempt in the medical research fields’

view of other disciplines, which I frequently encountered when describing my fellowship at Wiko to my colleagues. It is refreshing and essential that places like Wiko exist to pull people out of their bubble and realize that dogged hard work is not the only key to success and progress and that all fields of research and thinking, as well as taking the time to step back and breathe, are invaluable in the development of new ideas and breakthroughs.