Samantha Singh - Statement of Purpose:

[P1]The challenge of elucidating the complex interplay between neurons and the subsequent network computations is a compelling one. The implications of characterising these computations are vast and it represents one of the major obstacles in our understanding of the human brain. Such a challenge is attractive to me on a personal level because it allows me to address both my affinity for physiology and computer science. After considering the opportunities available on the Midlands Consortium Interdisciplinary Doctoral Programme (MCDIP) and the potential range of research projects, I am sure the programme offers the best platform on which to further my career in neuroscience and satiate my interests. To be able to complete two four-month research projects in different laboratories is especially appealing, as the breadth of research across the five universities is one of the greatest strengths of the programme. The work of principle investigators utilising computational modelling to investigate neuronal networks is of particular interest to me and I hope the programme will allow me to expand upon this.

[P2] My undergraduate degree in Biomedical Sciences at Kings College London focused on Pharmacology, Psychology and Mathematics. Elective modules such as Pharmacology of the Central Nervous System and Biological Psychology demonstrated the complexity of our nervous system, from neuronal networks to receptor properties. Other modules such as Stress, Immunity and Health, taught me how psychological factors can affect other parts of the human body via Hypothalamic-Pituitary-Adrenal axis-mediated cortisol release. I believe these modules established much of the core biological knowledge needed for a successful career in neuroscience. My final year dissertation focused on Major Depressive Disorder (MDD) and allowed me to utilise the knowledge and critical thinking skills I had developed during my degree. As a result I was able to analyse and investigate current scientific findings to produce a critical literature review. Not only did my undergraduate degree provide a firm foundation for further study in neuroscience, but my academic success was recognised by the award of a British Neuroscience Association first prize.

[P3] While studying Biomedical Science I was keen to gain work experience in neuroscience and this was achieved during my research year at The University of California, Berkeley. My work there was predominately focused on the neuronal basis of MDD and the role of neuronal nicotinic acetylcholine receptors (nAChRs). It was this research year that inspired me to pursue neuroscience as a career. It was fascinating to be able to target just one subunit of a nAChR in a specific brain region and visibly observe its effect on animal behaviour. I was intrigued by the fact that such a minuscule change at the molecular level can influence complex behaviours like anxiety and depression. The research itself was structured in such a way that I was given the opportunity to be responsible for my own project and experiments, which generally involved behavioural testing, histology and microscopy. These data were then presented as a prize winning poster when I returned to Kings College. The experience enabled me to develop many core skills, such as data analysis and interpretation that are required to succeed in a research environment. In addition it demonstrated that I can apply myself to challenges, both academic and personal.

[P4] Upon completion of my bachelor's degree I wanted to challenge myself and learn skills that would transfer well to neuroscience research. I identified computer programming and data analysis as suitable skills because I believe they are key elements of both current and future neuroscience research. As a result I accepted a position with the company Geotech Enterprise as a software developer. My primary role was to provide database solutions for a range of clients, including the National Health Service. Exposure to some of the possibilities of current computer technology opened my eyes to how it could be related to neuroscience. I believe that many future advances will be formed from the partnership between information technology and neuroscience, ranging from new analysis techniques to pragmatic artificial intelligence. Importantly my year at Geotech Enterprise was an excellent opportunity to experience working outside of academia. I gained valuable insight into the world of business and the inner workings of a variety of companies. The industry placements for PhD Students that is incorporated into the MCDIP is a unique chance to develop this further and guide my future career decisions.

[P5] The culmination of all these experiences was my application to the Master of Science (MSc) Neuroscience course at Imperial College London, a leading contributor of neuroscience research. Currently I am in the process of studying for the taught part of the course while also working on a masters project in the Sherborne group at the MRC Laboratory for Cell Biology. My project is focused on producing and testing a computational model of layer 2/3 cells in the mouse barrel cortex. This is a particularly exciting component of the course because it is an opportunity to investigate neuronal circuitry on a practical level, which will in turn prepare me for future research in the field. It is also an ideal way to apply the computer programming skills I learnt at Geotech Enterprise to the world of neuroscience. The SysMIC course fits well with this as additional training in mathematical, computational and statistical techniques is ideal for the modelling of neuronal networks and the option of a tailored third module will be particularly useful for a PhD project in the field.

[P6] Taking these experiences into account I believe I would be well suited to the MCDIP with my biological and computational background as well as my knowledge of both academia and business. The programme itself is attractive for numerous reasons. Firstly, the sheer breadth of high quality research and number of universities participating in the programme is ideal for identifying a project suited to my interests and experience. Secondly, the taught components of the programme and the opportunity for experience in industry provide a strong foundation for a successful career in neuroscience. Finally and most importantly, the programme will help me to make an informed decision about whether to pursue academia or industry upon completion of a PhD