From micro to macro

Propositions of the thesis

From Micro to Macro

Unravelling the underlying mechanisms of transcranial magnetic stimulation (TMS)

1. Excitatory rTMS (iTBS) increases while inhibitory rTMS (cTBS) decreases response to chemical depolarization in SH-SY5Y cells, showing that TBS protocols do work as advertised. -*This thesis*
2. While neither iTBS nor cTBS altered SH-SY5Y neuron morphology, iTBS did promote changes in gene expression indicating, as expected, plasticity-inducing potential. -*This thesis*
3. When modelling plasticity in human neurons using differentiated SH-SY5Y cells, supplemented serum should not be removed before experimentation. -*This thesis*
4. SH-SY5Y cells show evidence for TBS-induced plasticity effects; human-derived induced pluripotent stem cells (iPSCs) are now needed to understand the contribution of genetic variation. -*This thesis*
5. In humans, repeating rTMS sessions within a single day can promote additive metaplasticity, but longer breaks (50 minutes to 1 hour) between protocols are needed. -*This thesis*
6. Human cellular studies are needed to understand TBS effects at the most basic, fundamental level, because indirect measures of TBS-induced neuroplasticity in humans are variable and difficult to replicate.
7. Understanding the underlying mechanisms of rTMS through interdisciplinary research, from microscopic to macroscopic, will improve outcomes for rTMS in the clinic. -*Impact paragraph of this thesis*
8. To better understand the complexity of our brain, we must fully understand the tools we use to study it.
9. Bridging insights from different disciplines is necessary to tackle scientific bottlenecks, and yet interdisciplinary research remains a challenge due to systemic barriers hindering this approach.
10. Two roads diverged in a wood, and I—I took the one less traveled by, and that has made all the difference. -*Robert Frost*
11. The real voyage of discovery consists of not in seeking new landscapes, but in having new eyes. -*Marcel Proust*