

SBNS Bursary Reflection Report – Research Elective at the Starr Lab, University of California, San Francisco

I am extremely grateful to the Society of British Neurological Surgeons for supporting my five-week research elective at the University of California San Francisco (UCSF). The experience was formative both academically and clinically, and has shaped the next stage of my development as a future functional neurosurgeon-scientist.

Research Experience

During the placement, I worked under the supervision of Professor Philip Starr, Dr Simon Little, and Jiaang Yao on a project investigating aperiodic neural dynamics as a potential biomarker of motor states in Parkinson's disease. I had the opportunity to work with a rare, high-quality dataset integrating local field potential (LFP) recordings from Medtronic RC+S implants with motor fluctuations quantified through PKG wearable sensors.

My primary contribution was the development of a multi-step MATLAB and Python pipeline capable of:

- preprocessing RC+S data from multiple sessions,
- segmenting neural activity around PKG-defined bradykinesia/dyskinesia events,
- performing spectral decomposition using FOOOF to extract aperiodic exponent and offset features, and
- running regression and correlation analyses to examine their relationship to behavioural states.

I presented the work at two UCSF lab meetings, receiving valuable feedback from faculty and postdoctoral researchers. This pipeline is now being adopted by other members of the laboratory and is expected to contribute to an upcoming publication on real-time biomarkers to guide adaptive deep brain stimulation (aDBS). Being able to contribute to a project with direct translational implications for DBS programming was a highlight of the elective and reinforced my motivation to pursue research at the intersection of neurophysiology and neuromodulation.

Clinical Exposure

Alongside my research work, I had the chance to observe a range of functional neurosurgical procedures, including iMRI-guided DBS implantation and awake MER-guided DBS surgeries. Witnessing the precision, teamwork, and patient-centred decision-making involved in these cases gave me a deeper appreciation of the craft and responsibility of functional neurosurgery. Seeing the intraoperative neural recordings align with the physiological concepts I had been analysing at the computational level helped bridge the gap between laboratory work and clinical practice.

Professional and Personal Development

Outside the laboratory, the elective provided numerous opportunities for personal growth. I completed the San Francisco Marathon, my first marathon, an experience that taught me

resilience and gave me a community of endurance athletes who supported me throughout my time in the city.

I also formed meaningful friendships with students, residents, and researchers across UCSF, many of whom I remain in contact with. Importantly, the mentorship I received from Prof Starr, Dr Little, and others has already led to ongoing collaborative projects with groups in the UK, strengthening my long-term vision of building an international research network focused on adaptive neuromodulation.



The culture of generosity, intellectual curiosity, and collaboration at UCSF left a lasting impression on me. I returned to the UK with renewed motivation, a broadened skillset, and a clearer sense of direction in my academic and clinical journey.

Conclusion

This elective was a transformative experience that reinforced my commitment to a career in functional neurosurgery and neuromodulation research. I remain deeply thankful to the SBNS for providing the support that enabled this opportunity. The skills, relationships, and insights gained at UCSF will continue to shape my development as I progress towards residency training, advanced research, and a career dedicated to improving the lives of patients with movement disorders and epilepsy. I look forwards to more international opportunities, both research and clinical, and I will always look back at my time in San Francisco fondly.

