Final report

Internship abroad

Subject of studies: Neurosciences

Bachelor/Master/State exam: Master

Time of internship: 18/12/2023 to 7/3/2024

Place of internship: Lisbon, Portugal

Internship institution: Champalimaud Foundation

As part of the Erasmus+ Traineeship program, I traveled to Lisbon, Portugal, to conduct a Neuroscience research project at the Champalimaud Foundation (Figure 1). Established in 2011, this foundation was created according to the will of Antonio Champalimaud, the wealthiest man in Portugal at the time. It comprises two main parts: the Champalimaud Clinical Center, a private cancer clinic, and the Champalimaud Center for the Unknown, a facility dedicated to neuroscience and cancer research. My research group was one of approximately 30 groups that belonged to this research division.

Figure 1: Champalimaud Foundation from the bird's eye view. Source: https://www.fchampalimaud.org/

Figure 2: Open office where researchers work. Source: https://www.facebook.com/ChampalimaudFoundation/

The institute was constructed with the objective of creating a welcoming, engaging and collaborative scientific environment. It features two big open laboratory offices (Figure 2): one dedicated to Neuroscience research and the other to Cancer research. This layout helps to create connections among scientists; for instance, many students benefit from having dual supervisors thanks to the conversations they had with other scientists from different research groups. I had multiple times the opportunity to join meetings of other research groups, which allowed me to explore the diverse types of research being conducted.

This research environment is quite different from the typical Neuroscience laboratories which consist often of more independent research groups. The shared spaces also allow more efficient use of tools such as microscopes which can be shared across the whole institute. However, naturally, this environment also comes with its share of distractions, making it occasionally challenging to focus solely on work.

There are numerous seminars and lectures held regularly, enriching the academic learning. For instance, every Monday, a seminar takes place where two PhD students from different research groups present their current research findings. Another seminar I regularly attend is the Neural Cognitive Architectures Discussion Group, where we delve into contemporary topics in Theoretical Cognitive Neuroscience, which for example talks about Large Language Models such as ChatGPT and its uses. I like this collaborative approach to science, which stimulates learning and exchange of ideas.

At the institute, many social events take place. For example, Happy Hour happens every Friday, where a different research group rotate to take on the responsibility of organizing and providing drinks. We gather at the amphitheatre (Figure 3) to enjoy the warm weather of Portugal. Apart of this gathering, the institute also offers variety of social clubs, including groups for climbing, salsa dancing, football, basketball, LGBTQ and many others.

Figure 3: Amphitheatre of the Champalimaud Foundation. Source: https://www.fchampalimaud.org/

Figure 4: Bridge 25 April. Source: https://lisbonlisboaportugal.com/

Additionally, I joined the expats running club in Lisbon, to meet people outside of scientific circles. Many people are digital nomads – they work remotely and travel around the world. There is a big hub of nomads in Lisbon. They chose the city because of its splendid weather and they contribute to the intriguing and dynamic vibe of Lisbon. Last month, I also participated in a half marathon that took us across the 25th of April bridge—very exciting opportunity, as it's the only day pedestrians are permitted on the bridge!

I chose to do internship in Champalimaud Foundation, because it primarily focuses on the subfield of Systems Neuroscience within the broader field of Neuroscience. In contrast, other branches of Neuroscience include Molecular Neuroscience, which explores the brain at a molecular level by studying the interactions of receptors and molecules, and Cognitive Neuroscience, which typically investigates human psychology through studies and techniques like fMRI. Systems Neuroscience bridges these areas by aiming to understand how brain functions emerge from the interactions within neural circuits.

The research group I am part of focuses on studying serotonin. At the cognitive level, it is known that serotonin drugs can alleviate depression. On the molecular level, specific receptors were identified that serotonin molecules interact with. However, the functional mechanisms by which serotonin improves mood remain unclear. Furthermore, the specific groups of neurons or brain regions responsible for serotonin's therapeutic impact are still unknown.

There are several theories about the actual functions of serotonin in the brain. The three main theories—Flexibility, Opponency, and Patience (Figure 5). These theories suggest that serotonin not only influences our mood, but it also plays a critical role in decision-making, learning, and responding to changes in our environment.

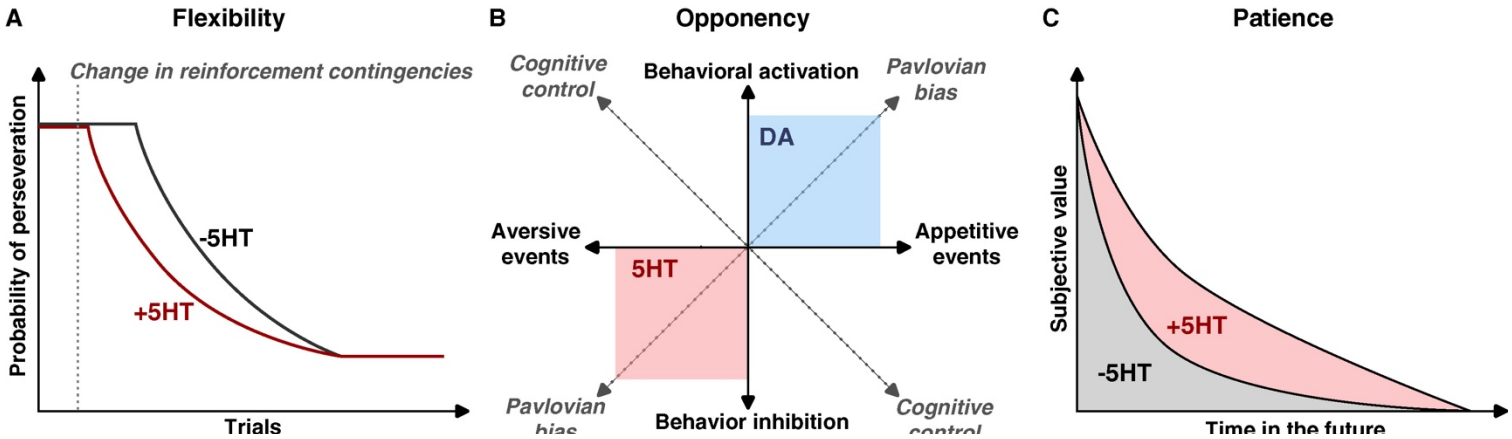

Figure 5: Principal cognitive theories of serotonin in the brain. Source: Romain Ligneul, Zachary F. Mainen, Serotonin, 2023, Current Biology, Volume 33, Issue 23

In my research project, I am exploring the relationship between serotonin and the behavioral states of animals. We perform experiments where we measure the activity of serotonin neurons while the animal runs on a wheel within a virtual reality environment. We've observed so far that serotonin activity varies with the animal's behavioral state—there is the

least activity during sleep, and it is increasing as the animal becomes more active. However, there appears to be a contradiction; as the animal begins to run faster, the serotonin activity seems to decrease. The aim of my project is to further investigate this relationship. My typical workday is that I do animal experiments in the morning, and in the afternoon I am analysing the data or attend some of the seminars which I spoke about before.

In the final part, I'd like to share a few words about Lisbon itself. I live in Graça, a vibrant and touristic district situated right next to the Sao Jorge Castle (Figure 7) and the Miradouro de Graça (Figure 6). It is located on top of one of Lisbon's highest hills, Graça combines traditional architecture with contemporary living.

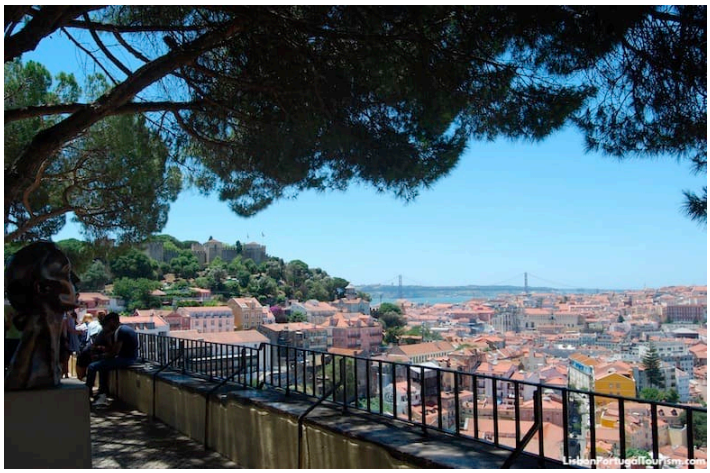

Figure 6: Miradouro da Graça. Source: https://www.lisbonportugaltourism.com/

Figure 7: Sao Jorge Castle. Source: https://castelodesaojorge.pt/en/

Reflecting on my internship at the Champalimaud Foundation, I can sincerely say that it has been a profoundly exciting experience. This opportunity solidified my enthusiasm for science as a collaborative and dynamic field. The foundation's commitment to fostering a highly collaborative environment at the cutting edge of neuroscience research is truly inspirational. I can recommend that anyone interested in seeing how modern science can be done in such an interactive manner consider visiting or joining this research institute. Living and working in Lisbon, with its rich cultural tapestry and vibrant community life, has been an invaluable part of my journey. Despite some challenges, such as the occasionally inconsistent transportation in Portugal, the country's charming aspects like the delightful weather and the relaxed attitude more than compensated.