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International Astrocyte School 2024, Bertinoro, Italy, April 14th - 20th 2024

I attended the International Astrocyte School (IAS) in Bertinoro, Italy from April 14th to April 20th. The one-week event is an interactive experience consisting of lectures and discussions focused on current developments in the study of astrocytes. Astrocytes are a type of non-neuronal nervous system cell and contribute to the function of the central nervous system by mediating homeostatic processes, manipulating neuronal excitability and signalling. The IAS serves as a space for early careers researchers to deepen their understanding of astrocyte research and connect with more senior investigators in the field.

The IAS is held in the Bishop's Fortress of Bertinoro and was made up of 35 students and 10 members of faculty. Following an introductory talk on Sunday, the school began in earnest on Monday, April 15th. We were taught about tools available for Ca²⁺ imaging by Prof Richard Robitaille and the analysis of Ca²⁺ imaging data by Prof Amit Agarwal, heard about genetic mouse models for glial studies from Prof Frank Kirchhoff and finally from Prof Keith Murai about how the complexity of neuron-astrocyte communication affects available astrocyte labelling protocols. These technical talks were often followed by animated discussion from both students and faculty members concerning intricacies of experimental design and how they may affect (or be exploited to improve) the validity and reliability of experimental outcomes. These discussions felt especially valuable to me: since the astrocyte research community is still limited in number, the opportunity to discuss experiments with a room full of experts is rare and yielded much food for thought.

In the afternoon, the student presentations began. Each student had been asked to prepare a 7-minute presentation introducing a recent or ongoing research project followed by 3 minutes of questions from the audience. My own presentation of my completed master's project entitled 'The effect of G-protein coupled oestrogen receptor activation on astrocyte calcium signalling' took place on Monday afternoon. It was fascinating to see the other students' presentations and gain an appreciation for the breadth of research concerning astrocytes currently being conducted all over the world. As during the morning talks, the questions and discussion following the student presentations was passionate and constructive, with both students and faculty members participating.

The student presentations continued to the next day. There were only two lectures by faculty members on Tuesday: Prof Matthew Holt provided an overview of the toolkit available for RNA sequencing, and we heard from Prof Paola Paolicelli how confocal imaging can be used to assess synaptic pruning by microglia, another type of glial cell. This allowed two hours in the late afternoon to prepare for the Agora presentations on Friday. The Agora, a hallmark of the IAS, is a 45-minute group presentation and collective discussion where students propose bold, new ideas to tackle big questions remaining in astrocyte research. Students were split into 3 groups: Group 1 (my group) discussed the topic of astrocyte heterogeneity, group 2 considered whether astrocytes can be inhibited, and group 3 focused on the connection between the metabolic and synaptic functions of astrocytes. Groups were given preparatory reading and are intended to propose an expansive program of research to make new headway into the still unsolved depths of their assigned topic. The Agora, named for the Greek gathering place, is usually held at a small amphitheatre present on the fortress grounds and is meant to foster inquisitive, open-ended exploration allowing students to learn more about a given topic, but also how a range of methods might be employed to approach a large research question from several angles.

By Wednesday, students and faculty were well-acquainted and debate and discussion flowed easily after each of the four lectures we heard: We heard about the limitations of behavioural studies from Prof Giovanni Marsicano, the development of organoids from Prof Elly Hol, were shown novel computational tools by Prof Kerstin Lenk and also had our first so-called 'science talk' from Frank

Kirchhoff, showing novel data on astrocytic receptors for neurotransmitters. In the afternoon, the intensive scientific programme was complemented by a half-day trip to nearby Ravenna. We were given some time to explore the city independently before taking part in a group tour where we saw the stunning mosaics in the ancient churches and mausoleums of Ravenna, an incredible experience.

Thursday morning was taken up entirely by scientific talks. First Prof Amit Agarwal shared his findings on astrocyte-induced analgesia with us, before Prof Matthew Holt spoke of the heterogeneous role of astrocytes in differential synaptogenesis. We also heard about microglia and pathogenesis from Prof Rosa Paolicelli, followed by my favourite talk of the week, in which Prof Keith Murai showed us electron microscopy data visualising the ultrastructure of astrocytes in a way I had never seen before. Then came our final preparatory session for the Agora, where we fleshed out our central goal with more specific aims as well as methods to achieve them. We developed a presentation, considered carefully how we might overcome the limitations introduced by the techniques we had chosen and theorised how our findings could transform the field of astrocyte heterogeneity and our understanding of astrocytes overall. Due to our varied research backgrounds, each group member was able to lend different expertise.

It was surprising when Friday came and the end of the IAS drew near. It had been such a pleasure to engage in rigorous scientific discussion with my fellow students and the lovely faculty members, I was sad to see it end so soon. On this last day Prof Elly Hol taught us about the role of GFAP filaments in brain disease, Prof Giovanni Marsicano provided insight into his work on astrocytic endocannabinoid receptors, Prof Kerstin Lenk introduced a computational model developed by her lab and finally Prof Richard Robitaille shared his findings on the role of Schwann cells at the neuromuscular junction in ALS. Lastly, we held our Agora presentations. As promised, group presentations elicited in-depth discussion. As a larger group, we considered each experiment proposed and how it might be used to glean new knowledge for the field. Discussions were technical and detailed without losing sight of the big picture. Then, after a wonderful, long goodbye dinner, it was all over.

Overall, I would recommend the IAS to any glial researcher. It was not only a rigorous, scientific exercise developing my understanding of astrocytes and allowing researchers to share and debate cutting-edge, often unpublished, new findings, but also a chance to develop a tight-knit community centred around promoting and uplifting the work of young researchers. I am thankful to have had the opportunity to take part in and benefit from the IAS, an opportunity I would not have had without the generous funding I received from the Royal Society of Biology.



IAS 2024 group photo in front of the Bertinoro Bishop's Fortress



IAS 2024 group photo at the amphitheatre



View from the Bishop's Fortress in Bertinoro