

## **Christian Pilling**

Year 2 (2020-21): MEng Mechanical Engineering

UROP (**Summer 2021**) undertaken in the Dept of Mechanical Engineering

**UROP title:** A Parametric Study of Resistance Welding Cylindrical Lithium-Ion Cells

Even before joining Imperial, I had great interest in electro-chemical power storage and the potential it holds to transition the world's energy consumption towards sustainability. In the first year, I was fortunate to have Professor Greg Offer assist me with a set of tutorial questions in a support session. Professor Offer began to explain some of the research he was working on and described the euphoria of a breakthrough explanation to one of the hardest problems the battery group was working on. Our small discussion on the impacts of that discovery got me interested in engaging with research myself.

In the second year of my degree, I approached our Maths lecturer Dr Monica Marinescu. I hoped that I could apply some of the numerical analysis methods I had learned in my ME2 course to modelling Li-ion batteries. Dr Marinescu was very supportive of my ambitions and got me in touch with the research assistance James Eaton (Research Assistant) and PhD student Waseem Marzook. I wanted to prioritize the utility of my research outcome to the battery group above all. James and Waseem highlighted to me the need for experimental results on the battery pack level. My goal, under Dr Marinescu's supervision, became to investigate electrical resistance welding, a cell connection method for battery packs, that had received little attention to date.

With the research experience I hoped to satisfy my curiosity and evaluate the possibility of completing a PhD with the battery group. At the same time, I wanted to obtain exposure to leading lithium-ion battery research, the way in which it is conducted, the key problems that are being solved, and the areas of greatest potential for the technology.

I benefited from the substantial amount of independence I was given. I believe this independence allowed me to engage my own curiosity, develop problem solving creativity, and a strong sense of ownership for the work I was doing.

I am looking forward to starting my third year of study where I will be tasked with the Design, Make and Test project. I would like to complete this project by designing the remainder of an optimized battery pack for a formula student application. I can also see myself answering some of the questions that came up in my research by doing a PhD at Imperial.

I am fortunate to be able to say that the pandemic had a small impact on my research experience. Being able to travel to campus allowed me to follow through with an in-person experimental UROP. The pandemic restrictions meant that contact with supervisors had to be used effectively and that there were certain access restrictions to offices or labs at times. However, these challenges were overcome by planning my experience well and making use of the online communication tools that everyone at the college is now very familiar with.