Hobson Industries Rokos Award Report

A degree in Physics offers its student a plethora of skills and analytical knowledge. It allows for hugely specific and entirely unbounded exploration of any topic within the physical world. What it does not have the time, or capacity, to offer is direct application of these skills in the world it seeks to describe. To this end, as a student of physics, the responsibility lies with me to develop experience and test my ability. This summer presented me with an opportunity to do just that.

Hobson Industries Ltd is a mechanical engineering firm specialising in reconditioning of Land Rover vehicles. Their work stretches from custom built vehicles for private customers to military grade vehicles. For a physics student the latter is, at face value, more interesting than the former. There is the capability for creation of highly armoured and technologically advanced vehicles. As a result of this the firm leads expertise in ballistics and blast protection. Hobson Industries Ltd founder Peter Hobson is just such an expert and conducted a selection of talks with me. These talks outlined the historical development of ballistics and how it is set to develop into the future. This went beyond experience in a field and forced me to stretch my mind to socio-economic influence on scientific development. It has spurred me to seek out where, in the current state of the world, my skills can be best suited. It opened my eyes to weighing up the moral and personal value to be found in a career path I might choose.

At the beginning of this internship, I questioned my own value. How could I be of use to a company which was going to invest time and effort in my entirely uncertain future? How could I repay some of their investment with output?

My technical skills were a good place to start answering these questions. In recent years, I have developed the ability to adapt to new computer software efficiently. It is a skill I have developed through my degree and other technological experience. This skill allowed me to grasp Solidworks, a 3-D modelling software. I could then model physical parts and items in the software with high precision. Software such as this is in line with a move towards more consistent and repeatable fabrication of replacement parts and better engineered specialist items. Obsolescence deals with an end to production of parts, and is an increasingly important part of vehicle restoration and upkeep. Modern methods of manufacture are providing alternative solutions to this problem. This modelling, and the more general engineering that it accompanied, constituted the early part of my time with the company.

As my time with Hobson Industries Ltd continued my concentration leaned towards the aforementioned ballistics. Ballistics is, simply put, the study of projectiles. It is a perfect example of applications aligned with a physics degree. One of the first things any student of physics will come across is the projectile of classical mechanics. However, the study of ballistics stretches far beyond just the distance a projectile will drop in a given time based on its velocity. You might think to ask yourself what happens inside the barrel of a rifle, the most common example of projectile motion? Well most people will appreciate that gyroscopic motion is required to keep a projectile stable and so there is ‘rifling’ (helical lines scored onto the inside of the barrel) to spin the projectile sufficiently quickly that it is stable due to rotation about its central axis. But how fast does the projectile need to rotate? And how many turns of the rifling are required to perform this? How long does that require the barrel to be? What barrel materials are appropriate for such manipulation? How do these factors vary with different projectiles, different weight, size, shape, material, construction? This is the concern of ballistics. Ballistics is an instructive example of the compromise between science and the logistical and financial implications of its commercial use. I am a student with little experience of the implementation of science in private markets. Spending time in the setting of a business on the

cutting edge of modern engineering techniques demonstrated the importance of research and development in a practical setting.

A key point that this summer highlighted to me is that a breadth of knowledge is very valuable in a practical setting. To demonstrate this you might propose consulting an expert in metallurgy to help you find a suitable material and treatment for a rifle barrel. If they, however, had no knowledge of internal ballistics they wouldn't have the full picture in advance of finding a solution. For example, they might find that a barrel and projectile combination appears to be very accurate but that with extended use the pressures lead to residue in the barrel which a different solution would better protect against. Without knowledge of the entire process and intended commercial use the optimal solution cannot be found.

With the importance of a wide scoped view at the forefront of my thoughts the remainder of my time was aimed at researching projectile production. The problems I have suggested above were suddenly the ones I was considering. Utilising data on current projectiles produced in a variety of ways, and on a variety of scales, allowed me to assess what techniques and processes best fit the desired projectile. Visits to local production facilities exposed me to pitfalls and points of note that data specific research cannot always highlight. I was able to use the extensive technical knowledge given to me by my research, accounting for commercial viability, to advise on an appropriate method of production for the purpose driven projectile.

Beyond the technical nature of the work I was involved with this summer I was fortunate to be surrounded by great people. My work was made infinitely easier and more valuable because of these people. I was able to use their expertise when I struggled and the sense of a common goal created within the company as a real source of motivation and direction in my work. I didn't simply feel like I was completing an internship but instead had a real purpose as part of a vision. It was not something I was expecting to come away from this summer with but is something I will now see as a requirement in my future. For this I am entirely grateful to both Peter and Barbara Hobson and the funding afforded to me through the Rokos grant.