Within this critical reflection I hope to show both my academic and personal improvement by undertaking the King’s Research Undergraduate Fellowship (KURF) with Dr Sanz’s Group in the Department of Chemistry at King’s College London. I will explain how the different skills and knowledge I have learnt throughout this project will be extremely useful for my future academic and professional life. The results of the project are presented in the submitted form of an academic poster (Figure 1).
I applied for the KURF with Dr Sanz as I she has been my physical chemistry lecturer for two years. During that time I had been able to gain a small idea of the type of research her group does, focusing on characterising conformational changes in odorants using broadband rotational spectroscopy. I knew that this field would not only challenge me, but was also within an area of my interest – spectroscopy. Before applying to the project, I visited Dr Sanz and her PhD student Donatella Loru at their laboratory, where Dr Sanz discussed with me the concept of the project and how I would work alongside Donatella within her group.

I was anxious before starting the project, I was really unsure of what academic research was like and that I may not even understand the theory behind the work I was doing. Thankfully I was eased into the project slowly, starting with reading and understanding the theory behind my project, especially focusing on unsymmetrical top molecules and the chirped-pulse Fourier transformed microwave spectrometer, which I hadn’t previously studied. The rest of my first week was spent working and getting to grips with the different software programs and some of the basic computational theory. During this time I was introduced to the laboratory and was shown the fundamental ideas of how the CPFT spectrometer at King’s works. There were two separate areas to my project, the first being the computational methods in which I used density function theory modelling to predict electronic structure and the possible conformers of my two different molecules of interest. The other was the experimental analysis of the compound using the complex spectrometer.

I quickly found my place within the research firstly turning my focus to dihydrocarveol and all its possible conformers, and as the project progressed I definitely got more comfortable with the theory, learning important computational ideas which can be applied not only in this project but to other areas such as drug design and areas within my studies during the third year of my degree. The first hurdle in the project was my access to Ada and the High Performance Computing centre at Kings, it took over 4 weeks for me to successfully gain access. This was extremely frustrating at times as all my computational calculations would have to be run through Donatella’s computer, so I was forever interrupting her work to work on my calculations. Luckily Donatella and I worked brilliantly together and her help and support really made such a difference to my project, I really wouldn’t have been the same experience if we hadn’t of worked so well together. Another challenge was collecting a spectra; as these molecules had never been studied using rotational spectroscopy in the gas-phase, there are many parameters which had to be optimised so that a spectra can be collected. It took over 6 weeks for a spectra of dihydrocarveol to be successfully collected, in this time I moved onto the computational analysis of my second molecule of interest limonene-oxide. By the last few weeks of the project I was working on assigning lines on my spectra using my computational calculations, it was great to get to a point where I could see the two areas of my project
converging. This showed me that it takes many different methods coming together to result in a final outcome.

Over the course of 8 weeks, I really felt that my input was taken seriously with my project running alongside that of the group. Every day was a new learning opportunity from how to add a sample into the reciprocal of the spectrometer to learning how to assign spectra lines to specific conformers of my molecules using specialised software. I felt that I was well supported by both Donatella and Dr Sanz along the way. My progress was always monitored and reviewed, approximately once a week there was a group meeting where we would discuss any areas of issue and the next path to investigate, this was extremely helpful and was a great opportunity to see how a research group ask questions of their results and learn from each other.

Before starting the project I really hadn’t considered the time demanding nature of research, this was probably my naive of me but at the end of my project I felt like I had only just cracked the surface with my research; there were plenty more questions left unanswered and many pathways which my project could have progressed along. The output of my project was an academic poster displaying the outcome of my research that I had achieved over the course of the project. This being the first time I had ever produced an academic poster, I found it challenging to condense all my data and results into a poster which was not only factual to the scientific community but also the other non-scientists interested in my project. This was an extremely useful experience as is it’s a fundamental necessity to communicate efficiently within the field. After all the calculations and weeks waiting for a spectra to be collected, it was fantastic to end the project with both the experimental methods being achieved for both molecules of interest. There were still some unanswered questions within my project, showing that a scientist’s work is never really complete, however in August 2015 some of my collected data and results from my poster were presented by Donatella at a conference in Dijon, where she won the Amat-Mills Award. The Sanz group are hopeful that this research will shortly be published, showing me that I had made a really valid contribution to the field. I really grateful to KURF for allowing me to take part in this project, it was stimulating and it was real pleasure to be a part of Dr Sanz’s group.