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In the underground tunnels over 10 metres below the surface at KEK's Tsukuba campus, engineers and scientists are hard at work in an attempt to complete the upgrading of possibly their most important facility. The B meson factory has not been in operation since mid 2010 and the improved Belle II detector, as well as the enhanced SuperKEKB accelerator, is to begin collecting data in late 2017. As I descended the stairs and opened the door to the observation platform on my visit to the Tsukuba Campus in July, I was left in awe by the grandeur and complexity of the Belle II detector and the entire project. It was a truly surreal experience to think that I was standing face-to-face with what was helping thousands of physicists around the world to better understand the nature of the Universe.

Today we seem to live in a matter dominated Universe made up primarily of protons, neutrons and electrons. However, since the hypothesis of the existence of the positron (the antiparticle to the electron) by Paul Dirac in 1928 and its subsequent discovery in 1932 by C.D. Anderson, physicists have been puzzled by the observed absence of these positrons and antimatter in general. For many years, the scientific community believed in CP symmetry between matter and antimatter to be the true symmetry. However while studying the decay of neutral kaons in Princeton University in 1964, James Cronin and Val Fitch observed there to be a favouring of matter over antimatter. This violation of CP symmetry, observed in the decay of B mesons to an even greater extent, is still not yet fully comprehended and the desire to further understand it is what drives the research of physicists around the world.

In the latter part of the day, we had the opportunity to speak to theoretical physicist Professor Matsufuru regarding his research. We were directed to the room which housed the supercomputers, where each machine completes trillions of calculations per second. The scale and complexity of the technology available is truly astonishing and it reenforced my appreciation for research in the field of Physics.

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During our summer holiday, I was lucky enough to visit KEK as work experience for a day to learn about high energy accelerators. In this report, I will be sharing some of the things I've observed and learnt through this prestigious experience. In KEK, almost all of the research revolves around particle accelerator. Many of the research activities are collaborated with other international organisation across the world.

The most memorable experience during the day was the research at the B-factory. In this factory, the electron and positron is collided that are accelerated almost to the speed of light through a double ring with asymmetric energies, which reveals the violation of the symmetry between particles and antiparticles. Through this collision, a great amount of different particles are produced such as Tau particles and Charm mesons. This is then, observed and researched to ultimately define why antimatter has disappeared from the universe. The experiment has begun in 1999, and is still investigated to find if there are any unknown particles and interactions that are yet to be discovered. There are over 400 researchers involved in this project and in 2001, there was a major discovery of the violation of relationship between B and anti-B mesons.

Other than the particle accelerator, KEK studies K-Meson decays, by measuring the transitions of Kaons into particles with smaller mass. The purpose of this investigation is to understand the interaction among quarks by observing the decay pattern and modes precisely. KOTO experiment has begun in 2013 and there are currently over 30 experimental physicist from all over the world working on this project.

I also had an opportunity to see the supercomputers. Supercomputers are used in collaborated researches on projects in elementary particle and nuclear physics including related fields. It is a computer with a high level computational capacity. This system with massive numbers of processor distributes small tasks for each individual computer and integrates the task results from all the clients into the overall solution. Processors are placed in proximity to each other, which saves a vast amount of time to move data. Therefore we were able to learn not only the physics of the particle collider, but also how they processed the data from the research.

Overall, through this work experience at KEK (High Energy Accelerator Research Organisation), I was able to learn a lot of new physics and definitely enhanced my interest towards the subject.

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On the 4th of July, we visited the KEK research centre located in Tsukuba as part of our work experience. We were given lectures to further deepen our knowledge, as well as an insightful tour of the facilities and even a chance to interview a research assistant.

In the afternoon, we had the rare opportunity to see the Belle II electron collider. The purpose of Belle II is to collect a huge amount of data on the interactions which occur in order to solve one of physics' biggest mysteries: why is there more matter than antimatter? Regardless of the fact that it was under construction, it was an upmost, valuable experience to observe the huge contraption first hand and was an eye opener to me on the scale of the project.

After visiting Belle II, we were kindly shown around by a research assistant, Hideo Matsufuru. He passionately spoke about super computers and his research. These super computers have a huge contribution towards the research. They carry out an immense amount of calculations allowing a comparison between theory and experiment. Hideo Matsufuru stated that 'We are all not satisfied with the standard model. If the standard model is not the answer, what is the final answer?'. It was extremely inspiring to hear the motivation behind the hard work of the scientists.