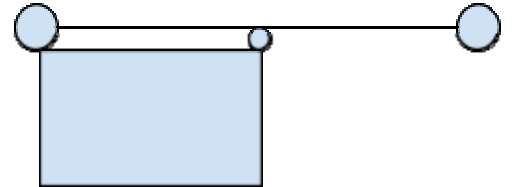


Work Experience Report 2013

During the Bristol University work experience week July 2013, we attended talks and conducted experiments. As well as this we went on a tour around the cryogenic (low temperature) laboratory, used computer programming to model various situations and played chess.

Programming

On the first day, after being given our safety induction and general tour, we were set the task to start work on programming in VPython. VPython helps make it *easy* to create 3D models or animations and so allowed us to model a ball bouncing, for example. Pretty much all of us had little or no prior experience in programming and so we were thrown in at the deep end but we were given a sheet with *some* guidance. There were a lot of programmes already on the system that we could look at to get a feel for using the software. Then we all started on different projects creating models of different concepts – some bounced balls in a box, some tried to track the trajectory of a thrown ball and others attempted solving a physics problem involving two balls attached to a pulley by a string, trying to see which ball would hit the end of their path first.



Talks

On Monday afternoon we had a talk by Particle Physicist Emyr Clement. He described his role and talked about his work at the CMS detector in the LHC. He explained the process of detecting different sub-atomic particles such as muons, electrons and charged and neutral hadrons. He also outlined a few problems with the standard model and some of the theories hoping to solve it, such as the idea that every particle has a supersymmetric partner.

Tuesday afternoon was focused around, what is hoped to be, the first of many HiSPARC conferences. HiSPARC is a global project in which secondary schools and universities alike can place detectors on their roofs to monitor the levels of cosmic rays (high energy particles from space). This is in an attempt to gain a deeper understanding of where these particles come from as well as the factors which affect their frequency and energy. The project is focused on researching particles with an ultra-high energy (twice as high as those achieved at the LHC).

As part of the HiSPARC conference a talk was given on dark matter and dark energy, entitled “The Missing Universe”. It was thoroughly interesting and we are all intrigued by the mysterious prospect of dark energy.

Another talk was presented by Christian Thomay, a postgraduate student at Bristol University. Topics in the talk included neutrino oscillation and applications of using cosmic rays, such as volcano radiography. We were taken through some methods and techniques that Physicists used in the past to discover new particles. The talk was brilliant as we learnt many new things. The conference was thoroughly interesting and we all came away intrigued and excited about any future developments to the research of cosmic rays, dark matter and dark energy.

Lab Work

On Wednesday we had a chance to work in an undergraduate teaching lab with Gemma Winter, and attempt to make holograms in a dark room. This required aligning lasers and mirrors in order to project an image of an object onto a piece of holographic film, which would then be developed. Two techniques were outlined to us; one was more complex and involved splitting a laser beam into an imaging beam and a reference beam (transmission holograms), whilst the simpler method used a single beam and one mirror to make a hologram that was visible under daylight (reflection holograms). After several attempts, groups had varying results, but everyone agreed it was enjoyable, and a different experience to the computing we had undertaken on the days prior.

For a fun afternoon activity we attempted to make some of our own homopolar motors, a very simple motor using only a battery, magnet and a piece of wire. Inspired by youtube videos we made our motors by attaching a neodymium magnet to the bottom of an AA battery and connecting the two poles of the battery with a piece of wire, the resulting circuit causes the wire to spin around the battery. The only problem we encountered was trying to keep the wire balanced and in contact with both the battery and the magnet. After many designs we came up with one that worked, it looked a little like the picture here. It was a very fun experiment which ended with good results.



Cryogenics

On Thursday we were taken on a trip to the 'Low Temperature Lab' where we were given a talk about Cryogenics. In the lab a postgraduate student explained various methods of achieving lower temperatures. Finally, he demonstrated how cooling a superconductor can create the impression of anti-gravity, as he floated a supercooled 'train' along a track of magnets. It was one of the standout activities in the experience.

Student Life

One afternoon two students gave us a tour of some of the departments at Bristol University, giving us a good feel for the university. We had a Q&A session with the two students where we asked questions about studying Physics at Bristol, workload, lectures, the amount of lab work for example. This helped to give us a better feel for university life at Bristol.



The experience has been very interesting and enjoyable, sampling what it would be like to study a diverse range of topics related to Physics at university.