Physics

Medical Physics

For medical physics, we first started with trying to really understand what 'medical physics' meant to each of the students. For some, it meant getting an x-ray after breaking a bone during sporting events; others mentioned that ultrasounds were used to observe prenatal development. Indeed, medical physics covers all the above, plus more! The general idea is that anything related to how we use techniques and technologies to better observe and measure what happens internally throughout our body, is studied under this field. Personally, I talked about my work with MRI, magnetic resonance imaging, which uses a combination of magnets and radio waves to generate pictures of what goes on inside the body. It kind of works like echolocation, where the machine emits a radio wave which interacts with your body, and then your body emits a wave back that the machine measures. One of the cool properties of MRI scanners is that they're supercooled by liquid helium to ~4 kelvin (really cold). There's a phenomenon of superconductors, where certain materials at cooled temperatures can have strong magnetic fields and zero electrical resistance. As it turns out, having stronger magnetic fields is great for MRI! In our session, we did an experiment where we took household magnets and exposed them to different temperatures: lukewarm water, boiling water, ice water, and dry ice. Then, we measured their magnetic strengths by seeing how many paperclips each magnet could pick up at each temperature. For background, we talked about Curie's law, which related the magnetization of a material to its applied magnetic field and temperature. The results were surprising; as it turns out, the magnets didn't behave the way students hypothesized! (If you're curious, this is a relatively easy and safe experiment to attempt at home.)

Particle Physics

Every second, millions of particles fly right through our bodies. We can neither see them with our eyes nor feel them with our hands. Yet, we can reveal their trace using cloud chamber, the first particle detector invented a century ago, which opened the door to a zoo of subatomic particles. A cloud chamber is a container filled with supersaturated vapour, in which particles leave white tracks while passing through. The layer of vapour looks like mist or cloud, which gives the name cloud chamber. In a team of five, the Future Science Leaders students built their own cloud chamber using alcohol as the cloud medium. As the alcohol vaporized and sank to the bottom, dry ice was used to create an abrupt drop in temperature which causes the alcohol vapour to become super-saturated. As the radioactive particles passed through this layer of vapour, they turned the vapour into tiny droplets leaving different looking white tracks behind. The different length and thickness of these tracks can be used to distinguished and characterized the different particles. For example, Alpha particle emitted from 1950s Fiesta dinnerware, which contains radioactive uranium oxide, would leave a short thick track; whereas cosmic rays, which are high energy charged muons striking the Earth from the outer space, would leave a long thin track. Beside detecting particles with their DIY cloud chamber, the students were also introduced how state-of-the-art particle detectors work, as well as some of the major unsolved problems in Particle Physics. To go beyond cloud chamber, the students visited TRIUMF, Canada's National Laboratory for Particle and Nuclear Physics. At the heart of it, you would find the largest cyclotron that provides the primary proton beam for the on-site facilities. Led by dedicated physicists at TRIUMF, the students were explained the process of the various experiments in different fields such as Particle Physics, Nuclear Physics, Medical Physics and Accelerator Physics. In addition to learning about these advanced technologies, the students also learned how special relativity plays a role in Subatomic Physics, and how it is applied and seen in action in the real-world environment at TRIUMF.

FSL Fellow

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I study magnetic resonance imaging (MRI) in relation to injuries of the spinal cord. This is done under the Medical Physics program at UBC, which also encompasses x-ray imaging, PET/CT scans, and ultrasound.

FSL Fellow

Vincent Wong
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Particle Physics is the study of the fundamental laws of the universe. My research focus is using the ATLAS detector at the world's highest energy particle factory, the Large Hadron Collider, to search for new particles and physics beyond the Standard Model. Probing how fundamental particles are created and interact with each other, we become closer to explaining all physics with a "theory of everything".