

Comenius multilateral project
Ins and Outs of the Magic Möbius Strip

From 10th to 17th March I participated in a project week organized in the UK, along with my high school colleagues and students from Germany, Romania and the UK. After landing at Heathrow Airport, we rushed through the airport to board a train to the center of London, where we met the rest of the group. Together, we headed towards a hostel where we spent the first night.

The next day, in the afternoon we visited the Science Museum, one of the largest museums in London. Its breathtaking collections span across six floors. What especially impressed me were the exhibits on physics. It's hard for me to point out what I liked best since mostly everything was cool and interesting. And by everything, I mean everything: from atom dissolvers, radio technology, machines, engines, biotechnology, astronomy, mummies, tools, to clothing. But, there were several items I would like to single out. Since this project is on Möbius strip I roamed around the museum until I found something about it. So, I discovered all sort of bands that really impressed me. Also, I came across Klein bottles formed in many different ways. Moreover, my friend Dominic found a Möbius shaped bench in the Egyptian department but with only two twists. Other things that weren't related to Möbius were: jet engines, air planes, old cars, ships and medical instruments used in the past. Seeing it I found myself taken aback with the ways people used physics to invent all sorts of devices, instruments and machines. The only downside of this visit was the fact we didn't have enough time to examine exhibits more thoroughly. That's why I decided to pay it a visit in the near future, maybe even this summer. The same day we went to Oxford, where we had a tour around the University. We were introduced to many traditions associated with the University. For instance, the type of clothes a student would be wearing throughout his/her schooling period at the university depends on the results of his/her entrance exams; the higher the score, the longer the gown will be.

The next day we visited the Mathematical institute where we had a lecture on topology and 3D geometry. The professor introduced us to the five Platonic solids, which are tetrahedron made of four identical equilateral triangles, cube made of six identical squares, octahedron made of eight identical equilateral triangles, dodecahedron made of 12 identical regular pentagons and icosahedron made of 20 identical equilateral triangles. We had to count all the edges, vertices and faces of every Platonic solid. Comparing the measured data for every solid, we determined that certain expression, called Euler's theorem always gives the

same result: $V-E+F=2$ where V stands for number of vertices, E for number of edges and F for number of faces. Then we took a piece of paper and imagined its edges being rotated in different directions. We concluded that if we rotated the edges of paper we could get cylinder, torus, Möbius torus or Klein bottle depending on the way we rotated the sides. We proved Euler's theorem for solids and determined its Euler's number to be 1.

At 4pm we departed for Plymouth. On our way to Plymouth we visited Stonehenge. By then I had heard much about its magnificence and many reasons why it represents such a mystery. What's so mysterious about it is the way it was built 3000 years B.C. Those type of rocks can't be found in less than a few hundred miles radius so the way those rocks were being transported to its current location remains unknown. Furthermore, it's a mystery how the structure was built even if the blocks had already been there. Stonehenge is made of several vertical stone blocks placed on a circle path, connected with horizontally placed parts. Each and every part weighs more than ten tons and to place them in that way seems unimaginable without heavy duty machinery. Still, they managed to build it more than four thousand years ago using only their bare hands. In the evening we arrived to Plymouth, where my hosts expected me.

The fourth day of the project week began at the Devonport High School for Girls. The school itself is astonishing while its students are friendly and easy-going. The school is attended by more than 800 students divided in 7 generations. On our tour around the school we saw different kinds of laboratories, such as physics, chemistry, biology and language laboratory. We attended one class; six grade mathematics. I enjoyed the lecture very much. It was about statistical method, standard deviation. We solved a couple of tasks on that theme, one of which the professor thoroughly explained on the whiteboard at the beginning of the class. I really enjoyed the time I spent in the school.

The next day we traveled to a one-hour-drive distant site, called the Eden project. The Eden project consists of two large greenhouses, surrounded by greenery. Before the site became Eden project, it used to be a mine. So, by building it, in the year 2000, scientists wanted to show that nature can repair itself if we gave it an opportunity. They built environmentally friendly domes, designed in the form of a bubble. We visited both of the domes, the tropical one and the Mediterranean one, which we briefly explored. We were given an assignment, which was to come up with an idea on how to familiarize visitors of the Eden project with the production of chocolate. We had an idea of building a sculpture, a "chocolate train" that would explain the way chocolate is produced and distributed all over the world.

On the sixth day of our project week, we visited the University of Plymouth. It consists of several parts, one of which is a 3D projection room. We've seen several short clips in order to comprehend what the equipment is capable of. Then we took a virtual space tour where we explored our planet Earth, Solar system, Milky Way galaxy, and other galaxies and stars in the currently known part of space. Afterwards, we attended two lectures, on statistics and mechanics. The lecture on statistics was about statistics paradoxes and the one on mechanics was about balancing bodies. We did some interesting experiments on mechanics, where we tried to determine the center of mass of given objects and then balance them.

On Friday, we spent the entire day at school, working on our presentations, where we showed what we've experienced and learned during the project week. Also, we presented what we've been working on so far back home.

The last day of the project week we said goodbye to our hosts and headed back home.

This project week was one of the greatest weeks of my life. It has enabled me to practice the English language, meet many wonderful people and different cultures. I feel grateful for having had an opportunity to participate in this project, while looking forward to October and the next project week.

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