Personal UROP perspective: Summer 2018
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Supervisor: Dr Jamie Standing
Geotechnical Ground Characterisation for tunneling projects

Motivations for UROP

There are two main reasons that motivated me to participate in this UROP with Dr Standing.

The first reason is related to the development of my hometown, Suzhou, China. There are a great number of infrastructure construction activities going on in China. My hometown is building an underground system, which brings many opportunities for relevant research and problems at the same time. Tunnel construction, as well as that of other underground structures, is highly challenging due to significant uncertainties, risks and variability. Therefore, tunneling is one of fields of civil engineering that I'm interested in.

The second reason is related to my individual development. I hope to become an academic and be able to solve engineering challenges in the future. UROP offered me a research experience which would be greatly helpful for my future study and career, such as my final-year individual research project and PhD course.

How I secured the placement and preparation I undertook before my research experience commenced

I researched information about the geotechnical academic and teaching staff and visited relevant website before autumn term started. Finally, I decided to choose Dr Standing as my supervisor when I knew that he was experienced in tunneling projects. Fortunately, he taught me soil mechanics in that autumn term, so I had the chance to express my interest in participating in UROP to him face to face. After several discussions, we agreed upon the topic and period of the project and I successfully applied for my bursary in February 2018.

Skills and experiences gained from undertaking my research experience

The UROP has helped me to gain laboratory research skills and experience. I worked with an MSc student, Heena Sheth and anther UROP student, Phoebe Otten on a geotechnical project. This project aimed to investigate the slope stability of an island in the Thames near Chiswick. I undertook a ground investigation with the other two students and Dr Standing on the island in the early morning when the river level was low, taking samples using a hand auger and watching piezometers being installed. Afterwards, we three students performed soil characterisation experiments on the samples obtained. Previously I had gained knowledge about most of tests but had little chance to perform them in practice before. Such experience enables me to learn more details of these tests and have a deeper understanding about geotechnics and soils. I have also improved my communication skills because I often needed to discuss problems encountered during the testing with the other two group members. This is very important if I work in a group research project in the future.

In addition, I gained more knowledge about tunneling. Dr Standing lent me a book about Jubilee Line Extension project (JLE) tunneling as background reading. I not only learnt about the project

itself but also a general perspective of tunneling in terms of its construction, monitoring etc. Dr Standing also took his UROP and MSc students for a day out walking along the JLE tunneling route. He introduced his work and experience in this project and showed us clues of his work which remained after the project finished. It is really a better way for me to learn things about tunneling in this way than reading books because I could experience the real thing.

Problems I experienced and how I resolved them

Sometimes there might be great distinction between theory and practice and researchers are required to handle unexpected conditions. For example, in the test determining particle size distribution of a sample, the distribution for particles larger than silt size are determined using dry sieving method while remaining silt and clay particles are determined using a hydrometer. Theoretically, results obtained from these two tests should fit together well. In practice, there was substantial discontinuity found between the results of the two tests when data was analysed. This could be due to sample loss during the hydrometer test. Therefore, we re-ran the sieving and hydrometer tests for this sample and finally got a normal particle size distribution plot.

I initially made many other mistakes during experiments and in many cases the test procedure had to be repeated. As I spent more time on these tests and became more experienced and familiar with the procedure, the frequency of my making mistakes greatly reduced and satisfactory results could usually be obtained.

How the research experience might influence the remainder of my course and my future career plans

Although the knowledge of tunneling and experience of laboratory work may not help my future undergraduate studies, they are useful in many other aspects. The experience gained doing the laboratory work has prepared me for what a life as a researcher could be like and strengthens my will to be an academic researcher after graduation. Gaining knowledge of tunneling at this stage could save a great amount of time if I choose to do relevant related research in the future.

Finally, I would like to express my gratitude to Dr Standing for offering this placement and organising the field trip. I would also like to thank Heena and Phoebe for their cooperation during my UROP.