CaMPUS Placements: UK Industrial - Reports 2018

Below are reports on the Summer Placements provided by students who participated in the scheme in 2018.

Granta Design, Cambridge

Report 1

1. General		
Placement Location	**Granta Design**	
Arrival and Departure Dates	**02/07/18 – 07/09/18**	
No. of working days spent at Institution	**50**	
2. Financial		
Where did you stay during your placement (town name)?	**Cambridge**	
Total cost of daily travel to and from Institution (£)	**0 (10 minute bike ride)**	
Total received from Institution (£)	**~2950**	
3. Research Project		
Title of Research Project	**Investigating a better structure for the JAHM database (temperature dependent material data)**	
Written Report submitted to host institution	**No – didn't require one**	
Experimental Techniques used:	**VBA code + Excel functions**	
Interest level of project	on a scale of 1 (low) to 10(high)	**7**
Quality of support provided	on a scale of 1 (low) to 10(high)	**8**
Interaction with other researchers	on a scale of 1 (low) to 10(high)	**7**
Short summary (~ 200 words) of technical content of project:		
Granta Design is a software company who create powerful software to manipulate materials data using a variety of databases. I was a part of the data products team, which involved building and improving the variety of databases that Granta provides. My task was to come up with a way to improve the JAHM database, which was incredibly messy; this made it hard to find the specific record a user may want, leading to errors. I carried out initial investigations into use-cases and problems which are present in JAHM, also considering the decisions made in how the database was first built. I demoed solutions to the team and we decided that combining records was best. This also involved re-categorizing descriptive attributes (e.g. heat treatment & product form) as some were incorrect/not standard. A final presentation to the team (and then company) allowed me to collect feedback on my demo records – with this I came up with a list of software proposals which must be implemented to better both the JAHM database and the Granta software (GRANTA MI), as well as creating guidelines for future JAHM builds. **Additional tasks involved finding links between similar & identical records between various databases uses VBA. The large amount of data is loaded into arrays when the code runs, and links are found between similar records (there is different matching logic for different types of materials); these links are then formed and saved to the sheet, which can be copied and imported into the databases.**		

Report 2

1. General	
Placement Location	**Granta Design**
Arrival and Departure Dates	**01/07/18-08/09/18**

No. of working days spent at Institution	**47.5 (10 weeks – 2.5 days Holiday)**	
2. Financial		
Where did you stay during your placement (town name)?	**Cambridge**	
Total cost of daily travel to and from Institution (£)	**£0**	
Total received from Institution (£)	**£2427.58 received (post tax) , Total to be received pre-tax (£3110.5 – 1.3333 weeks pay left to be received plus unspent holiday)**	
3. Research Project		
Title of Research Project	**Edu Maintenance Project**	
Written Report submitted to host institution	**Not requested**	
Experimental Techniques used:	**N/A**	
Interest level of project	on a scale of 1 (low) to 10(high)	**8**
Quality of support provided	on a scale of 1 (low) to 10(high)	**8**
Interaction with other researchers	on a scale of 1 (low) to 10(high)	**(Researchers not appropriate)**
Short summary (~ 200 words) of technical content of project:		
The primary aim of the project was to improve the process for updating the data in the Edu only databases. I was supported by the Data Products team to understand the maintenance needs of the Edu databases, accurately map the Edu attributes to the Main edition of MaterialUniverse (MU) attributes, map the Edu records to MU records, and create a procedure for an annual update. Within the project there was scope to develop any tools necessary to automate the update process.		

Report 3

1. General	
Placement Location	**Granta Design Ltd.**
Arrival and Departure Dates	**02/07/2018 to 07/07/2018**
No. of working days spent at Institution	**47**
2. Financial	
Where did you stay during your placement (town name)?	**Selwyn College**
Total cost of daily travel to and from Institution (£)	**None (used a bicycle).**
Total received from Institution (£)	**2961.50**
3. Research Project	
Title of Research Project	**Granta DI: Deliverables Intelligence**
Written Report submitted to host institution	**None.**
Experimental Techniques used:	**None.**

Interest level of project	on a scale of 1 (low) to 10(high)	**7**
Quality of support provided	on a scale of 1 (low) to 10(high)	**9**
Interaction with other researchers	on a scale of 1 (low) to 10(high)	**9 (colleagues)**
Short summary (~ 200 words) of technical content of project:		
This project was to improve the management of internal data. Involved identifying the data and how to group it, standardising different fields (including what the company delivers) and collecting some sample data. Initially, a system was created with mock up data and then real data was collected after some improvements were made. **Microsoft Power BI was used to visualise the data and I had to create a user-friendly interface for the different departments to use. Excel was used to collect and store the data. This project involved a lot of meetings with different members of staff- to find out about legacy projects and to convince them to support the new system we were proposing.** **It required little materials knowledge or technical skills and more business knowledge and communication skills.**		

Frazer-Nash Consultancy, Dorking, Surrey

1. General		
Placement Location	**Dorking, Surrey**	
Arrival and Departure Dates	**25th June-31st August**	
No. of working days spent at Institution	**49 (10 weeks, 1 bank holiday, option to take up to 5 days holiday)**	
2. Financial		
Where did you stay during your placement (town name)?	**Dorking**	
Total cost of daily travel to and from Institution (£)	**None- walked**	
Total received from Institution (£)	**£325 per week- total of £3250**	
3. Research Project		
Title of Research Project	**Modelling lobe creep and force redistribution in gas turbine disks**	
Written Report submitted to host institution	**Slide presentation prepared**	
Experimental Techniques used:	**None**	
Interest level of project	on a scale of 1 (low) to 10(high)	**9**
Quality of support provided	on a scale of 1 (low) to 10(high)	**8**
Interaction with other researchers	on a scale of 1 (low) to 10(high)	**8**
Short summary (~ 200 words) of technical content of project:		
My project built on work of the previous summer student. Gas turbines have a central disk holding the blades together using a system of interlocking lobes. During operation these lobes are loaded so creep. Creep causes the load on each lobe to change over time as each lobe creeps at a different rate, so the lobe forces redistribute over time. This force redistribution is currently modelled using Finite Element Analysis which can be difficult and time consuming. I was helping to develop a new viscoelastic model which was much simpler and gave instant results. I developed a numerical solution to model the behavior and constructed Excel spreadsheets to easily model the behavior without the need to write codes. I compared the fitted spring and dashpot constants required to model the true behavior with those estimated from materials, geometric and temperature data for the disks.		

I also did some smaller pieces of work. For example, I did research into methods used to analyse Low Cycle Fatigue of alloys and fitted some of these models to experimental data.

TWI, Great Abington, Cambridge

Report 1

1. General		
Placement Location	**TWI**	
Arrival and Departure Dates	**2nd July – 2nd September 2018**	
No. of working days spent at Institution	**45**	
2. Financial		
Where did you stay during your placement (town name)?	**Cambridge**	
Total cost of daily travel to and from Institution (£)	**£1 (car share)**	
Total received from Institution (£)	**£3086.35**	
3. Research Project		
Title of Research Project	**X-Ray Microscopy of MEMS Components**	
Written Report submitted to host institution	**Yes**	
Experimental Techniques used:	**X-Ray Microscopy, Python, ImageJ/FIJI macro language, MATLAB**	
Interest level of project	on a scale of 1 (low) to 10(high)	**8**
Quality of support provided	on a scale of 1 (low) to 10(high)	**6**
Interaction with other researchers	on a scale of 1 (low) to 10(high)	**4**
Short summary (~ 200 words) of technical content of project:		
The main project I was a part of was to design a new X-Ray Microscope (XRM). This involved the following • **Determining the effectiveness of a previously-unused Flat Panel Detector for the microscope, by taking a series of images using different parameters such as energy, time-step, source-sample-detector distances, etc. to obtain the best resolution** • **Designing sample holders on Solidworks and either building them physically with steel beams or sending them to be 3D-printed.** • **Finding plugins on FIJI/ImageJ to correct XRM images, determining the best parameters to use** • **Writing code in imagej macro language or python (self-taught during the placement) to automate the correction of large batches of images.**		

Johnson Matthey, Royston, Herts.

Report 1

1. General	
Placement Location	Johnson Matthey Noble Metals, Royston
Arrival and Departure Dates	25/06/18 - 31/08/18

No. of working days spent at Institution	44.5	
2. Financial		
Where did you stay during your placement (town name)?	Cambridge (at college)	
Total cost of daily travel to and from Institution (£)	~£300	
Total received from Institution (£)	£4214.46	
3. Research Project		
Title of Research Project	Improving the High Temperature Creep Resistance of ZGS Pt Wire	
Written Report submitted to host institution	Yes	
Experimental Techniques used:	SEM, SRT (Stress Rupture Testing), ICP, Optical Microscopy, Hardness Testing, Keyence (Digital Microscopy), Cold Tensile Testing, Furnace Operation, Met Prep.	
Interest level of project	on a scale of 1 (low) to 10(high)	9
Quality of support provided	on a scale of 1 (low) to 10(high)	8
Interaction with other researchers	on a scale of 1 (low) to 10(high)	9

Short summary (~ 200 words) of technical content of project:

I spent 10 weeks of this summer working with the Noble Metals R&D team (10 members) at Johnson Matthey to improve the high temperature creep strength of one of their platinum wire products. This Zirconia Grain Stabilised (ZGS) platinum uses oxidized zirconium content to pin the grain boundaries and dislocations and hence to improve creep strength.

Before this work, the wire failed in accelerated creep, stress rupture testing (SRT) around 90% of the time. By looking into the microstructure progression throughout key processing stages, and modifying these processes accordingly, we improved the pass rate of the test to around 40-50%.

A large amount of my work looked into the different failure modes of different wires, and within the same wire, due to variations in particle distribution. This allowed the whole team to develop a better understanding of the desirable microstructure to form, and hence how to optimise the process stages to best achieve this.

I was given the opportunity to work as a full member of the team, with individual tasks led by myself and also with collaborative tasks involving the whole team. In doing so, I had an enjoyable time and also learned a lot.

Report 2

1. General	
Placement Location	**Johnson Matthey, Royston**
Arrival and Departure Dates	**26th July – 26th September**
No. of working days spent at Institution	**41**
2. Financial	
Where did you stay during your placement (town name)?	**Parental Home** **Commuted by driving**
Total cost of daily travel to and from Institution (£)	**~ £350 in petrol**

Total received from Institution (£)	**~ £3000 (in the form of salary)**	
3. Research Project		
Title of Research Project	**Sintering Factor of Ceramic Additive Manufactured Parts, and Kinetic Model of Ammonia Oxidation**	
Written Report submitted to host institution	**Yes**	
Experimental Techniques used:	**3D Printing** **Sintering in Furnace** **Optical Microscopy** **ICP Analysis** **XRF Analysis** **Pressure drop equipment** **Measurement using calipers/micrometers**	
Interest level of project	on a scale of 1 (low) to 10(high)	**8**
Quality of support provided	on a scale of 1 (low) to 10(high)	**10**
Interaction with other researchers	on a scale of 1 (low) to 10(high)	**8**
Short summary (~ 200 words) of technical content of project:		
I was given a project to investigate the sintering behavior of ceramic parts that had been 3D printed, and to see how this varied with part size, powder composition and other variables. This involved printing many parts, post-processing, firing, measuring and analysis of the results. **I also helped develop an excel/VBA based kinetic model used for predicting outputs of plants producing nitric acid through ammonia oxidation, based on the design of the catalyst that the company sells. This involved analysing the gauze catalyst produced by the company before and after a campaign in order to populate the model with data; comparing plant data, measured data and model outputs; designing experiments to test and validate the model, and reviewing literature in order to enhance the scientific theory used.**		

AIXTRON, Swavesey, Cambridgeshire

Report 1

1. General	
Placement Location	**AIXTRON, Swavesey**
Arrival and Departure Dates	**25th June – 14th September**
No. of working days spent at Institution	**46**
2. Financial	
Where did you stay during your placement (town name)?	**College accommodation, Cambridge**
Total cost of daily travel to and from Institution (£)	**£0**
Total received from Institution (£)	**£4100**
3. Research Project	
Title of Research Project	**Roll-to-Roll growth and transfer of graphene**
Written Report submitted to host institution	**none**

Experimental Techniques used:	**SEM, Microscopy, electrochemistry, Raman, Product development and building**	
Interest level of project	on a scale of 1 (low) to 10(high)	**9**
Quality of support provided	on a scale of 1 (low) to 10(high)	**6**
Interaction with other researchers	on a scale of 1 (low) to 10(high)	**4**
Short summary (~ 200 words) of technical content of project:		
There is significant interest in the use of graphene as a transparent conductor in displays, touch panels and solar cells due to its unique properties of high conductivity whilst being flexible and transparent. At AIXTRON, my project was to grow graphene using copper catalyst, firstly at a batch scale on an R&D system, and then to move this onto a large roll to roll system for production. After graphene growth, the graphene is then transferred it onto a clear plastic substrate, namely PET. Again this was tested in small scale and then attempted in continuous, roll-to-roll fashion. Graphene growth was performed using a process known as chemical vapour deposition. In this process, the metal catalyst, in the form of a foil, is first exposed to hydrogen at high temperature to remove any oxides as well as to promote grain growth; after which, the catalyst is then exposed to hydrocarbon which then reacts with the foil to form a graphene layer. This graphene layer is subsequently removed from the metal catalyst foil and transferred onto the PET, with first tests on small samples and then later on a roll to roll system. The graphene quality was assessed using optical microscopy and Raman spectroscopy. In addition, I assisted with other projects in the Nanotechnology department, such as the growth of Carbon Nanotubes on catalyst coated metal foils. My work at AIXTRON involved planning and executing the experiments, designing/building hardware where required and interpreting the results.		

Report 2

1. General		
Placement Location	**Swavesey, Cambridgeshire**	
Arrival and Departure Dates	**2nd July – 31st August**	
No. of working days spent at Institution	**44**	
2. Financial		
Where did you stay during your placement (town name)?	**Cambridge, college accommodation**	
Total cost of daily travel to and from Institution (£)	**None (cycled)**	
Total received from Institution (£)	**£4000**	
3. Research Project		
Title of Research Project	**Roll to Roll Graphene Growth**	
Written Report submitted to host institution	**Yes**	
Experimental Techniques used:	**Raman spectroscopy, CNT & graphene growth, Physical Vapour Deposition, product design & implementation, electrochemical delamination, research and development**	
Interest level of project	on a scale of 1 (low) to 10(high)	**8**
Quality of support provided	on a scale of 1 (low) to 10(high)	**7**

Interaction with other researchers	on a scale of 1 (low) to 10(high)	**6**

Short summary (~ 200 words) of technical content of project:

There is significant interest in the use of graphene as a transparent conductor in displays, touch panels and solar cells due to its unique properties of high conductivity whilst being flexible and transparent. At AIXTRON, my project was to grow graphene using copper catalyst, firstly at a batch scale on an R&D system, and then to move this onto a large roll to roll system for production. After graphene growth, the graphene is then transferred it onto a clear plastic substrate, namely PET. Again this was tested in small scale and then attempted in continuous, roll-to-roll fashion.

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