

CaMPUS Placements: UK Industrial - Reports 2017

Below are reports on the Summer Placements provided by students who participated in the scheme in 2017.

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Granta Design, Cambridge

Report 1

1. General		
Placement Location	Granta Design Ltd.	
Arrival and Departure Dates	03/07/2017 – 08/09/2017	
No. of working days spent at Institution	48	
2. Financial		
Where did you stay during your placement (town name)?	Wolfson Court – Girton College	
Total cost of daily travel to and from Institution (£)	0 – used a bicycle	
Total received from Institution (£)	£3072	
3. Research Project		
Title of Research Project	Updating Eco and Supply Risk data in the MaterialUniverse database	
Written Report submitted to host institution	Not required but have sent my Part III vacation report	
Experimental Techniques used:	Materials informatics – mainly Excel VBA	
Interest level of project	on a scale of 1 (low) to 10(high)	6
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 (researchers being colleages)
Short summary (~ 200 words) of technical content of project:		
<p>Researching the recent new classification of water types that contribute to a materials primary production water footprint. Collecting and collating life cycle assessment data from companies/manufacturers/scientific papers, manipulating data with Excel and using Granta's software to import new and updated data into the MaterialUniverse database.</p> <p>Creating a new procedure for updating governance data on countries to be used for supply risk data. Required use of Excel macros, VBA and notepad++ to match data from sources to all 208 countries in MaterialUniverse with one click. Produced a document of suggested improvements in presenting the data for the Granta EduPack product.</p>		

Report 2

1. General	
Placement Location	Granta Design, Cambridge
Arrival and Departure Dates	3 Jul - 8 Sep
No. of working days spent at Institution	44
2. Financial	
Where did you stay during your placement (town name)?	Jesus College, Cambridge

Total cost of daily travel to and from Institution (£)	£0.00	
Total received from Institution (£)	£2887.50	
3. Research Project		
Title of Research Project	Sustainability and Data Matching	
Written Report submitted to host institution	Multiple short reports throughout placement	
Experimental Techniques used:	Excel, OpenLCA, Python, Ecoinvent Database	
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)	9
Interaction with other researchers	on a scale of 1 (low) to 10(high)	7
Short summary (~ 200 words) of technical content of project:		
<p>Read over and summarised Ecoinvent (eco-database) changes documentation to help the company decide whether to upgrade from V2 to V3.</p> <p>Created a procedure to semi-automatically map Granta material records to Ecoinvent records so that additional eco-data could be used in a prototype Environmental Product Declaration (EPD) tool. This involved learning and writing Python code as well as creating an Excel interface for user input.</p> <p>Assessed the ability of the prototype EPD tool procedure by performing case studies against existing EPDs.</p> <p>Used OpenLCA software to perform life cycle impact assessments (LCIA).</p> <p>Used the tool I created to look for errors in the environmental data maintained by the company.</p> <p>All findings were written up in reports throughout the project and then summarized in two presentations.</p>		

Frazer-Nash Consultancy, Dorking, Surrey

Report 1

1. General		
Placement Location	Dorking, Surrey	
Arrival and Departure Dates	17/07 – 21/09	
No. of working days spent at Institution	44 (10 weeks, with 5 days holiday and 1 bank holiday)	
2. Financial		
Where did you stay during your placement (town name)?	Woking (my home) – most students stay in/near Dorking	
Total cost of daily travel to and from Institution (£)	£5.66 (based on petrol usage for 31-mile daily return journey)	
Total received from Institution (£)	>£2500	
3. Research Project		
Title of Research Project	<ol style="list-style-type: none"> 1. Industrial Internet of Things Platform Assessment 2. Viscoelastic Modelling of Load Redistribution on Fir-Tree Lobes of Gas Turbine Discs 	
Written Report submitted to host institution	No, but gave slide packs and presentation	

Experimental Techniques used:	None	
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)	9
Short summary (~ 200 words) of technical content of project:		
<p>I undertook two main projects:</p> <p>1. IIoT Platform Assessment The Industrial Internet of Things is a concept that has gained significant interest recently, and refers to the idea of using the internet to connect real-time sensory data from 100,000's of 'assets' (ie machines/hardware) to cloud-based data storage, and performing complex data analysis on large quantities of data to gain an insight into the management and maintenance of these assets. My project investigated how these systems are implemented and assessed the viability of commercially available IoT platforms.</p> <p>2. Modelling Load Redistribution on Fir-Tree Root lobes Turbine blades are connected to the turbine disc by means of fir-tree root structures, which consist of interlocking lobes. During the +30,000 hour lifetime of a turbine, the centrifugal load in redistributed across the lobes as they creep. This creep can be modelled using FEM, but it can be slow and difficult to extract the relevant data. My project aimed to develop a faster, simpler model using viscoelasticity. I extracted stress profiles across each of the lobes from two different Abaqus FEM using Python code, and fit a suitable 3-parameter viscoelastic model to the data using Excel Solver and VBA. I presented my findings to the client and suggested further work needed to generalise the model to any geometry, load or temperature.</p>		

TWI, Great Abington, Cambridge

Report 1

1. General		
Placement Location	TWI, Granta Park, Great Abington, Cambridge	
Arrival and Departure Dates	28/06/17 to 31/08/17	
No. of working days spent at Institution	37	
2. Financial		
Where did you stay during your placement (town name)?	Cambridge	
Total cost of daily travel to and from Institution (£)	3	
Total received from Institution (£)	2103.19	
3. Research Project		
Title of Research Project	No specific title working on a few small projects	
Written Report submitted to host institution	Written reports in the form of instructions for the company to use after I left	
Experimental Techniques used:	XRM	
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)	4
Short summary (~ 200 words) of technical content of project:		
<p>Working in the NDT section (Non-destructive testing), I was using the XRM to take 2D and 3D images of a number of samples for different clients, including using a semi-automated process they had already set up to scan a number of samples.</p> <p>I also used some image analysis software called Avizo, which can be used to view and analyse the 3D scans. They didn't have the time to train someone up on it, so I was given a number of tasks such as aligning and comparing the scanned CT image and the original design file in 3D, and I had to write sets of instructions and explain them so that they would be able to use the processes more effectively after I left. Not much materials science knowledge was required, mostly just an ability to use a computer.</p>		

Report 2

1. General		
Placement Location	TWI	
Arrival and Departure Dates	03/07/2017 - 15/09/2017	
No. of working days spent at Institution	55	
2. Financial		
Where did you stay during your placement (town name)?	Whittlesford	
Total cost of daily travel to and from Institution (£)	0	
Total received from Institution (£)	£16008 pro rata (approx £3300 in total)	
3. Research Project		
Title of Research Project	TankRob	
Written Report submitted to host institution	Statement of method and updating drafted report with my contribution.	
Experimental Techniques used:	Soldering. Coding.	
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:		
<p>I worked on 4 separate parts of the TankRob project that had the aim of doing NDT on petrochemical tank floors without needing to empty the tanks first.</p> <p>I had to devise a method of data encapsulation using two part silicon compound, so that no air bubbles were entrapped around the data chips. This was completed.</p> <p>With supervision, I took data and analysed the results of an ultrasonic testing probe that was a prototype for the final design. This can now progress to the next stage.</p> <p>I set up and run an encoder comparison test. This included soldering the magnetic encoder and wiring all connections that were needed. (I also had to wire together 15-wire connector and adapter plugs in order for the encoder to be visible on the computer interface) Preliminary results showed the magnetic encoder I made was viable. This has now progressed to the next stage of testing.</p> <p>These three sections were approx. 50% of the project.</p>		

The final section was testing a water cooling system. LabVIEW was used to code for data acquisition and real time display. The code is finished, and tests on the cooling system were started. These are now being continued.

Report 3

1. General		
Placement Location	TWI, Granta Park, Great Abington	
Arrival and Departure Dates	26/06 – 13/09	
No. of working days spent at Institution	55	
2. Financial		
Where did you stay during your placement (town name)?	Jesus College, extended my termtime tenancy	
Total cost of daily travel to and from Institution (£)	£3, £1.50 each way on commuter bus from station	
Total received from Institution (£)	~3700 before national insurance	
3. Research Project		
Title of Research Project	Coupled Eulerian Lagrangian Modelling of Friction Stir Welding	
Written Report submitted to host institution	Presentation done to company, contribution to a written report by TWI	
Experimental Techniques used:	All computer based work, largely on ABAQUS and Excel	
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)	7
Interaction with other researchers	on a scale of 1 (low) to 10(high)	6
Short summary (~ 200 words) of technical content of project:		
<p>The first four weeks of the placement were spent learning how to use the ABAQUS finite element analysis software as well as reading a number of papers on friction stir welding and different modeling techniques that have been used in similar projects. Up until this point, most work covered was practice tutorials. The aim of the project was to produce a working model that accurately reflected the thermo-mechanical data recorded in a number of experiments at TWI, and hence optimize parameters (e.g. weld speed, tool rotation) to produce the best possible weld. The project began by building a Lagrangian model to simulate the weld, from which heat transfer data was extracted. This data was then used as boundary conditions for the Coupled Eulerian Lagrangian model that focused on the deformation of material in the immediate vicinity of the weld.</p> <p>Various parameters (e.g. friction coefficient, mesh size) were varied to produce the best model which accurately reproduced the trends seen in the experimental weld trials.</p> <p>TWI is hoping to publish a journal paper based upon the work carried out by my supervisor and myself. As well as this, I produced a 15 minute presentation for members of the Numerical Modelling and Optimisation department in which I was based.</p>		

Report 4

1. General		
Placement Location	TWI	
Arrival and Departure Dates	31/7/17 - 29/9/17	
No. of working days spent at Institution	44 (including 4 days holiday)	
2. Financial		
Where did you stay during your placement (town name)?	Cambridge, in college accommodation	
Total cost of daily travel to and from Institution (£)	£3 for commuter bus	
Total received from Institution (£)	£2620	
3. Research Project		
Title of Research Project	No overall title, worked on a few small projects	
Written Report submitted to host institution	No	
Experimental Techniques used:	Phased array ultrasound scanning, metallographic replication, optical microscopy	
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)	7
Interaction with other researchers	on a scale of 1 (low) to 10(high)	6
Short summary (~ 200 words) of technical content of project:		
<p>I worked on several small projects rather than one large one, which included:</p> <ul style="list-style-type: none"> - scanning components for defects using a phased array ultrasound probe. - investigating the microstructure of pipes suspected to have creep damage. This was done by replication – grinding and polishing the surface of a large sample where it isn't practical to cut out a section to mount. The replicas were inspected under an optical microscope. - researching literature on creep modeling, in particular nucleation and growth of voids. - collecting data from a water cooling system designed by another placement student, which involved using Labview. - designing and collecting data from a system which tested the maximum flow rate of various water pumps <p>The work I did was mostly fairly interesting but there was quite a bit of time when I had no work to do. Not much knowledge of materials was needed, though a basic understanding of creep was helpful. Overall I would recommend a placement at TWI, the main drawback was they were not very efficient at arranging an interview, mine was near the end of June and I didn't have my place confirmed until after this.</p>		

Johnson Matthey, Royston, Herts.

Report 1

1. General		
Placement Location	Johnson Matthey, Royston	
Arrival and Departure Dates	26/06/17 – 18/08/17	
No. of working days spent at Institution	40	
2. Financial		
Where did you stay during your placement (town name)?	Cambridge	
Total cost of daily travel to and from Institution (£)	£100 (mixture of train and lift share)	
Total received from Institution (£)	£2460 (in form of salary)	
3. Research Project		
Title of Research Project	Investigation into the effect of particle size distribution of ceramic powders on the performance of 3D printed parts	
Written Report submitted to host institution	Yes	
Experimental Techniques used:	Scanning Electron Microscope; compression testing; mixing equipment such as Turbula mixer and ball mill, 3D printing, sintering in furnace, particle size analysis equipment for imaging powders, sieving	
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)	10
Interaction with other researchers	on a scale of 1 (low) to 10(high)	9
Short summary (~ 200 words) of technical content of project:		
<p>I worked in the Ceramic Additive Layer Manufacturing team (ALM) where I was given a project to investigate how changing the particle size distribution of ceramic print powders affects the density and compressive strength of the finished 3D printed parts. I prepared the print powders from the raw supplier ingredients using a range of techniques including sieving, mixing and milling. Different particle size distributions were obtained. I was trained on the small 3D printer and printed a series of shapes with each print powder. After the parts were fired, I measured their density and compressive strength and analysed the data collected.</p>		

Report 2

1. General		
Placement Location	Johnson Matthey, Royston	
Arrival and Departure Dates	17/07/17 – 08/09/17	
No. of working days spent at Institution	40	
2. Financial		

Where did you stay during your placement (town name)?	Cambridge	
Total cost of daily travel to and from Institution (£)	£4.90	
Total received from Institution (£)	£2584.62	
3. Research Project		
Title of Research Project	High temperature deformation of iridium and its alloys	
Written Report submitted to host institution	Yes	
Experimental Techniques used:	Hot tensile testing, Metallography, Drawing bench	
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)	10
Interaction with other researchers	on a scale of 1 (low) to 10(high)	9
Short summary (~ 200 words) of technical content of project:		
<p>Iridium possesses a combination of high strength, melting point and oxidation resistance, ideal for application in spark plugs. However, it is difficult to process due to limited ductility, suffering from many wire breaks during drawing.</p> <p>Hot tensile testing was used to determine the peak ductility temperature of iridium and two alloys for a given strain rate, with the intention of applying the results to suggest optimal drawing temperatures for iridium wire based on materials properties. Results indicated a large discrepancy between the peak ductility temperatures of each alloy and the temperature range over which wire is drawable in practice, leading to drawing trials to determine the cause of this discrepancy. Analysis of breaks from drawing confirm that the wires were limited to being drawn significantly below their peak ductility temperatures, due to lubricant oxidation. Two potential solutions were suggested: using a lubricant with higher temperature stability or drawing in a less oxidizing atmosphere. Initial trials found one alternative lubricant with higher temperature stability which may be suitable, but it did not sufficiently wet the wire.</p> <p>Further work is being carried out now trying to find a suitable lubricant blend for drawing and to install heating elements which allow an inert gas to pass through.</p>		