



Host Institution:	University College Dublin (UCD)
Location:	Belfield, Dublin 4, Ireland
Website:	http://www.ucd.ie/
College/Company:	Engineering & Architecture
School/Unit:	Mechanical & Materials Engineering
Project Lead	Dr Eoin O'Cearbhaill
Email contact:	eoin.ocearbhaill@ucd.ie
Website:	http://www.ucd.ie/mecheng/

Project Title:

Medical Device Design.

Brief Project Description:

Additive Manufacturing of Medical Devices. We are developing novel additive manufacturing processes to create implantable medical devices, including polymeric stents. This project will involve prototyping and testing the mechanical and functional performance of these devices in bench top models.

Project Dates:

From the end of May to August (specific dates can be agreed between the PI and the student directly over a 10-week period).

Candidate requirements:

The Project would suit students from a biomedical / mechanical / chemical engineering background.



Host Institution:	University College Dublin (UCD)
Location:	Belfield, Dublin 4, Ireland
Website:	http://www.ucd.ie/
College/Company:	Engineering & Architecture
School/Unit:	Biosystems and Food Engineering
Project Lead	Prof Shane Ward and Dr Tom Curran
Email contact:	shane.ward@ucd.ie ; tom.curran@ucd.ie
Website:	http://www.ucd.ie/biosystems/

Project Title:

Agri-food waste management.

Brief Project Description:

AgroCycle is a prestigious international “Horizon 2020” research and innovation project addressing the recycling and valorisation of waste from the agri-food sector. Led by the School of Biosystems and Food Engineering at University College Dublin, the consortium of 26 partners comprises partners from 8 EU countries, two partners from mainland China, and one from Hong Kong. The project takes a holistic approach to understanding and addressing how to make best use of the full range of waste streams associated with the agri-food industry. It will deliver the AgroCycle Protocol, a blueprint for achieving sustainable agri-food waste valorisation.

Further details are available at www.agrocycle.eu. The Summer Research aspect of the project at UCD in collaboration with Maynooth University is seeking assistance to develop digital outputs aligned to the dissemination goals of engaging with specific audiences including the general public and primary school children ("Agrocycle Kids"). We wish to recruit **two** Notre Dame undergraduate engineering students for a 10-week period in Summer 2018 to review the AgroCycle project with the aim of creating digital outputs (i.e. video/animation/graphics) that they think best represents the project, thus having the potential to make an international impact with a wide audience.

Project Dates:

From the end of May to August (specific dates can be agreed between the PI and the student directly over a 10-week period).

Candidate requirements:

Ideal candidates for the two positions should have a strong academic record, excellent communication skills and a flair for digital technology (e.g. video/animation/graphics).



University College Dublin
Ireland's Global University

Project Details:	
Host Institution:	University College Dublin (UCD)
Location:	Belfield, Dublin 4, Ireland
College/Company:	Innovation Zed, NovaUCD
School/Unit:	NovaUCD (based on the UCD campus)
Website:	http://www.InnovationZed.com/

Project Lead:	
Name:	Dr William Cirillo
Email Contact:	williamrc@innovationzed.com
Telephone Contact	+353 1 716 3600

Project Title:
Biosensors and health monitoring.

Brief Project Description:
Working on various commercial sensors to acquire bio-medically relevant data predominately in Diabetes to monitor and assist in managing compliance and alleviate complications resulting from such long-term health conditions.

Project Dates:
From the end of May to August (specific dates and weekly hours can be agreed between the PI and the student directly over a 10-week period).

Candidate Requirements:

Minimum requirements:

- Need a strong background (or personal interest) in electronics and sensors for health monitoring.
- Electrical/Electronic Engineering.
- Comfortable with basic electronic principles. and building/testing circuits.
- Interest in embedded Software should have some understanding of C/C++ and at least one other programming language.
- Show a keen interest to learn anything new and a good sense of humour.

Desirable

- Some exposure to Digital signal processing techniques.
- 3D CAD packages (such as AutoCAD or SolidWorks etc.).
- Any experience using any kind of digital sensors and general data collection.



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Project Details:	
Host Institution:	University College Dublin (UCD)
Location:	Belfield, Dublin 4, Ireland
College/Company:	College of Engineering & Architecture
School/Unit:	School of Mechanical & Materials Engineering
Website:	http://www.ucd.ie/mecheng/

Project Lead:	
Name:	Dr Eoin O'Cearbhaill
Email Contact:	eoin.ocearbhaill@ucd.ie
Telephone Contact	+353 1 716 1715

Project Title:

Medical Device Design.

Brief Project Description:

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Candidate Requirements:

The Project would suit students from a biomedical /mechanical /chemical engineering background.



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Location:	Belfield, Dublin 4, Ireland
College/Company:	Engineering & Architecture
School/Unit:	Biosystems and Food Engineering
Website:	http://www.ucd.ie/biosystems/

Project Lead:	
Name:	Prof Shane Ward/Dr Tom Curran
Email Contact:	shane.ward@ucd.ie ; tom.curran@ucd.ie
Telephone Contact	+353 1 716 7364/+353 1 716 7362

Project Title:

Agri-food waste management.

Brief Project Description:

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Project Details:	
Host Institution:	University College Dublin (UCD)
Location:	Belfield, Dublin 4, Ireland
College/Company:	College of Engineering & Architecture
School/Unit:	School of Civil Engineering
Website:	http://www.ucd.ie/civileng/

Project Lead:	
Name:	Professor Eugene O'Brien
Email Contact:	eugene.obrien@ucd.ie
Telephone Contact	+353 1 716 3224

Project Title:

Bridge Engineering, including bridge health monitoring and the effects of traffic.

Brief Project Description:

Visual inspections are the primary method of assessing bridge condition in the current era. Problems associated with this include an expensive labour cost and unreliability due to a lack of consistency as a result of human subjectivity. It is important to have a reliable bridge inspection method to prevent catastrophic failures like the Malahide estuary bridge collapse in Ireland in 2009. Bridge scour is the erosion of soil around the bridge foundations and is the most common cause of bridge collapse. Visual inspection methods are problematic in this case and a team of divers is often required to assess the state of the bridge from a scour perspective.

This project investigates an alternative approach. Here, instrumentation such as accelerometers are installed on the bridge and the presence of scour is determined from analysing these signals. Data from a laboratory scale bridge model is available from the University of Kyoto, Japan. In this model, the bridge supports are resting on springs (which represent the soil stiffness) and scour can be modelled by reducing the spring stiffness under the supports. This data will be analysed, and scour damage detection methods will be created.

Other possibilities exist on traffic issues if this is unsuitable.

Project Dates:

From the end of May to August (specific dates and weekly hours can be agreed between the PI and the student directly over a 10-week period).

Candidate Requirements:

No application requirements except strong academic background.



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Project Details:	
Host Institution:	University College Dublin (UCD)
Location:	Belfield, Dublin 4, Ireland
College/Company:	College of Science
School/Unit:	School of Biomolecular and Biomedical Science
Website:	http://www.ucd.ie/sbbs/

Project Lead:	
Name:	Dr Siobhán McClean
Email Contact:	siobhan.mcclean@ucd.ie
Telephone Contact	

Project Title:

Stress proteins: Unlocking the mechanism of chronic infection in people with cystic fibrosis

Brief Project Description:

People with cystic fibrosis suffer from chronic infections throughout their lives, leading to a gradual but unrelenting decline in their lung function, which is ultimately the cause of death [1]. The most difficult of these infections is caused by *Burkholderia cepacia* complex (Bcc), a highly antibiotic resistant group of bacteria that causes chronic opportunistic lung infections in people with cystic fibrosis. The cystic fibrosis lung is a low-oxygen environment. We have shown that Bcc evolves over time of infection in response to low oxygen and improves its ability to attach to lung cells [2], thereby improving its ability to colonise the lung. We have identified a group of stress proteins that are stimulated in the low oxygen environment of the cystic fibrosis lung, which are upregulated during chronic infection in cystic fibrosis patients. The aim of this project is to examine the role that these stress proteins play in chronic infection.

This project will involve comparing mutants that lack individual stress proteins with those that express the stress proteins. We will use a proteomics approach to examine the pathway that these stress proteins are involved in. We will also investigate the impact that low oxygen stress has on other proteins and functions in the bacterium. Investigating this process is important because if we can unlock the mechanism by which these bacteria evolve and enhance their ability to colonise, we can target the pathway and prevent chronic infection in people with cystic fibrosis.

References:

1. Cullen, L. and S. McClean, *Bacterial Adaptation during Chronic Respiratory Infections*. Pathogens, 2015. **4**(1): p. 66-89.
2. Cullen, L., A. O'Connor, P. Drevinek, K. Schaffer, and S. McClean, *Sequential Burkholderia cenocepacia Isolates from Siblings with Cystic Fibrosis Show Increased Lung Cell Attachment*. Am J Respir Crit Care Med, 2017. **195**(6): p. 832-835.

Project Dates:

From the end of May to August (specific dates and weekly hours can be agreed between the PI and the student directly over a 10-week period).

Candidate Requirements:

No application requirements except strong academic background.



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Project Details:	
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Location:	Belfield, Dublin 4, Ireland
College/Company:	College of Science
School/Unit:	School of Biomolecular and Biomedical Science
Website:	http://www.ucd.ie/sbbs/

Project Lead:	
Name:	Professor Breandán Kennedy
Email Contact:	brendan.kennedy@ucd.ie
Telephone Contact	

Project Title:

Genetic and Pharmacological Determinants of Vision

Brief Project Description:

The goal of the UCD Ocular Pharmacology & Genetics group is to develop treatments for blindness based on enhanced understanding of the genes and drugs that modify visual function. In this project, the student will characterise novel CRISPR-Cas9 zebrafish models of inherited blindness and assess the potential of pharmacological interventions to overcome disease phenotypes.

Techniques implemented include: zebrafish stock maintenance, zebrafish larval genotyping (PCR, RFLP, SNP-PCR, DNA sequencing), analysis of retinal histology (light microscopy), analysis of visual function (optokinetic and visuomotor behavioural assays) and drug treatment of larvae.

References:

- 1: Daly C, Shine L, Heffernan T, Deeti S, Reynolds AL, O'Connor JJ, Dillon ET, Duffy DJ, Kolch W, Cagney G, Kennedy BN. A Brain-Derived Neurotrophic Factor Mimetic Is Sufficient to Restore Cone Photoreceptor Visual Function in an Inherited Blindness Model. *Sci Rep.* 2017 Sep 12;7(1):11320.
- 2: Smith AJ, Carter SP, Kennedy BN. Genome editing: the breakthrough technology for inherited retinal disease? *Expert Opin Biol Ther.* 2017 Oct;17(10):1245-1254.
- 3: Merrigan SL, Kennedy BN. Vitamin D receptor agonists regulate ocular developmental angiogenesis and modulate expression of dre-miR-21 and VEGF. *Br J Pharmacol.* 2017 Aug;174(16):2636-2651.
- 4: Butler CT, Reynolds AL, Tosetto M, Dillon ET, Guiry PJ, Cagney G, O'Sullivan J, Kennedy BN. A Quininib Analogue and Cysteinyl Leukotriene Receptor Antagonist Inhibits Vascular Endothelial Growth Factor (VEGF)-independent Angiogenesis and Exerts an Additive Antiangiogenic Response with Bevacizumab. *J Biol Chem.* 2017 Mar 3;292(9):3552-3567.

Project Dates:

From the end of May to August (specific dates and weekly hours can be agreed between the PI and the student directly over a 10-week period).

Candidate Requirements:

No application requirements except strong academic background.



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School/Unit:	School of Mechanical & Materials Engineering
Website:	http://www.ucd.ie/mecheng/

Project Lead:	
Name:	Dr Philip Cardiff
Email Contact:	philip.cardiff@ucd.ie
Telephone Contact	+353 1 716 1888

Project Title:
Computational Modelling and Simulation

Brief Project Description:

For the past half-century, computational methods have increasingly been used by scientists to gain a unique insight in the world around them. Powerful tools, such as the finite element and finite volume methods, have enabled the comprehension and manipulation of complex physical mechanisms in the fields of heat transfer, fluid flow, solid deformation and electromagnetics. The application of such formidable methods to intricate multi-physics problems, however, has been slow. Concurrent analysis of, for example, air and wave interactions with an offshore wind turbine and the underlying saturated seabed, has been limited; methods that are available for such fluid-solid interaction cases suffer from accuracy, efficiency and robustness issues. While some incipient advances have been made, there remains a demand for next generation numerical methods that can address such formidable challenges.

This project will examine the use of open-source software OpenFOAM to simulate complex fluid-solid interactions problems and benchmark the methods against literature and available experimental data.

Project Dates:

From the end of May to August (specific dates and weekly hours can be agreed between the PI and the student directly over a 10-week period).

Candidate Requirements:

The student does not require any experience with finite element/volume simulation software: training will be provided.