**Applications are invited for the following a PhD studentship for the following project:**

***Transverse Thermoelectrics***

The position will be based with *Nanothermal research group of Prof. David McCloskey* at the school of Physics in Trinity College Dublin, and be part of the Materials for Energy platform within the Advanced Materials and Bioengineering Research Centre (AMBER) centre.

**Summary of project**

Conventional thermoelectric materials convert heat flux to electric current and vice-versa. They can be used to harvest waste heat or as solid state heat pumps. Thermoelectric materials, are artificial materials produced by stacking skewed alternating layers of metal and semiconductor. They fundamentally differ from conventional thermoelectric materials in that heat flux and electric current flow in different directions as depicted in Fig.1(a). This allows independent optimization of thermal and electrical conductivity in these directions. Transverse thermoelectrics have been shown to be viable for harvesting power under high heat flux conditions such as in liquid-liquid heat exchanger applications[1]. Fig.1(b) shows a prototype device which utilizes alternating layers of Nickel and Bismuth Antimony Telluride as a transverse thermoelectric composite[1]. The module can generate 2.5kW/m$^2$ at temperature difference of 85$^o$C.

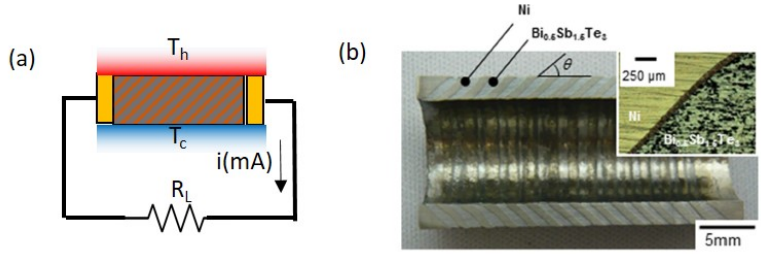


*Figure 1(a) Schematic of power generation for transverse thermoelectric material. (b) Prototype device for liquid-liquid heat exchanger from ref 1. Alternating layers of BiSbTe and Nickel.*

***Project Description***

In the project we will explore the transverse thermoelectric concept using advanced materials available through the AMBER research centre. In particular the student will develop a range of transverse thermoelectric materials and device geometries for testing under extremely high heat flux conditions such as evaporative cooling. This will allow us to explore the limits of electrical power density that can be achieved with these devices. We will also explore practical limitations in realistic devices due to interface resistance and search for optimal fabrication techniques.

The ideal applicants will have a 1$^{st}$ Class Honours Bachelor's degree in *Physics or Engineering*

The researcher will work closely with other members of a multidisciplinary project team. Excellent written and oral communication skills are essential.

**References:**

[1] Breaking the trade-off between thermal and electrical conductivities in the thermoelectric material of an artificially tilted multilayer, Akihiro Sakai *et.al.*, Scientific reports, 4 : 6089

**How to apply:**

CVs with the names and addresses of three referees should be emailed to Prof. David McCloskey at:

*mccloskd@tcd.ie*

Positions will remain opened until filled but preferred start date is ***September 2 2019***. Only short-listed applications will be acknowledged.

This position is funded by the SFI-research centre AMBER.

The AMBER research centre, as a community of researchers, welcomes its responsibility to provide equal opportunities for all. We are actively seeking diversity in our research teams and particularly encourage applications from underrepresented groups.