

## Title: DEVELOPMENT OF INSPECTION TECHNIQUES FOR NON-SHARP DEFECTS

*Type of award* PhD Research Studentship

*Department* Mechanical Engineering

*Scholarship Details* Scholarship covers full UK/EU (EU applicants who have been resident in the UK for 3 years prior to 1<sup>st</sup> September 2017) and a generous tax-free annual stipend (at least £16,000, subject to contracts). EU nationals resident in the EU will qualify only for PhD tuition fees unless they have been permanently resident in the UK for at least the last three years.

*Duration* 3.5 years

*Eligibility* Home/EU applicants only  
1st class honours degree in, or expected to achieve, in Maths, Physics or Engineering

*Deadline* 20 January 2018

### PhD Topic Background/Description

The science of fracture mechanics, and hence the engineering assessments based on fracture mechanics, assume a sharp crack is present. This approach is conservative, sometimes overly so, for real defects such as porosity, mechanical or corrosion damage, weld defects, or certain design features including crevices in partial penetration welds. These defects have non-sharp defect tips and an increased resistance to fracture [1-3] compared to an equivalent component containing a sharp crack. To take advantage of this increased fracture resistance in the latest structural integrity assessment techniques, it is necessary to measure the radius. From an inspection viewpoint, this poses a significant challenge as it is not currently possible to distinguish between sharp (e.g. fatigue) cracks and non-sharp defects and to produce accurate shape descriptions. Recent developments [4-7] show promising opportunities for creating new capabilities for improved structural efficiency of safety-critical assets. These methods were pioneered at the University of Bristol (UoB) and have yet to be exploited for design and structural integrity applications and therefore further experimental testing and validation is required. This is an exciting opportunity to work in a highly motivated and vibrant research-intensive group as well as spending time at a leading industrial institute in the field, TWI Ltd.

At UoB, you will be working at the interface between NDE and structural integrity. This will allow you to develop unique skills both in novel NDE methods and structural integrity and damage mechanisms (fracture, fatigue, plastic collapse) in both an academic (UoB) and industrial environment (TWI)

### References

1. Kim J-S., Larrosa N.O. et al. (3) Eng Fract Mech (2017) DOI 10.1016/j.engfracmech.2017.05.047
2. Larrosa, N.O and Ainsworth, R.A. Eng Fract Mech, (2017) DOI: 10.1016/j.ijpvp.2016.03.002
3. Han J-J, Larrosa NO, Ainsworth R A, Kim. Y-J. Int J Pres Ves Pip, (2016) DOI:

10.1016/j.ijpvp.2016.07.006

4. Barber TS, Wilcox PD, and Nixon AD. AIP Conference Proceedings 1650, 962, 2015.
5. Holmes C, Drinkwater B.W., Wilcox PD. NDT & E Int., 38, 701-711, 2005.
6. Brierley N, Tippetts T, Cawley P, Proc. Roy. Soc. A, 470, 2014.
7. Velichko, A., Bai, L. & Drinkwater, B.W. Proc. R. Soc. A, 473, 2017

## Further Particulars

You will be working as a member of a Solid Mechanics Group at the University of Bristol, a world-renowned research team in the field of Structural Integrity. During your studies you will be working in developing and testing NDE techniques both at TWI and University of Bristol. You are expected to be highly computer literate and able to learn using software such as finite element to simulate your experiments as well as undertaking experimental measurements.

Candidates interested in fracture mechanics, non-destructive evaluation methods and structural analysis and optimisation and 'hands on' experiments are encouraged to apply. The candidate will be co-supervised by Dr Channa Nageswaran (TWI) and Dr Nicolas Larrosa (UoB) and will spend 1/3 of his/her time in UoB and 2/3 in TWI. Candidates should ideally hold a first/upper-second class degree or masters (MSc) in Aerospace Engineering, Mechanical Engineering or Physics.

## Candidate Requirements

Good ability in experimental solid mechanics and a grasp of computer coding (e.g. Matlab).

Ability and willingness to travel nationally and internationally.

Willingness to conduct the research between the University of Bristol and TWI, Cambridge.

## Informal enquiries

For informal enquiries please contact Dr Nicolas Larrosa [nicolas.larrosa@bristol.ac.uk](mailto:nicolas.larrosa@bristol.ac.uk)

For general enquiries, please email [ggen-pgrs@bristol.ac.uk](mailto:ggen-pgrs@bristol.ac.uk)

## Application Details

To apply for this studentship submit a PhD application using our [online application system](#)

[[www.bristol.ac.uk/pg-howtoapply](http://www.bristol.ac.uk/pg-howtoapply)]

Please ensure that in the Funding section you tick "I would like to be considered for a funding award from the Mechanical Engineering Department" and specify the title of the scholarship in the "other" box below with the name of the supervisor.

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