



NUI Galway  
OÉ Gaillimh



UNIVERSITY OF  
CAMBRIDGE

iCrag

SFI RESEARCH CENTRE  
IN APPLIED GEOSCIENCES

## PHD OPPORTUNITY IN GEOTECHNICAL ENGINEERING

### “Development of an instrumented jacking pipe for optimisation of soil-lubricant-pipe interface mechanics in microtunnelling” (SMART-PIPE)



#### Background

The projected effects of population growth/urbanization, climate change and a need to protect the environment on one hand, and antiquated Water and Wastewater (W/WW) supply networks on the other, has placed unprecedented pressures on these essential networks in Ireland and worldwide. In recognition, €8.5b has been allocated to public water services in Ireland under the National Development Plan 2018-2027 to help resolve network deficiencies. However, significant step changes in the way we construct our buried infrastructure are required to *'build back better'*. The construction sector has a pivotal role to play in this, and in Ireland's post-Covid economic recovery.

Trenchless construction techniques have been shown to deliver substantial advantages over traditional open-cut methods for W/WW pipelines. However, key residual uncertainties surrounding structural interaction with the ground has inhibited further advances in efficiency. These technical shortcomings have been exacerbated in light of the increasingly longer and larger diameter microtunnel (MT) drives demanded in urban environments.

The main objective of SMART-PIPE is to bring about a step-change in efficiency in the delivery of critical buried infrastructure using MT techniques, achieved through the development testing, optimization and validation of a novel instrumented 'smart pipe', together with complementary reduced-scale element testing. The primary outputs of the research will include: (a) an instrumentation strategy using state-of-the-art Fibre Bragg Grating and contact sensing to create cost-effective 'smart pipes' for use in MT drives, (b) a significantly improved understanding of soil-lubricant-pipe mechanics arising from smart pipe and laboratory data, and (c) new rigorous design methods for predicting critical MT performance factors including jacking forces and penetration rates.

The project will be funded by the Science Foundation Ireland Research Centre in Applied Geosciences (iCrag) <https://www.icrag-centre.org/>, and will be carried out in collaboration with leading international civil engineering contractor Ward and Burke Construction <https://www.wardandburke.com>.

### **Requirements**

Applicants should have a 1<sup>st</sup> class or 2.1 Bachelor's degree (Level 8) in Civil Engineering, and ideally a Master's degree (Level 9) in Civil Engineering or a cognate subject. The successful candidate should be highly motivated, well organised and curious to learn, with good communication skills (including writing). Some prior knowledge/experience of instrumentation and monitoring, and a full driving licence (evidence to be included with application) would be an advantage.

### **Supervision**

The student will be based in the School of Engineering at the National University of Ireland, Galway under the supervision of Assoc. Prof. Bryan McCabe. The supervisory team will include Assoc. Prof. Brian Sheil (University of Cambridge, UK) and representatives of Ward and Burke Construction. The Fellowship will begin as soon as possible after the most suitable candidate is selected, **but no later than 1<sup>st</sup> January 2023.** **International applicants requiring a visa should be mindful of this deadline.**

### **Fellowship**

The fellowship provides a stipend of €18,500/annum, tenable for 4 years, in addition to NUI Galway PhD fees.

### **Application Procedure**

Submit an electronic copy of your Curriculum Vitae, a cover letter expressing your suitability for the position and a copy of your driving licence to A/Prof. Bryan McCabe ([bryan.mccabe@nuigalway.ie](mailto:bryan.mccabe@nuigalway.ie)). *Please note that after the online interview stage, the preferred candidate may be required to attend a follow-on interview in person at NUI Galway before a final decision is made.*

### **Closing date**

5pm on Friday 19<sup>th</sup> August 2022.

### **Further Information/Applications**

Assoc. Prof. Bryan McCabe, Civil Engineering, School of Engineering, NUI Galway.  
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