



## **Institute of Technology**

### **Ciência sem Fronteiras / Science Without Borders**

#### **Postgraduate Project Template**

<b>Institution:</b>	Cork Institute of Technology
<b>Title of Postgraduate Opportunity:</b> (include level of study)	Research in the area of high precision optical photometry of active galaxies and extrasolar planets Masters or PhD
<b>PI Name &amp; Contact Details:</b>	Dr. Niall Smith, Research Office, Cork Institute of Technology (niall.smith@cit.ie)
<b>Department/School:</b>	Faculty of Engineering and Science
<b>Research Centre /Group:</b>	Blackrock Castle Observatory
<b>Research Centre/Group website:</b>	www.bco.ie
<b>Brief Summary of PI research / research group /centre activity</b> Blackrock Castle Observatory (BCO) is operated by Cork Institute of Technology. It houses a research group and a science centre. Research at BCO centres around high precision optical photometry and the ICT /Engineering infrastructure required to enhance the photometric precision. Photometry is the measurement of light and our research uses these measurements of the time-variability of astrophysical sources as a means to determine the physics which underlies their behaviour. Our group specialises in optimising the precision of the photometry by using new mathematical and computational techniques to remove the detrimental effects of the atmosphere, whilst also making the observations in at least two colours, simultaneously, as this provides a very powerful means to differentiate between competing theoretical models, especially in the area of active galaxies.	
<b>Brief Description of Masters or PhD Project</b> We wish to further develop our capacity to remove adverse atmosphere effects from ground-based photometric measurements of astrophysical sources. The ultimate goal of the research is to allow ground-based photometry to reach theoretical limits of precision based on photon fluxes. This will involve the student taking the current datasets and extending the existing methodologies to further clean the data. This will require developing an expert knowledge of the CCD imagers that record the data in the first instance, the instrumental effects of the telescope and the CCD, the absorption and scattering properties of the atmosphere that introduce scatter into the data, and most importantly of all the assessment of new data-analytical approaches that can remove/minimise these effects. The student will participate in taking new datasets, which will require devising new observing strategies that will contribute to improving the overall quality of the data. The student will also be involved in the customisation of the instrumentation – hence the project offers a very diverse set of experiences that will provide an excellent groundwork for future research.	

### Key Attributes of Project for Brazilian Postgraduate Students

Blackrock Castle Observatory is a unique facility that houses both the astrophysical research team and a public science centre. This makes the location a vibrant and innovative place to work and research students are encouraged to interact with the public via some of our many workshops, open nights, etc. We have two robotic optical telescopes on-site and a small radio telescope that is used for public outreach. The optical telescopes are used largely to test new concepts in instrument design and observing strategies. Most of our science data is taken at professional observatories, often using the techniques we have developed at BCO.

While BCO is housed in a 16<sup>th</sup> century castle, the infrastructure includes high-speed internet connectivity and a full suite of all the necessary software and hardware. We have links with a number of international research groups and are active participants in EU research programmes. Research at BCO is part-sponsored by industry and some of our projects involve translational research from astrophysics to industry, especially in the areas of optical imaging, photometry, healthcare monitoring and process automation. There are opportunities for BCO researchers to work with industry-linked projects, while also working on their own individual research projects.

The BCO research is small and diverse and this affords research students the opportunity to work in a multidisciplinary environment where teamwork is crucial to success. BCO researchers are required to avail of CIT's extensive postgraduate training courses in areas relevant to their research skills development and their future employability. They are encouraged to present at international conferences and to write in peer-reviewed journals. A PhD typically takes 4 years to complete and a Research Masters takes two.

### Name and contact details for project queries, if different from PI named above:

#### Please indicate graduate disciplines which are eligible for application:

Astrophysics/astronomy, Physics, Computer Science (especially with data analytics or informatics), Instrument Engineering

#### Alignment with Science Without Borders Priority Areas:

Please indicate the specific programme priority area under which the proposed postgraduate project fits – choose only one (tick box)

Engineering and other technological areas	X
Pure and Natural Sciences (e.g. mathematics, physics, chemistry)	X
Health and Biomedical Sciences	
Information and Communication Technologies (ICTs)	X
Aerospace	
Pharmaceuticals	
Sustainable Agricultural Production	
Green Chemistry	
Oil, Gas and Coal	
Renewable Energy	
Minerals	
Biotechnology	
Nanotechnology and New Materials	
Climate Change	
Biodiversity and Bioprospection	

Marine Sciences	
Productive Inclusion and Social Technologies	
Housing and Sanitation	