



SEAHA

EPSRC CENTRE FOR DOCTORAL TRAINING
SCIENCE AND ENGINEERING IN
ARTS HERITAGE AND ARCHAEOLOGY

SEAHA Studentship: 3D Hyperspectral Imaging of Heritage

The EPSRC Centre for Doctoral Training in Science and Engineering in Arts, Heritage and Archaeology at University College London, University of Oxford and University of Brighton (www.seaha-cdt.ac.uk), in collaboration with Camlin Group Ltd (www.camlingroup.com) and the Rijksmuseum, Amsterdam (<https://www.rijksmuseum.nl/en>), are seeking applications for a fully funded studentship on the topic "3D Hyperspectral Imaging of Heritage". Funded by the Engineering and Physical Sciences Research Council (EPSRC) through the Centre for Doctoral Training and co-funded by Camlin Group Ltd., the four year doctoral research project will be supervised jointly by UCL Medical Physics and Biomedical Engineering and Institute for Sustainable Heritage (<https://www.ucl.ac.uk/bartlett/heritage/>), as well as Camlin Group Ltd and the Rijksmuseum.

Many art and heritage surfaces have a 3D structure that requires either objects or cameras to be moved in order to keep the surface in focus. Movement of objects during imaging is often difficult for conservation or practical reasons, particularly of large objects. For 3D objects, the camera would ideally freely move in the space. Maximum freedom of movement could be enabled using an articulated robotic arm, which would need to carry not only the camera but the illumination system as well. Depth information could also be derived from two cameras pointing at the surface at an angle, i.e. stereo-imaging.

UCL Institute for Sustainable Heritage has won an EPSRC grant to purchase a custom built aluminium frame and a robotic arm to enable the simultaneous movement of one or two (stereo mode) hyperspectral imaging cameras at 10-um resolution, in 3D across a plane of 2 x 2 m or within a 1m³ cube of space, respectively. The positioning head will be equipped with LED & halogen lights for strip-illumination, allowing for spectrally calibrated images. The head will be equipped either with a focussing system to enable focussing of the camera(s) within plane. The system will be fully software-controlled, which will enable accurate (<10 um) hyperspectral datacube mosaicking (stitching). This will represent the most advanced hyperspectral system available globally and will push the boundaries of imaging beyond anything currently possible. The software supplied with the imaging system will enable synchronised movement of the hyperspectral cameras in space, however, hyperspectral data management will be required in order to compute images of large surfaces, e.g. paintings, or 3D objects. The studentship project will address the following research questions:

1. How can mosaicking of hyperspectral information be achieved for large surfaces scanned in translational mode?
2. How can accurate spatial information be extracted from hyperspectral stereo-imaging?
3. How can objects be imaged safely using a robotically enabled hyperspectral imaging system?

The research project will require the use of an exciting range of computer science and physics research methods, as well as understanding of spectroscopy, statistical analysis and mathematical modelling. The project will require an advanced understanding of research challenges within heritage institutions, and frequent interaction with non-scientists. Extended stays in the company are planned. This exceptionally interesting and interdisciplinary project will enable you to seek employment in any number of multidisciplinary environments: from engineering and industry, to academia to conservation.

SEAHA is a Doctoral Training Centre at University College London (UCL), University of Oxford, and University of Brighton. SEAHA is funded by the Engineering and Physical Sciences Research Council (EPSRC).



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As a SEAHA student, you will have unparalleled access to research infrastructure and expertise across three universities and 60+ heritage, research and industrial partners. In addition to the university doctoral training requirements, SEAHA students take part in an exciting range of cohort activities, ranging from residential events and group projects, to conferences and careers events. Please visit the SEAHA website (www.seaha-cdt.ac.uk) for details.

You will have a good first degree (min 2:1) in engineering, physics, computer science, mathematics or related science or engineering disciplines.

For any further details regarding the project contact Professor Adam Gibson:
adam.gibson@ucl.ac.uk.

The SEAHA Studentship will cover home fees and a stipend of up to a maximum of £18,172 per year (current rate) for eligible applicants (<http://www.seaha-cdt.ac.uk/opportunities/eligibility-criteria/>), and a substantial budget for research, travel, and cohort activities. Non-EU applicants are not eligible for funding.

There are two steps to apply.

Firstly, apply to study on the MRes Science and Engineering in Arts, Heritage and Archaeology, through the UCL online admissions system, following this link:
<https://www.ucl.ac.uk/bartlett/heritage/programmes/mres-science-and-engineering-arts-heritage-and-archaeology>

Secondly, send the following documents directly to the SEAHA Manager:

- A covering letter clearly stating your motivation, and stating your understanding of eligibility according to these guidelines: <https://www.epsrc.ac.uk/skills/students/help/eligibility/>
- A short research proposal (max. 2000 words) exploring the challenges as evident from the project research questions

SEAHA Manager

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UCL Institute for Sustainable Heritage

Faculty of the Built Environment

UCL

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The award will be subject to a Grant Agreement between UCL, Camlin Group Ltd and the Rijksmuseum.

UCL Taking Action For Equality.

Application deadline: noon, 1 Sep 2017.

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