Collaborative Doctoral Award
Optimisation of Environmental Control in Museum Collections of Bone and Ivory

Research area: Cultural and Museum Studies and Materials Science

University Partner
Birkbeck College, Department of Biological Sciences, and UCL Eastman Dental Institute

Project Summary
English Heritage holds a very significant collection of archaeological bone, displayed and stored in a much wider range of environments than most other heritage institutions. There are important displays at Stonehenge, Lullingstone Roman Villa, St Augustines Abbey, St Peters church, Chesters Roman Fort amongst others. A number of forthcoming projects will incorporate bone materials on display. Over 10,000 boxes of bone are stored in Dover, Fort Brockhurst, St Peters Ossuary, Helmsley and Wrest Park Stores. In 2010 a national audit of collections identified major degradation of materials and work is now underway to address this; however we still lack vital information for our archaeological bone collection. A review of the literature has identified critical gaps in knowledge about RH and acetic acid response. Managing our bone collection is hence particularly challenging due to this lack of evidence.

This is the first piece of research to address archaeological bone behaviour to fluctuating relative humidity across the spectrum of collections and to apply acoustic emission to these materials. It is a truly interdisciplinary project, working at the interface between conservation science and physical/biological sciences, for an arts and humanities purpose.

Preventive conservation of bone and ivory objects in collections has very limited scientific underpinning, with few studies on the determination of suitable relative humidity (RH), pollution and light levels. A review of the literature has identified critical gaps in information concerning the effect of fluctuations in RH, effect of volatile organic acids, and effect of light exposure for these materials.

Damage assessment will be based on a multi-disciplinary and multi-scale approach ranging from nanometrology to the meso and macro scale and will include non-invasive imaging techniques, atomic force microscopy (AFM), together with thermoanalytical, spectroscopic, mechanical, and dielectric techniques. The aim will be to develop minimally intrusive to completely non-invasive methods for damage assessment.

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